Эргодизайн. 2022. № 3 (17). С. 155-161. ISSN 2619-1512 Print, ISSN 2658-4026 Online
Ergodesign. 2022. № 3 (17). P. 155-161. ISSN 2619-1512 Print, ISSN 2658-4026 Online

Управление в организационных системах

Научная статья
Статья в открытом доступе
УДК 519: 001.891
doi: 10.30987/2658-4026-2022-3-155-161

Применение методологии эргономического дизайна при создании региональных и корпоративных антропогенных экосистем

Валерий Владимирович Глущенко[1]✉
[1] **Московский политехнический университет, Москва, Россия**
[1] **Glu-valery@yandex.ru; https://orcid.org/0000-0003-1324-9326**

Аннотация. *Предметом статьи выступает развитие методологии эргономического дизайна при проектировании антропогенных корпоративных и региональных экосистем; объектом статьи является эргономический дизайн антропогенной корпоративной или региональной экосистемы; целью работы выступает рост эффективности антропогенных корпоративных или региональных экосистем; для достижения поставленной цели решаются такие задачи: описания метода эргономического дизайна проектирования сложных систем; изучается содержание экосистемного подхода при проектировании антропогенных объектов в процессе развития 9-го технологического уклада; описано понятие и сущность корпоративной или региональной экосистемы; обсуждаются критерии оценки эффективности корпоративных и региональных антропогенных экосистем; описаны этапы создания корпоративных и региональных экосистем; описан эргономический дизайн рисков создания корпоративных региональных экосистем; научными методами в статье выступают: методология эргономического дизайна; исторический анализ; экосистемный подход; теория технологических укладов; системный и логический анализ; прогнозирование; научная новизна статьи связана с развитием методологии эргономического дизайна как инструмента проектирования корпоративных и региональных экосистем*.

Ключевые слова: метод, эргономический дизайн, антропогенная экосистема, технологический уклад, создание, структура, эффективность, критерий, функции, роли, риски

Для цитирования: Глущенко В.В. Применение методологии эргономического дизайна при создании региональных и корпоративных антропогенных экосистем // Эргодизайн. №3 (17). 2022. С. 155-161. http://dx.doi.org/10.30987/2658-4026-2022-3-155-161.

Original article
Open Access Article

Application of the methodology of ergonomic design in the creation of regional and corporate anthropogenic ecosystems

Valery V. Glushchenko [1]✉
[1] **Moscow Polytechnic University, Moscow, Russia**
[1] **Glu-valery@yandex.ru; https://orcid.org/0000-0003-1324-9326**

Abstract. *The subject of the article is the development of the methodology of ergonomic design in the design of anthropogenic corporate and regional ecosystems; the object of the article is the ergonomic design of an anthropogenic corporate or regional ecosystem; the purpose of the work is to increase the efficiency of anthropogenic corporate or regional ecosystems; to achieve this goal, the following tasks are solved: descriptions of the method of ergonomic design of design complex systems; the content of the ecosystem approach in the design of anthropogenic objects in the development of the 9th technological order is studied; the concept and essence of a corporate or regional ecosystem are described; criteria for evaluating the effectiveness of corporate and regional anthropogenic ecosystems are discussed; the stages of creating*

corporate and regional ecosystems are described; the ergonomic design of the risks of creating corporate regional ecosystems is described; scientific the methods in the article are: methodology of ergonomical design; historical analysis; ecosystem approach; theory of technological orders; system and logical analysis; forecasting; scientific novelty of the article is connected with the development of the methodology of ergonomic design as a tool for designing corporate and regional ecosystems.

Keywords: method, ergonomic design, anthropogenic ecosystem, technological structure, creation, structure, efficiency; criterion; functions, roles, risks

For citation: Glushchenko V.V. Application of the methodology of ergonomic design in the creation of regional and corporate anthropogenic ecosystems // Ergodizayn [Ergodesign], 2022, no. 3 (17). pp. 155-161. doi: 10.30987/2658-4026-2022-3-155-161.

Introduction

The relevance of the topic of the article is determined by the growing attention to the use of ergonomic design methods in the creation of various types of anthropogenic ecosystems. In the period of the 9th technological order (2010-2040), ecosystems and ergonomic design can be considered new forms of doing business. Therefore, the integration of an ergonomic approach and the process of creating corporate and/or regional ecosystems is very important.

The formation of a new technological order and the process of post-crisis modernization of the regional economy and the social life of the society of the regions give additional relevance to the topic of the article.

The hypothesis of the article is the statement that the development of the methodology of ergonomic design of corporate and regional ecosystems will improve the efficiency of the processes of creation and functioning of such ecosystems.

The aim of the work is to increase the effectiveness of the application of the methodology of ergonomic design at all stages of the creation and functioning of corporate and regional ecosystems.

To achieve this goal , the following tasks are solved:

- the content of the ecosystem approach in the development of the 9th technological order is studied;
- describes the concept and essence of ergonomic design in the creation of anthropogenic corporate and regional ecosystems;
- criteria for evaluating the effectiveness of regional ecosystems are discussed; the stages of creating a regional ecosystem are described;
- the application of ergonomic design in the risk management of the creation of regional ecosystems is described.

The object of the article is anthropogenic ecosystems.

The subject of the article is the development of the methodology of ergonomic design in the creation of anthropogenic ecosystems.

The study of scientific results on the topic of the article allows us to say the following. The application of ergonomics methods in the design of the external environment is becoming an increasingly popular area of practice [1, p. 2; 2, p. 2]. The use of ergodesign and emotional design create conditions for a complex perception of the environment by a person [3, pp. 46-50]. The use of ergodesign can be accompanied by standardization [4, pp. 122-138]. It is believed that an accessible (inclusive) fashion can be the result of the application of the ergodesign methodology [5, pp. 97-99].

At the same time, at the beginning of the 21st century, researchers are actively studying the concept, types and essence of ecosystems [6, pp. 23-24]. Scientists consider it necessary to develop theoretical ideas in the field of ecosystem approach [7, pp. 103-111]. They form standards of activity and recommendations for the development of entrepreneurial ecosystems [8, p. 2]. Private industry ecosystems should be integrated into the ecosystem of the national economy [9, p. 156-166]. One of the most well-known ecosystems working in practice is the ecosystem of Sberbank PJSC, aimed at comprehensive customer service of this organization [10, p. 49-51]. They develop an ecosystem approach in the construction of regional and sectoral ecosystems [11, pp. 19-32; 12, pp. 29-36].

The analysis of scientific publications carried out in this article shows the relevance of the topic of this article.

Method

The ongoing global systemic crisis is associated with the process of formation of a new 9th technological order. Studies show that the cause of the crisis is a mismatch between new technologies and existing types of public relations [13, pp. 333-354].

To eliminate such disharmony between the organizational conditions of the development of new technologies and existing production institutions, the methodology of ergodesign can be applied.

Ergonomic design can be used to solve the following tasks:

- creation of harmonious systems from a set of elements;
- ensuring the perception of a set of elements as a whole;
- harmonization of relations between the elements of the internal among the complex system;
- harmonization of relations between the system and its external environment, etc.

The analysis shows that in the period up to 2040, the formation of a new technological order will be accompanied by the development of such types of technologies: resource-saving technologies; nanotechnologies, environmentally friendly technologies; neurotechnologies, information technologies and more.

In turn, the development of these new technologies will be accompanied by the formation of new forms of doing business and carrying out the life of the inhabitants of this region (people) [11, pp. 19-32; 12, pp. 29-36]. The development of regional and/or corporate ecosystems may become one of the promising areas of the forms of relations between stakeholders of regions and/or corporations. At the same time, it can be expected that the integration of these two promising areas: ergonomic design and ecosystem approach will be characterized by the emergence of a synergistic effect.

Under the anthropogenic coprorative or oegional ecosystem, we will agree to mean a multifunctional system created by man to meet his social needs. A characteristic feature of anthropogenic ecosystems is that they comprehensively provide safe and comfortable human life.

The activities of anthropogenic regional ecosystems must meet the requirements of: life safety; sustainability of the region's development; a high degree of completeness of meeting the needs of the region's residents; minimizing environmental damage; timely restoration of the environment in case of damage to the external environment; maximally satisfying the collective needs of stakeholders, taking into account the possible inconsistency of these requirements of stakeholders.

The characteristic features of the ecosystem approach include: comprehensive service of the social needs of the firm's clients or residents of the region; the desire to avoid consumer competition or for the labor force of its residents with other regions by creating an original system of comprehensive service of the social needs of customers or residents of the region; reliance on the traditional lifestyle of the firm's clients or the population of the region; orientation to the whole life cycle the cycle of the company's clients or residents of the region, and more.

In 2022, the development of anthropogenic ecosystems in the regions can be considered as a new paradigm for managing the socio-economic development of the region as a whole. In the process of modernization of the technological basis of the regions, the traditional ways of life of all categories of stakeholders of this regional ecosystem should be taken into account. This implies a different psychology of forming a strategy for the socio-economic development of the region, doing business and managing companies. This psychology should be based on the interests, needs and habits of various categories of stakeholders (clients, individuals and legal entities) in the region. As part of the creation of ecosystems in the regions, we can expect the emergence of processes of integration of technical and humanitarian knowledge.

The methodology of creating anthropogenic corporate and regional ecosystems can be called anthropogenic ecosystem engineering. Such ecosystem engineering can be defined as a new field of knowledge that harmoniously combines knowledge from various fields of science and practice in order to effectively solve the problems of creating regional anthropogenic ecosystems. The scientific methods of anthropogenic ecosystem engineering may include: geopolitical economics; marketing of places (regions); social insurance; social entrepreneurship; state and municipal management; ergodesign and other areas of modern science.

At the same time, the geopolitical economy means reliance on production factors and competitive advantages in the development of the region's production forces [14, pp. 33-37; 15, p. 2].

The concept of an ergodiainer approach to the creation of anthropogenic corporate or regional ecosystems in the process of developing a new technological order can be understood as a systematic view of such modernization of corporations or regions and its practical results.

The image of the future ecosystem of a corporation or region will be called the structure and main characteristics of the functioning of such ecosystems.

The stages of creating corporate or regional anthropogenic ecosystems can be recognized as:

1) pre-project studies (preliminary draft);
2) development of a project of a certain corporate or regional anthropogenic ecosystem;

3) practical implementation of the project "Anthropogenic ecosystem";

4) observation and analysis of the effectiveness of such an ecosystem.

The formation of the image of the future of an anthropogenic corporate or regional ecosystem is an important stage of pre-project studies of such systems. The structure of an anthropogenic ecosystem will be called the totality of its elements and the connections between them. Allocation of structural elements - structuring of anthropogenic regional ecosystems is possible on the basis of a number of factors. The structural elements of the anthropogenic ecosystem of the region can be considered the most important parts of such a system.

With a functional approach, the structural elements of the regional anthropogenic ecosystem can be called: the subsystem of providing the population of the region with jobs; the subsystem of social security of the population of the region; the subsystem of scientific and educational support for the activities of residents of the region; the subsystem of health care of the region and others.

With a gender approach , subsystems can be distinguished: ecosystem of men's vital activity; ecosystem of women's vital activity and others.

When dividing residents by the factor of their age, subsystems of the anthropogenic ecosystem can be distinguished: for children; for young people; for middle-aged residents of the region; for pensioners and others.

Under the ergodesigner design of the ecosystem of the region, we will begin to understand the process of creating a project of such an anthropogenic ecosystem based on the active use of the ergodesign methodology.

The project of the ecosystem of the region will be called a specific image of the future anthropogenic ecosystem of this region.

Ergonomic design at the stage of synthesis of the appearance of an anthropogenic ecosystem can solve the following problems: identification of factors of structuring such an eco-system; optimization of the appearance of subsystems of an anthropogenic ecosystem; harmonization of relationships between different subsystems.

In order to synthesize an ergodesigner project of a corporate or regional anthropogenic ecosystem, it is necessary to formulate the philosophy, ideology, culture, mission, vision of the process of creating such an eco-system.

The systematic unification of philosophy, ideology, and policy of creating ecosystems can be called the paradigm of the ergodesigner approach in the creation of anthropogenic corporate or regional ecosystems.

The philosophy of creating ergodesigner corporate or regional ecosystems can be called the most general wise view of the project and the process of functioning of such an ecosystem in the region.

The ideology of the creation and functioning of corporate or regional ecosystems can be called: firstly, the basic idea of creating the ecosystem under consideration in the region; secondly, the way power is distributed in the process of creating and functioning of such an ecosystem. With regard to the idea of creating ecosystems, the methodology of ergodesign allows solving such problems: firstly, the formation and selection of the best goal for building such an ecosystem; secondly, the best distribution of power between stakeholders of the project to create such an ecosystem.

The organizational culture of creating corporate or regional ecosystems can be called: values, beliefs and behavioral stereotypes of developers and staff of such an ecosystem. Ergodesign of organizational culture of corporate or regional ecosystems can solve such tasks: optimization of elements of organizational culture; harmonization of relations between elements of organizational culture of ecosystems.

The mission of creating an ergodesigner corporate or regional ecosystem can be understood as: a general description of the purpose of such an ecosystem in the region, the expected socio-economic effect of creating such an ecosystem.

The vision of creating an ergodesigner corporate or regional ecosystem will be called a motivating scenario for the creators of such an ecosystem, employees of the corporation or residents of the region for the development of such an anthropogenic ecosystem.

The stages of creating corporate or regional ecosystems can be called: pre-project studies of an anthropogenic ecosystem; design (creation of a project) of an ecosystem; creation of an ecosystem; operation (functioning) ecosystems; monitoring of ecosystem performance indicators.

The risk in creating corporate or regional ecosystems is the possibility of negative deviations in the processes of functioning of anthropogenic ecosystems.

Risks when creating corporate or regional ecosystems may consist of the following: incorrect choice of the purpose, mission and vision of creating an ecosystem; incorrect selection of structural elements of such an ecosystem; incorrect choice of tools for the functioning of the ecosystem; insufficient

effectiveness of the control system for the functioning of the anthropogenic ecosystem, and more.

Discussion

By the effectiveness of corporate or regional ecosystems, we agree to understand the ability of this ecosystem to achieve the goals set for them, provided that this ecosystem fulfills certain restrictions. These may be restrictions; on the amount of resources consumed; for the duration of the implementation of certain socio-economic processes.

The application of the methodology of ergonomic design in the design of such anthropogenic ecosystems should: increase the efficiency of such ecosystems; create a synergetic effect in the functioning of such systems due to more effective interaction of elements of such ecosystems.

The level of efficiency of corporate or regional ecosystems can be assessed using criteria for evaluating the effectiveness of the functioning of such ecosystems. The criterion for evaluating the effectiveness of a corporate or regional ecosystem can be understood as the rule for choosing the best option from a number of possible options for such an ecosystem.

The criterion for evaluating the effectiveness of an ecosystem can be synthesized using the performance indicators of such an ecosystem. An indicator of the effectiveness of an anthropogenic ecosystem can be called the most important indicators of such an ecosystem, reflecting its purpose and main characteristics.

The performance indicators of a corporate ecosystem can include: a list of the main functions of such an ecosystem; performance indicators for each of the ecosystem functions.

The main indicators of the corporate ecosystem can be called: the current profit of the company; the value of the company; the profitability of the company's assets and more.

As indicators of the effectiveness of the functioning of the ecosystem of the region, we can name: the number of inhabitants of the region; the dynamics of the number of inhabitants of the region; per capita income of the inhabitants of the region; the birth rate in the region; the mortality rate in the region; life expectancy; the happiness index of the population of the region and more.

The main tasks of ergonomic design at the stage of forming sets of criteria for evaluating the effectiveness of corporate or regional anthropogenic ecosystems include: highlighting the most important indicators of ecosystem activity; optimizing a set of such indicators of ecosystem efficiency, and more.

Similar criteria for evaluating the effectiveness of subsystems of a regional ecosystem can be formed. For example, to assess the production system of a region, the following indicators can be used: the average number of jobs in the region; the ratio of the number of jobs to the number of able-bodied population; average revenue per employee; average salary in the region and others;

As indicators of the effectiveness of the health subsystem of the region, we can name: the life expectancy of the inhabitants of the region (according to their various groups); the number of beds in hospitals per 1000 residents and others.

Indicators of the effectiveness of the subsystem of science and education of the anthropogenic ecosystem of the region can be called: the number of patents per year: the number of scientific and pedagogical workers; the number of students; the level of satisfaction of stakeholders with the quality of services in this area, and more.

The tasks of ergonomic design in the study of the risks of creating anthropogenic ecosystems can be considered: analysis of the significance of individual risks, taking into account the conditions of a particular ecosystem; ranking of risks by their importance; optimization of ecosystem risk management methods, and more.

The originality of a corporate or regional ecosystem is based on the following factors: the competitive advantages of the firm or region; the competitive disadvantages of the company or region; the market position of the corporation; the specialization of the region's labor in the national economy; the national characteristics of the region and more.

Conclusion

The article discusses the relevance of creating and developing corporate and regional ecosystems using ergonomic design methods. It is proved that during the formation of the new 9th technological order, the ecosystem approach and ergonomic design will be intensively applied. Integration of the methodology of ergonomic design and the eco-system approach will allow to obtain a synergetic effect in the functioning of anthropogenic ecosystems. The concept of "corporate or regional ecosystem" is clarified, the structure of anthropogenic ecosystems is discussed. The paper substantiates the tasks of ergonomic design in the process of creating anthropogenic ecosystems. A set of

indicators is proposed to assess the effectiveness of corporate and regional ecosystems. The results of this article can be useful in the development of corporate or regional anthropogenic eco-systems.

СПИСОК ИСТОЧНИКОВ

1. **Панеро Дж., Зелник М.** Основы эргономики. Человек, пространство, интерьер. М.: Астрель, 2008. 320 с. ISBN 5-17-038655-9.

2. **Рунге В.Ф., Манусевич Ю.П.** Эргономика в дизайне среды. М.: Архитектура-С, 2009. 328 с. ISBN 978-5-9647-0026-5.

3. **Мирсаяпова И.И.** Эмоциональный дизайн и эргодизайн как средство комплексного восприятия предметов дизайна человеком // Дизайн-ревю. 2017. № 1-4. С. 46-50.

4. **Рубцов А.Л., Свирко В.А., Шмелева Т.Ф.** Фактор стандартизации в эргодизайне // Теория и практика дизайна. 2019. № 16. С. 122-138. DOI 10.18372/2415-8151.16.14335.

5. **Медведева О.А., Рыкова Е.С.** Инклюзивная мода как часть эргодизайна // В сборнике: Эргодизайн как инновационная технология проектирования изделий и предметно-пространственной среды: инклюзивный аспект. Сборник научных трудов. Москва, 2019. С. 97-99.

6. **Боровик Г.Г., Дорошенко К.В.** Понятие экосистемы, виды экосистем и основные отличия природных экосистем от антропогенных // Студенческий форум. 2020. № 30 (123). С. 23-24.

7. **Фадейкина Н.В., Малина С.С.** Развитие теоретических представлений на категории "экосистема" и "инновационная экосистема"// Сибирская финансовая школа. 2021. № 2 (142). С. 103-111.

8. **Коротков А.В., Зобнина М.Р.** Стандарты предпринимательской экосистемы университета: рекомендации по развитию предпринимательской экосистемы. М.:ВШЭ , 2019. 96 с. ISBN 978-5-7598-1926-4.

9. **Гаврилов С.Н., Володина С.И.** Информационная (цифровая) экосистема адвокатуры в контексте экосистемы цифровой экономики России // Актуальные проблемы российского права. 2019. № 6 (103). С. 156-166. DOI 10.17803/1994-1471.2019.103.6.156-166.

10. **Иванович М.Н.** Экосистема ПАО Сбербанк. продукты экосистемы для юридических лиц // Достижения науки и образования. 2020. № 14 (68). С. 49-51.

11. **Глущенко В.В.** Экосистемный подход при модернизации северного морского пути в период становления 8-го технологического уклада // Kazakhstan Science Journal. 2021. Т. 4. № 9 (34). С. 19-32.

12. **Glushchenko V.V.** Concepts of modernization of the technical infrastructure of the fuel and energy complex during the transition to the eighth technological order// The scientific heritage. 2021;78-3 (78):29- 36. DOI 10.24412/9215-0365-2021-78-3-29-36.

13. **Глущенко В.В.** Развитие методологии кризисологических исследований и антикризисного управления (к 10-ти летию начала глобального системного кризиса 2008 года) // Бюллетень науки и практики. 2018. Т.

REFERENCES

1. **Panero J., Zelnik M.** Fundamentals of Ergonomics. Man, space, interior. M.: Astrel, 2008. 320 p.

2. **Runge V.F., Manusevich Yu.P.** Ergonomics in the design of the environment. M.: Architecture-S, 2009. 328 p.

3. **Mirsayapova I.I.** Emotional design and ergodesign as a means of complex perception of design objects by a person. Design review. 2017;1-4:46-50.

4. **Rubtsov A.L., Svirko V.A., Shmeleva T.F.** The factor of standardization in electronic design. Theory and practice of design. 2019;16:122-138. DOI 10.18372/2415-8151.16.14335.

5. **Medvedeva O.A., Rykova E.S.** Inclusive fashion as part of ergodesign. Ergodesign as an innovative technology for the design of objects and the subject-spatial environment: an inclusive aspect. Collection of scientific papers. Moscow, 2019. p. 97-99.

6. **Borovik G.G., Doroshenko K.V.** The concept of an ecosystem, types of ecosystems and the main differences between natural and anthropogenic ecosys-tems. Student Forum. 2020;30(123):23-24.

7. **Fadeikina N.V., Malina S.S.** Development of theoretical concepts in the categories "ecosystem" and "innovative ecosystem". Siberian Financial School. 2021;2(142):103-111.

8. **Korotkov A.V., Zobnina M.R.** Standards of the entrepreneurial ecosystem of the University: recommendations for the development of the entrepreneurial ecosystem. M.:HSE, 2019. 96 p

9. **Gavrilov S.N., Volodina S.I.** Information (digital) ecosystem of advocacy in the context of the ecosystem of the digital economy of Russia. Actual problems of Russian law. 2019;6(103):156-166. DOI 10.17803/1994-1471.2019.103.6.156-166.

10. **Ivanovich M.N.** Ecosystem of Sberbank PJSC. ecosystem products for legal entities. Achievements of science and education. 2020;14 (68):49-51.

11. **Glushchenko V.V.** Ecosystem approach to the modernization of the Northern sea route during the formation of the 8th technological order. Kazakhstan Science Journal. 2021;4 (9(34)):19-32.

12. **Glushchenko V.V.** Concepts of modernization of the technical infrastructure of the fuel and energy complex during the transition to the eighth technological order. The scientific heritage. 2021;3(78):29-36. DOI 10.24412/9215-0365-2021-78-3-29-36.

13. **Glushchenko V.V.** Development of the methodology of crisis research and crisis management (to the 10th anniversary of the beginning of the global systemic crisis of

4. №9. С. 333-354. DOI 10.5281/zenodo.1418755.

14. **Глущенко В.В.** Геоэкономикология: научная основа развития геополитической экономики в посткризисный период // Инновационная наука. 2015. № 10-2. С. 33-37.

15. **Глущенко В.В., Глущенко И.И.** Геополитическая экономика. М: Глущенко Валерий Владимирович, 2016. 116 с. ISBN 978-5-9908432-0-2.

2008). Bulletin of Science and Practice. 2018;4(9):333-354. DOI 10.5281/zenodo.1418755.

14. **Glushchenko V.V.** Geoeconomicology: the scientific basis for the development of the geopolitical economy in the post-crisis period. Innovative science. 2015;10-2:33-37.

15. **Glushchenko V.V., Glushchenko I.I.** Geopolitical economy. M: Glushchenko Valery Vladimirovich, 2016. 116 p.

Информация об авторе:

Глущенко Валерий Владимирович
доцент, доктор технических наук,
тел. 89260829685, международный идентификационный номер автора:
Scopus-Author ID 0000-0003-1324-9326,
Research- ID-Web of Science 746410, Author-ID-РИНЦ 4386-8746, SPIN-код: 7626-5920, AuthorID: 817374

Information about the author:

Glushchenko Valery Vladimirovich
Associate Professor, Doctor of Technical Sciences,
tel. 89260829685, international identification number of the author:
Scopus-Author ID 0000-0003-1324-9326, Research- ID-Web of Science 746410, Author-ID-RSCI 4386-8746, SPIN-код: 7626-5920, AuthorID: 817374

Вклад автора: автор сделал эквивалентный вклад в подготовку публикации.
Author's contribution: The author has made an equivalent contribution to the preparation of the publication.
Автор заявляет об отсутствии конфликта интересов.
The author declares that there is no conflict of interest.
Статья поступила в редакцию 04.05.2022; одобрена после рецензирования 11.05.2022; принята к публикации 12.05. 2022. Рецензент – Демиденко Э.С., д.фн., профессор, профессор Балтийского федеральнго университета им. И. Канта, член редсовета журнала «Эргодизайн».
The paper was submitted for publication on the 4th of May, 2022; approved after the peer review on the 11th of May, 2022; accepted for publication on the 12th of May, 2022. Reviewer – Demidenko E.S., Ph.D., Professor, Professor of the Baltic Federal University named after I. Kant, member of the Editorial Board of the journal "Ergodesign".