Scientific Bulletin
of Mukachevo State University

Series
Economics

Volume 10, No. 4, 66-75
Journal homepage: https://economics-msu.com.ua/en

UDC 658.5:316.324.8
Doi: 10.52566/msu-econ4.2023.66

Modelling decision-making in the field of green production in a post-industrial society

Yevheniia Savchuk*
Senior Lecturer
Odesa National Maritime University
65029, 34 Mechnikov Str., Odesa, Ukraine
https://orcid.org/0000-0002-4108-666X

Abstract. Modern management processes must solve the complex problem of optimal decision-making and timely and effective forecasting of their results, to select successful combinations of solutions in a particular production area of the new information and innovation society that has replaced the industrial era. Considering the above issues, the modelling process as an effective mechanism for decision-making and risk management deserves special attention. The purpose of the study was to highlight modelling as an effective method of decision-making in green production in a post-industrial society, and to justify the feasibility of its use at different levels of the production process. During the study, theoretical methods were applied, in particular, the study of scientific materials and research results, description and comparison. The results were also generalized and analysed. The article considers main approaches to the strategy of the introduction of modelling of decision-making in the field of green production in the post-industrial society, and provides a detailed definition of its structural elements and priority principles. It is clarified that modelling as a management tool is used in the development of rather complex production and management decisions and is the construction of a model or system of models of the process or phenomenon under study for its study, analysis, and formation of an appropriate fan of alternatives to the result. The main types of modelling according to different classifications are analysed, and the possibilities of applying some of them in the decision-making system in the production plane are investigated. Conclusions on the efficiency and effectiveness of the use of the modern innovation and information economic space in production processes are provided. The expediency of using different approaches to decision-making modelling, depending on some influencing factors, is substantiated. The possibility of solving the industrial multitasking of decision-making by creating models is proved. These research results are of practical importance for improving management processes in the field of green production in a post-industrial society, regardless of ownership, production volumes and scope of activity

Keywords: innovation; system model; green economy; alternative solutions; production process

Received: 27.08.2023, Revised: 30.10.2023, Accepted: 27.12.2023

Suggested Citation: Savchuk, Ye. (2023). Modelling decision-making in the field of green production in a post-industrial society. *Scientific Bulletin of Mukachevo State University. Series "Economics"*, 10(4), 66-75. doi: 10.52566/msu-econ4.2023.66.

*Corresponding author

Introduction

Modern economic and production processes are faced with the acute problem of limited and exhaustible resources on the one hand, and the growing burden on the environment on the other. The post-industrial society, characterized by a shift from the predominant production of goods to the priority of the service sector, with the primary influence of information and intellectual technologies, sets its own requirements for the production process. The production system is acquiring "green" characteristics based on the principles of energy efficiency, minimization of negative impact on the environment and innovation. Intellectual assets, highly skilled labour, and the ability to come up with and implement ideas are becoming productive forces in a post-industrial society (Radziszewska-Zielina *et al.*, 2022). Sustainable innovation development and the "proactive movement" inherent in green manufacturing require a fundamentally new approach to decision-making – more flexible, adaptive, but at the same time with clearly defined structural algorithms and an orderly hierarchy of priorities.

One of the most optimal tools in the decision-making system in the production activities of a post-industrial society is modelling, a special way of reflecting objective reality, in which a specially created model is used to study the system with the reproduction of the essential properties of the phenomenon or process under study (Kuzmin *et al.*, 2021; Hurzhyi *et al.*, 2022). Modelling makes it possible to make reliable predictions of real systems and effectively optimize their operation (Zhang *et al.*, 2020; Han & Xia, 2021). Depending on the goals set, models are developed and applied to make decisions in various areas of production management. In particular, the management of the production logistics system, planning of production activities, management of the sales system, etc. The specifics of model creation are primarily determined by the choice of appropriate performance criteria and procedures for implementing the modelling results. The goal of the modelling process is to prepare and adopt the most successful solution to a particular problem, considering the maximum possible variability of preconditions and influencing factors. Since the decision-making process in the manufacturing sector is usually accompanied by a limited amount of information, modelling allows successful decisions to be made without taking this limitation into account (González-Prida & Carnero, 2021). Modelling is becoming particularly relevant for decision-making in the field of green production, as it makes it possible to consider the priorities and features of the latter in the decision-making process, shifting the focus from standard algorithms to optimally structured flexible models.

The problem of decision-making in a sustainable economy of a post-industrial society is covered in the works of many scholars and leaves a lot of room for finding optimal solutions. Modelling of decision-making is considered in the works of modern scientists R.X. Ding (2020), M. Mahrinasari *et al.* (2021). Their research is aimed at establishing modelling as an effective decision-making tool in modern production processes, considering the basic principles of circular economy development and the innovative direction of post-industrial society. Ways to improve and prevailing dominance of "green" processes in modern production, which are studied in detail in the works of S. Gershwin (2018), M. Goncharenko *et al.* (2020), N. Norouzi (2021), include the introduction of advanced decision-making methods and correlation of situational production changes with the help of an accessible and effective tool, primarily modelling, as an integral part of management processes. The need to apply modelling to decision-making in the production processes of the green economy is due to the complexity of organizational situations, the impossibility of experimenting with real objects and the orientation of management processes towards the future with mandatory analysis of the consequences of certain alternatives. The purpose of the study was to examine modelling as an optimal tool for successful production decision-making in the green economy of a post-industrial society, as well as the necessary prerequisites for its practical implementation at different stages of production processes and to compare the main approaches to model building, with the most optimal and universal options being identified.

Materials and Methods

The study used the analysis method to reveal the theoretical aspects of modelling as a decision-making tool in production activities. Also, based on this method, its classification types and main approaches that are optimal for practical use in the management processes of a post-industrial society were characterized. The analysis was necessary for studying the features of green production as an integral part of the development of post-industrial society. In the course of using this method, the essence of the principles of the circular economy and the environmental orientation of the modern production and economic system was revealed. By means of analysis and synthesis of information volumes and scientific works in the field of the studied issues, as well as by means of the comparison method, the weaknesses of the object of study, the priority vectors of further detailed research are identified, and the effectiveness of modelling as the dominant approach to decision-making in the field of green production is assessed.

To determine the effectiveness, advantages, and features of the process of modelling decision-making in green production in a post-industrial society, a systematic approach is used, which focuses the research on revealing the integrity of the object of study and the mechanisms that ensure it. Particular attention is paid to the variability of approaches to the modelling process, its flexibility, focus on development and improvement. In the course of the study, theoretical methods of scientific research were used. In addition, the study has formed its own model of optimization of green production in a post-industrial society, the implementation of which can effectively affect the activities of Ukrainian enterprises in the field of green production.

Accordingly, its purpose, tasks, structure, stages, as well as advantages and disadvantages were revealed. The developed model in the study can be adapted to any specific production conditions and goals set for the enterprise.

In the course of the study, the author conducted relevant analytics and determined the level of priority of certain types of models in terms of the efficiency of decision-making in production and management activities. Within the framework of the deterministic approach, the study revealed the prerequisites and determining factors for choosing the optimal type of models used. The method of comparison was used in the study to compare the general principles and those inherent in most of the decision-making models. It was used to establish a list of principles that can form the basis for the successful implementation of a modelling system in green economy production processes. The comparison was also necessary to compare different approaches to decision modelling in order to identify their advantages and disadvantages.

Based on the comparative and descriptive method, the study expressed the specifics of the properties of the modelling object, as well as its classification types. The descriptive approach was necessary to reveal the best options for modelling schemes used in decision-making directly in the field of green production of post-industrial society. The method of generalization was necessary to study and identify typical features and properties of the phenomenon under study. On its basis, the regularities of the phenomenon under study, its opportunities, and problems in the conditions of post-industrial society were expressed. This method made it possible to determine the list of factors that cause difficulties in the process of implementing the approach of creating decision-making models in production processes.

Using the deduction method, the specific principles of successful use of the modelling process were revealed, based on an understanding of general approaches to effective decision-making. It was necessary to implement a differentiated approach in the study, as well as to determine its specific orientation towards the innovation and information path of production development in a post-industrial society.

Results

In the process of studying the phenomenon of decision-making modelling and its theoretical implementation in management processes in the field of green production in a post-industrial society, some features, differences, and specific factors have been identified that affect both the general decision-making process and the nuances of implementing the results of the decision in a problematic production situation.

The process of choosing the best of several possible courses of action to achieve a certain goal is called decision-making. Modelling is an effective tool for justifying and selecting management decisions. Models are the basis of a scientific approach to decision-making. O. Kushlyk-Dyvulska & B. Kushlyk (2014) note that a model is a simplified representation of an object, system, or idea that differs from the real world. Modelling is used in theoretical and experimental research methods, the only difference is in the types of models used.

Decision-making models should reflect the key elements of this process: goals, possible options, environmental conditions, and functions that determine the success of the chosen decision. Models can perform both one and several objective functions, i.e. the value underlying the assessment. In addition to the objective function, a prerequisite for successful modelling is the existence of priorities for the ratio, which represent the relative efficiency of achieving the objective functions. The second element is a set of alternatives, i.e. expected courses of action. In software decision models, several options can be implemented simultaneously. The third element is the state of the external environment, a set of external factors of influence and their predicted development. There are situations of certainty, uncertainty, and risk. The model provides different levels of information support for different states. The effectiveness function allows predicting the consequences of a certain alternative in a given state of the environment. At the same time, consequences of an unambiguous nature can only be inherent in combinations that include an alternative and a state of certainty, while in a situation of uncertainty or risk, several options for consequences are possible simultaneously. The time factor, which is clearly manifested in decision-making models and is a priority in determining the periods and timing of actions, should not be neglected. Thus, models can be both static and dynamic. The effectiveness of modelling is determined by a number of factors specific to production processes:

- the complexity of production and organizational situations in relation to a particular issue;
- impossibility of conducting an experiment in most situational circumstances;
- the future orientation of production activities, which makes it impossible to study a phenomenon that does not yet exist and may never occur.

In such a situation, modelling is positioned as the best way to see the options for the future and determine the potential consequences of alternative solutions, which makes it possible to compare them objectively. At the same time, there are options for studying the interrelationships and interdependencies of the modelled system and improving its further functioning and development. If the simplification of a real production system is carried out correctly, the approximate reflection of the real situation obtained as a result allows forming rather accurate characteristics and properties of the object of study.

Among the advantages of decision-making modelling as an effective tool are the following

- the possibility of applying a systematic approach to analysing a situation or problem;
- obtaining a wide variety of alternatives as a result of modelling;
- the possibility of involving data from the lowest levels of management;

• less resource and time consumption compared to conducting experiments with real production systems;

• identification of factors of minimal impact on the problem in the process of modelling and their subsequent limitation.

Among the main properties of models in general, it is worth noting that the model should be similar to the object under study, but at the same time should be simpler so that it can be studied. At the same time, the main purpose of the model is to allow for experiments, analysis, and study that are not possible with the object under study. The creation of a model is the development of a formalized scheme, which includes the establishment of the purpose of modelling, the accumulation of input information from a list of sources, which is subject to further processing and makes it possible to create a modelling result – decision options, and sometimes even alternative ways of solving a problem or situation. Identification of the advantages of a situational solution or goal, as well as the formation of an optimal selection criterion in the modelling process, makes it possible to eliminate a problematic situation or obstacle or make another correct decision. Developing an algorithm for choosing such a solution through certain possible actions ensures that the production goal is best achieved. Model validation involves checking whether the built model matches the real situation. For this purpose, information based on experience or analogies with decisions already made and implemented is used. It is worth noting that for decision-making in the field of production, including green production, it is most appropriate to use models with clear regulations. They rationalize the development of an action strategy in terms of pre-identified constraints and criteria, taking into account the most reasoned positions. Such models have some specific features:

• the system parameters should cover the characteristics and peculiarities of the place, time, and product of the problem;

• the information on which the essence of the problem situation is based must have a reliable assessment of the degree of completeness and reliability;

• the relevance, novelty, priority, and urgency of the problem are taken into account;

• all stakeholders in solving the problem are covered, as well as possible limitations that may be imposed by them at the stages of preparation and implementation of the solution;

• different types of decisions are applied – innovative, stochastic, deterministic, etc.

In the process of building a decision-making model in the field of green production, general stages can be identified (Fig. 1):

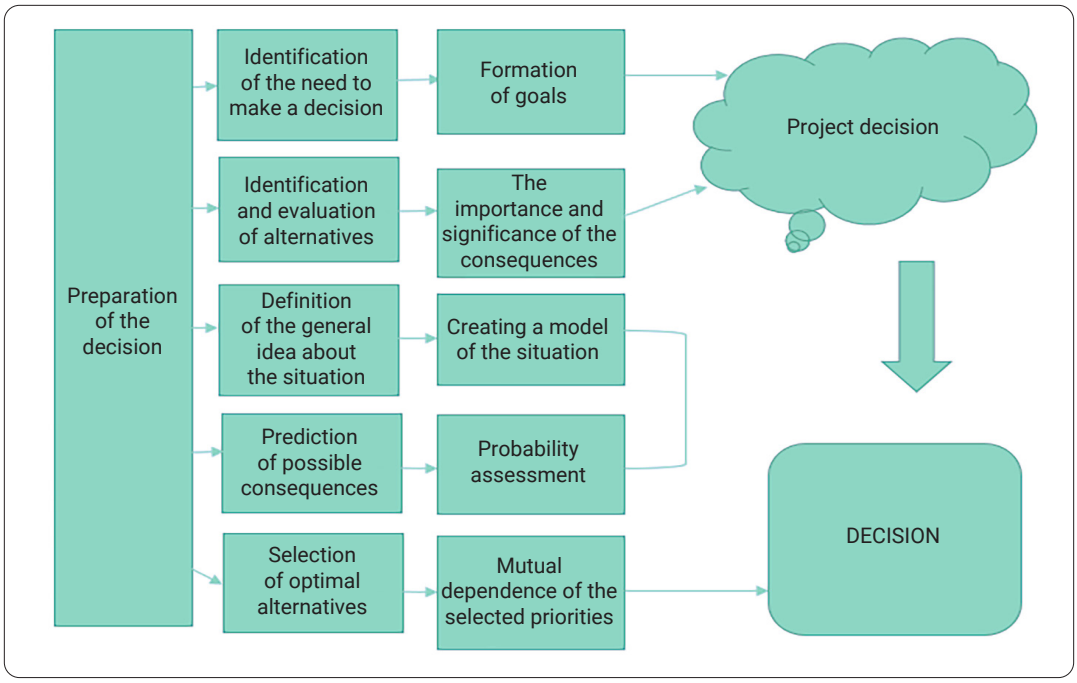

Figure 1. Modelling decision-making

Source: developed by the author

If considering the main conceptual models of decision-making in the field of green production in a post-industrial society, it is worth focusing on the feasibility of using some of them. In particular, the following can be identified as proposed for practical application:

• convergence model (special attention is paid to the impact of the production process on intra-group relations);

• descriptive model (used to determine the properties and parameters of the decision-making process for the purpose of long-term forecasting);

• adaptive (based on the introduction of new methods for a specific problematic decision-making situation);

• deterministic model (based on a clear formulation of goals, taking into account the factors of periodicity and complexity and with a clear fixation of the factors of influence at the time of decision-making and accurate predictability of their impact);

• stochastic model (involves an element of uncertainty and unpredictable impact on the development of the situation).

In addition, general approaches (models) to decision-making in the field of green production in a post-industrial society can be distinguished: the rational decision model, the intuitive model and the creative decision model. Despite some generality inherent in the above classification, virtually all decisions in production processes, depending on the urgency, availability of resources, and nature of the problem, can be made by using one of these models.

The key is to focus on using the most logical solutions to find the best option. This process often involves analysing several solutions simultaneously. The rational decision model is a convenient approach if there are sufficient time resources (Fig. 2). The value of the model lies in the fact that it often results in rational decisions. In addition, the use of computer technology and minimization of the negative aspects of the human factor are given the highest priority for its creation.

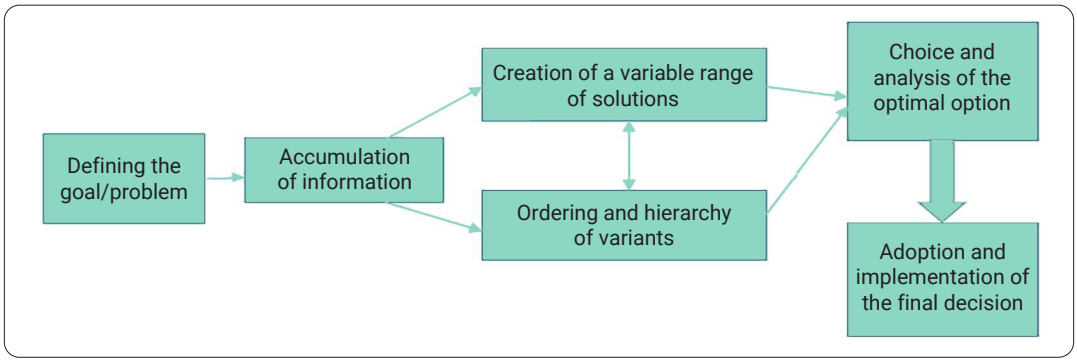

Figure 2. Model of making a rational decision

Source: developed by the author

It is characterized by the use of feelings and instincts to make decisions. Despite some ambiguity of this approach to production processes, it is justified in case of the need to make quick decisions or in extreme circumstances when logical justification is limited by the time factor. The intuitive decision-making process is less structured and is based mainly on experience and analogies. Intuitive decision-making relies more on personal experience and intuition than on consistent logic or concrete reasoning. Intuition is not arbitrary or irrational, as it is based on years of practice and common sense arguments accumulated in the subconscious mind. The use of intuition provides a quicker sense of the problem and a much faster choice of a solution. The main disadvantage of the intuitive decision-making model is that it does not reflect functional relationships and constraints, although it does provide the basis for building more complex models (Fig. 3).

The creative solution model is based on the use of non-standard approaches to make innovative decisions that allow achieving goals or overcoming obstacles. A special feature in this case is the search for solutions based on experience or analogy. The creative solution model is effective when situations arise that have not been encountered in the production process before, or when implementing new projects. Using this type of decision-making usually requires flexible thinking to create successful, unique solutions and is an integral part of the iterative processes that characterize post-industrial society. The use of various software products and computer-graphic methods opens up opportunities to reduce time costs and minimize the impact of the human factor on the modelling result, if necessary, as well as to create a kind of decision archive that can serve as a starting point when using a creative decision model or a rational model. If an intuitive decision-making model is the priority, even a schematic hand drawing can be used.

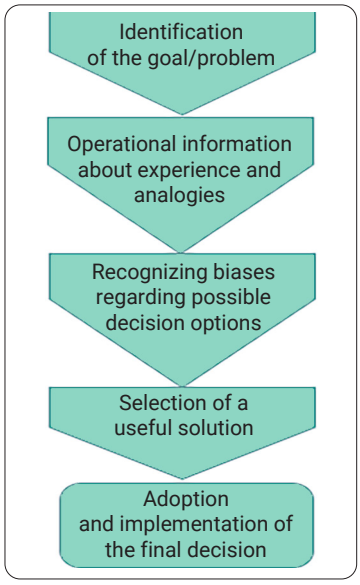

Figure 3. Intuitive decision-making model

Source: developed by the author

Based on the above, the study developed its own model of production optimization for green manufacturing in a post-industrial society. Its purpose is to ensure maximum efficiency of green production with minimal environmental impact. The objectives of this model are to optimize the production process, resource use, and waste management. As for the basic principles on which the model should be implemented, they include:

- energy efficiency – using the minimum amount of energy for production (introduction of energy-saving lamps in industrial workshops; use of energy-saving engines in transport; use of closed cooling circuits);
- use of renewable energy sources – use of energy from renewable sources (installation of solar panels at industrial enterprises; use of wind power plants for electricity generation; development of hydropower);
- use of resource-saving technologies – use of technologies that reduce the consumption of raw materials and supplies (waterless technologies for cement production; use of recycled materials for paper production; reduction of waste per unit of production, for example, through the use of compact packaging);
- absence of harmful emissions – ensuring the absence of harmful emissions into the environment (introduction of waste-free technologies; installation of filters at industrial enterprises; reduction of chemicals use).

The structure of a production optimization model for green production in a post-industrial society consists of a database (containing information on the production process, resource characteristics, emissions, and waste); an optimization algorithm (determining the optimal production parameters). In this case, the latter is based on the method of mathematical programming and allows setting such values of production parameters that ensure maximum production efficiency with minimal environmental impact. The stages of the model are shown in Figure 4.

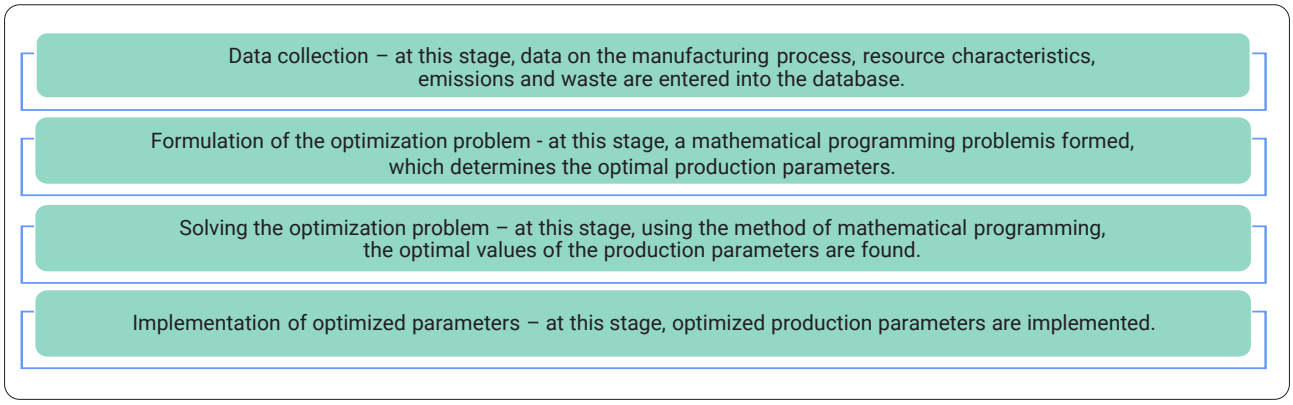

Figure 4. Stages of implementation of the optimization model of green production in a post-industrial society
Source: developed by the author

In a post-industrial society, where attention is paid to renewable energy sources and resource-saving technologies, the proposed green manufacturing optimization model can be used to reduce: dependence on fossil energy sources; consumption of raw materials and supplies; and emissions of harmful substances into the environment. For example, the model can be used to optimize the production of solar panels using renewable energy sources such as solar and wind power. This will help reduce greenhouse gas emissions and reduce dependence on fossil energy sources. In addition, the model can be used to optimize the production of solar cells using resource-saving technologies, such as zero-waste technologies. This will reduce the consumption of raw materials and reduce the amount of waste generated in the production process.

The advantages of the proposed model are as follows:

- it allows for maximum efficiency in the production of green products with minimal environmental impact;
- flexible and can be adapted to any type of green production;
- efficient and can be used to optimize the production of any volume of green products.

As for the disadvantages, they include:

- it requires a significant amount of data on the production process, resource characteristics, emissions, and waste;
- it can be difficult to understand and use.

Based on the above, it can be established that the production optimization model for green production in a post-industrial society is an effective tool that can be used to increase the efficiency of green production with minimal environmental impact. The studied variants of decision-making models in the field of green production recommend themselves as having the right to be applied in practice. The choice of the optimal way to apply them and their priority in each case depends on a number of factors, such as the nature of the problem, the specifics of the production process, the availability of information collection and processing systems, the level of efficiency required in decision-making, and the risks of the prolonged impact of the decision on production processes. However, each of the approaches can bring practical benefits in the decision-making process, while minimizing risks and creating alternatives to problematic decisions.

Discussion

Analysing the results of the study of modelling as a decision-making tool in green manufacturing in a post-industrial society, it is worth noting that many scientists and researchers consider the issue of its active implementation to be a prerequisite for the development of intelligent management of production processes in a post-industrial society (Käki *et al*., 2019; Mahrinasari *et al.,* 2021). The green economy is characterized by the priority of an innovation and information approach to management processes, and somewhat deviates from the classical decision-making methods typical of an industrial society. The development of advanced technologies, the growing importance of the knowledge and creativity factor are at the forefront of society's modern movement into the future. This process requires a rethinking of approaches to the main levers of management, in particular, decision-making in the production sector. C. López Bello *et al.* (2014), T. Aliyev & Sh. Aliyeva (2022), C. Julmi (2019) believe that decision-making modelling allows not only avoiding gross mistakes in the options for solving a problem or situation, but also makes it possible to use intuition, which is undoubtedly a priority in solving extreme problematic situations. It is difficult to disagree with them, because modelling not only allows for decision-making based on both a rational and intuitive approach, but also involves creativity and critical thinking in the decision-making process.

It should be noted that those options for building decision-making models that are based on a clear structuring are more optimal when it is necessary to eliminate the ambiguity of the result. This is insisted on by E. Flores-Garcia *et al.* (2021). At the same time, in their opinion, the intuitive component of the process is also important, and only a competent proportion between the normative, intuitive, and mixed processes in each specific case of decision-making can ensure the proper effect of modelling and a high level of success of the adopted solution to a problem or situation. A similar opinion is shared by D.J. van der Zee (2006), M. Mahrinasari *et al.* (2021). V. González-Prida & M. Carnero (2021) consider it necessary to continuously improve modelling as a tool for effective decision-making, especially in conditions of uncertainty or increased risk. The scientists propose a comprehensive approach for an optimal and objective decision-making process, as this approach can guarantee an increase in the competitiveness of production, reduce risks, and eliminate uncertainty. The opinion of the author of the current study is consistent with the statements of scientists, since such an approach makes it possible to take into account various factors that influence decision-making, including economic, social and technological aspects.

Such an integrated approach helps to increase the competitiveness of production, reduce risks and effectively eliminate uncertainty, making it a key element in modern management. Competent knowledge management, effective production planning, focus on renewable resources and risk management are becoming a priority in the post-industrial era. One of the obstacles that may arise on the way to the successful construction of a decision-making model may be the lack of integration and accumulation of the necessary information (Johansson & Winroth, 2010; Gigerenzer & Gaissmaier, 2011; Durbach & Montibeller, 2019). Despite the increased complexity of this aspect, scientists are currently actively developing methods for enriching analytical models with industry information to facilitate data analytics, in particular in smart manufacturing (Zhang *et al*., 2020). Such modern high-tech research makes it possible to implement interoperability and traceability factors, which creates the effect of reducing the model development cycle and minimizing errors, which is important, since it is important to integrate and enrich analytical models with industry information as a means of facilitating data analysis and improving the quality of management decisions.

Within the production cycle, modelling can be effectively used both at the stage of justification and innovative implementation, as well as during the implementation of production technologies (O'Kane *et al*., 2000; Mealy & Teytelboym, 2022). However, it is at the operational stage that decision-making modelling can potentially be most useful, as it results in optimizing the use of resources, taking preventive measures against possible risks, and achieving the set goals in a timely manner. Thus, the advantages of using modelling as a decision-making tool in the field of green production in a post-industrial society include the following:

- modelling allows highlighting the most important and influential elements of decision-making;
- this way of decision-making eliminates gaps in the system and helps to identify new problems and obstacles that could not be foreseen in advance;
- this method facilitates adequate work with the problem, allows developing alternative options and ways;
- effective and timely modelling helps to optimize and improve existing models, introduce novelty and innovation into the existing system.

The disadvantages of using modelling in decision-making include the following

- difficulty in determining the parameters of influence;
- limited reflection of the actual functioning of production processes;
- imperfection of the assessment methodology as the basis for model design.

Despite several difficulties that inevitably arise in the process of decision-making modelling, this method requires due attention and occupies a prominent place in the decision-making process (Fourquet, 2019).

Based on the above, it can be established that various researchers believe that post-industrial society is characterized by critical thinking, flexibility, and creativity in approaching problem situations. Thus, this indicates the possibility of rapid adaptation of its subjects, as well as the widespread use of emotional intelligence. It is these qualities that can be effectively implemented in a decision-making modelling system, bringing the effect of innovative rethinking of old model variants, adding dynamism and efficiency to them.

Conclusions

Based on the goal set in this study, it is worth noting that it is necessary to predict the effectiveness of using modelling for decision-making in the field of green production in a post-industrial society synergistically with the basic principles of the circular economy and taking into account the specifics of individual production areas, the priority factor and time constraints, considering the available resource and the possibility of accumulating and integrating information data as a starting point. Only a comprehensive multifactorial approach makes it possible to determine strategic priorities for the use of a particular decision-making model in harmony with the unchanging principles of sustainable development and the innovation and information orientation of the development of post-industrial society. Modelling decision-making in the production sphere of a modern post-industrial society makes it possible to solve several problematic aspects of the production process management system: risk management, effective combination of rational and intuitive, involvement of creativity and critical thinking in the decision-making process, active implementation of innovative approaches, development of effective alternatives and realistic forecasting of the consequences of decision-making.

The study has succeeded in substantiating the feasibility of using different approaches to modelling (rational, intuitive, creative, etc.) under the existing production conditions and decision-limiting factors. It is proved that the models should be characterized by clear structuredness, regulation, reliability of the initial information, and consider such factors as relevance, priority, and novelty of the problem and urgency of its solution. Adaptation of decision-making models relevant to the production processes of a post-industrial society to the specific requirements of a green economy and the principles of sustainable development are relevant vectors for further research, since the value and significance of modelling lies in its practical application. In addition, based on the results obtained, the study developed a model for optimizing green production. It is established that it is an important tool for achieving sustainable development goals, as it allows enterprises to increase production efficiency, reduce environmental impact and increase competitiveness. Given this, the study reveals its structure, establishes a number of fundamental principles, and compares its advantages and disadvantages. It should be noted that the proposed model is promising, as enterprises engaged in green production can implement a monitoring and management system that will collect data on the technological process, product characteristics and emissions, and use it to train the optimization model.

Among the prospects for further research is the practical implementation of modelling as a common tool for decision-making in production processes, studying the level of its successful performance and significance. It is also promising to study the possibilities of replacing the method of experiment with modelling to reduce resource costs and with the use of modern innovative technologies. A separate vector for further research is the active use of computer modelling methods.

Acknowledgements

None.

Conflict of Interest

None.

References

[1] Aliyev, T., & Aliyeva, Sh. (2022). Economic forecast of further development for oil suppliers to world markets against the background of the development of renewable energy sources. *Scientific Horizons*, 25(7), 123-132. doi: 10.48077/scihor.25(7).2022.123-132.

[2] Ding, R.X., Palomares, I., Wang, X., Yang, G.R., Liu, B., Dong, Y., Herrera-Viedma, E., & Herrera, F. (2020). Large-Scale decision-making: Characterization, taxonomy, challenges and future directions from an Artificial Intelligence and applications perspective. *Information Fusion*, 59, 84-102. doi: 10.1016/j.inffus.2020.01.006.

[3] Durbach, I.N., & Montibeller, G. (2019). Behavioural analytics: Exploring judgments and choices in large data sets. *Journal of the Operational Research Society,* 70(2), 255-268. doi: 10.1080/01605682.2018.1434400.

[4] Flores-Garcia, E., Bruch, J., Wiktorsson, M., & Jackson, M. (2021). Decision-making approaches in process innovations: An explorative case study. *Journal of Manufacturing Technology Management*, 32(9), 1-25. doi: 10.1108/JMTM-03-2019-0087.

[5] Fourquet, R. (Ed.). (2019). *Handbook on green growth*. Northampton: Edward Elgar Publishing.

[6] Gershwin, S.B. (2018). The future of manufacturing systems engineering. *International Journal of Production Research*, 56(1-2), 224-237. doi: 10.1080/00207543.2017.1395491.

[7] Gigerenzer, G., & Gaissmaier, W. (2011). Heuristic decision making. *Annual Review of Psychology*, 62, 451-482. doi: 10.1146/annurev-psych-120709-145346.

[8] Goncharenko, M., Parkhomenko, N., & Luchyn, O. (2020). "Green" economy as a direction to achieve sustainable ecological and economic development of the region. *Actual Problems of the Economy*, 6(228), 6-15. doi: 10.32752/1993-6788-2020-1-228-6-15.

[9] González-Prida, V., & Carnero, M. (2021). *Advanced models and tools for effective decision making under uncertainty and risk contexts*. Hershey: Business Science Reference. doi: 10.4018/978-1-7998-3246-1.

[10] Han, H., & Xia, S. (2021). An agro-based society after post-industrial society: From a perspective of economic growth paradigm. *Social Sciences*, 10(12), article number 455. doi: 10.3390/socsci10120455.

[11] Hurzhyi, N., Kravchenko, A., Kulinich, T., Saienko, V., Chopko, N., & Skomorovskyi, A. (2022). Enterprise development strategies in a post-industrial society. *Postmodern Openings*, 13(1), 173-183. doi: 10.18662/po/13.1Sup1/420.
[12] Johansson, G., & Winroth, M. (2010). Introducing environmental concern in manufacturing strategies: Implications for the decision criteria. *Management Research Review*, 33(9), 877-899. doi: 10.1108/01409171011070305.
[13] Julmi, C. (2019). When rational decision-making becomes irrational: A critical assessment and re-conceptualization of intuition effectiveness. *Business Research*, 12, 291-314. doi: 10.1007/s40685-019-0096-4.
[14] Käki, A., Kemppainen, K., & Liesiö, J. (2019). What to do when decision-makers deviate from model recommendations? Empirical evidence from hydropower industry. *European Journal of Operational Research*, 278(3), 869-882. doi: 10.1016/j.ejor.2019.04.021.
[15] Kushlyk-Dyvulska, O., & Kushlyk, B. (2014). *Fundamentals of decision-making theory*. Kyiv: National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute".
[16] Kuzmin, O., Stanasiuk, N., & Berdnik, D. (2021). Forecasting economic result of manipulation using game theory modeling. *Economics, Entrepreneurship, Management*, 8(1), 1-13. doi: 10.23939/eem2021.01.001.
[17] López Bello, C.A., Medina García, V.H., & Udden, L. (2014). Decision-making model for the development of productive capacity as a component of a knowledge management system. *Tecnura*, 18(2), 16-29. doi: 10.14483/udistrital.jour.tecnura.2014.DSE1.a01.
[18] Mahrinasari, M., Hussain, S., Yapanto, L.M., Esquivel-Infantes, S.M., Untari, D.T., Yusriadi, Y., & Diah, A. (2021). The impact of decision-making models and knowledge management practices on performance. *Academy of Strategic Management Journal*, 20(2).
[19] Mealy, P., & Teytelboym, A. (2022). Economic complexity and the green economy. *Research Policy*, 51(8), article number 103948. doi: 10.1016/j.respol.2020.103948.
[20] Norouzi, N. (2021). Green economy: A necessary decision to be taken. *Universal Journal of Finance and Economics*, 1(1), 3-12. doi: 10.31586/ujfe.2021.108.
[21] O'Kane, J., Spenceley, J.R., & Taylor, R. (2000). Simulation as an essential tool for advanced manufacturing technology problems. *Journal of Materials Processing Technology*, 107(1-3), 412-424. doi: 10.1016/S0924-0136(00)00689-0.
[22] Radziszewska-Zielina, E., Adamkiewicz, D., Szewczyk, B., & Kania, O. (2022). Decision-making support for housing projects in post-industrial areas. *Sustainability*, 14(6), article number 3573. doi: 10.3390/su14063573.
[23] van der Zee, D.J. (2006). Modeling decision making and control in manufacturing simulation. *International Journal of Production Economics*, 100(1), 155-167. doi: 10.1016/j.ijpe.2004.11.001.
[24] Zhang, H., Roy, U., & Tina Lee, Y.T. (2020). Enriching analytics models with domain knowledge for smart manufacturing data analysis. *International Journal of Production Research*, 58(20), 6399-6415. doi: 10.1080/00207543.2019.1680895.

Моделювання прийняття рішень в області зеленого виробництва в постіндустріальному суспільстві

Євгенія Вікторівна Савчук
Старший викладач
Одеський національний морський університет
65029, вул. Мечникова, 34, м. Одеса, Україна
https://orcid.org/0000-0002-4108-666X

Анотація. Сучасні управлінські процеси мають вирішити комплексне завдання оптимального прийняття рішень та своєчасного ефективного прогнозування їх результатів, для вибору вдалих комбінацій рішень у тій чи іншій виробничій сфері нового інформаційно-інноваційного суспільства, що прийшло на зміну індустріальній епосі. У світлі окресленої проблематики особливої уваги заслуговує процес моделювання як ефективний механізм прийняття рішень та регулювання ризиків. Метою дослідження було висвітлення моделювання як ефективного методу прийняття рішень в умовах зеленого виробництва в постіндустріальному суспільстві, обґрунтування доцільності його використання на різних рівнях виробничого процесу. У ході дослідження застосовано зокрема теоретичні методи – вивчення наукових матеріалів та результатів досліджень, опис та порівняння. А також проведено узагальнення та аналіз результатів. У статті розглянуто основні підходи до стратегії впровадження моделювання прийняття рішень в області зеленого виробництва в постіндустріальному суспільстві, надано розгорнуте визначення його структурних елементів та пріоритетних принципів. З`ясовано, що моделювання як інструмент управління застосовується при розробці досить складних виробничо-управлінських рішень і являє собою побудову моделі чи системи моделей досліджуваного процесу чи явища для його вивчення, аналітики та формування відповідного віяла альтернатив результату. Проаналізовано основні види моделювання за різними класифікаціями, досліджено можливості застосування окремих із них у системі прийняття рішень у виробничій площині. Надано висновки щодо ефективності та результативності застосування у виробничих процесах сучасного інноваційно-інформаційного економічного простору. Обґрунтовано доцільність використання різних підходів до моделювання прийняття рішень в залежності від ряду впливових чинників. Доведено можливість вирішення виробничої багатозадачності прийняття рішень за допомогою створення моделей. Вказані результати дослідження мають практичну значимість для удосконалення управлінських процесів в області зеленого виробництва в постіндустріальному суспільстві, незалежно від форм власності, об'ємів виробництва та сфери діяльності

Ключові слова: інновації; модель системи; зелена економіка; альтернативні варіанти рішень; виробничий процес