# Chapter 12
# Human Resource Management to Improve the Quality of Energy Efficiency of the Enterprise


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**Keywords** Human resources · Renewable energy sources · Technological innovations · Nuclear energy

## 12.1 Introduction

In addition to organizing training and professional development, the main tasks of forming energy-efficient human resources include creating management teams aimed at motivating employees to save energy, and introducing them to the corporate culture of lean energy consumption.

When studying energy efficiency issues, the term energy-efficient human capital is used, the concept of which includes a set of professional and managerial competencies in the field of energy efficiency management, which makes it possible to increase the competitiveness of an enterprise to the level of the best global usage guidelines.

The implementation of the proposed approach is possible only when forming individual areas of responsibility in the field of energy conservation management, improving the internal culture of energy conservation and involving participants in the process in an open dialogue. Responsibility should be based primarily on indicators of the energy efficiency of human capital. Efficiency assessment should be carried out by managers of energy services using simple and understandable methods, based on publicly available management information material. If necessary, a more detailed analysis is possible by means of narrowly focused surveys, organizing open discussions, and building an organizational profile.

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H. Dincer, S. Yüksel (eds.), *Economic Development and the Environmental Ecosystem*, Contributions to Economics,
https://doi.org/10.1007/978-3-031-26596-9_12

The existing energy efficiency management strategy at the enterprise, aimed at unlocking the innovative potential of employees and improving the culture of energy consumption, is acceptable (Fang et al., 2021; Kayacık et al., 2022; Eti et al., 2022; Dinçer et al., 2023). However, to improve the chosen direction, it is necessary to provide additional incentives and develop mechanisms to support the energy efficiency management system by implementing the principles of human resource management and creating a favorable internal environment that promotes changes and improves the energy consumption culture.

The human capital planning process is the initial stage of the chosen strategy and includes an analysis of the external environment (studying the labor market, monitoring job seekers 'requests) in order to form the company's personnel policy and then develop a personnel management strategy. The inclusion of the basic principles of energy efficiency in the competence model of job seekers for employment will promote the idea of implementing energy saving principles by means of personnel policy. The list of competencies should include basic knowledge and skills in the field of rational use, starting from every day and everyday actions of employees, ending with professional competencies necessary for the implementation of technical tasks of energy saving (Martínez et al., 2022; Sun et al., 2022; Kafka et al., 2022; Mukhtarov et al., 2022).

## 12.2 Literature Review

The next process of human capital development is mainly aimed at improving the level of competencies of employees through the organization of professional training. To increase the efficiency of the process, it is necessary to stimulate educational activities by means of investment, motivate staff to learn, and apply modern teaching methods, including using digitalization tools (Denisova et al., 2019; Nyangarika et al., 2019a, 2019b; Huang et al., 2021a; Huang et al., 2021b; Mikhaylov, 2018, 2022a; 2022b; Mikhaylov et al., 2019; Conteh et al., 2021; Sediqi et al., 2022; Khan et al., 2021; Bhuiyan et al., 2022a; Liu et al., 2021a, 2021b; Daniali et al., 2021; Moiseev et al., 2023; An et al., 2022).

The implementation of training programs can be implemented with the participation of internal training units or transferred to specialized organizations, including various universities. A significant potential in the development of the field of study is associated with the creation of cooperation between our own training centers and scientific organizations, since in this case a synergy effect is formed between practical and theoretical knowledge (Bhuiyan et al., 2021; Dong et al., 2021, Mikhaylov, 2021b; Barykin et al., 2022b; Liu et al., 2022a, 2022b; Bhuiyan et al., 2022b; Danish et al., 2022a, 2022b; Saqib et al., 2021; Mukhametov et al., 2021, Candila et al., 2021; Mikhaylov & Grilli, 2022; Li et al. 2022a, 2022b, 2022c).

Training methods should be based on the category of the target audience and the tasks assigned to the training organizers, and can vary from traditional academic lectures to business trainings, practical seminars, as well as using modern training

tools—electronic courses, computer modeling (Khan et al., 2022; Dinçer et al., 2022b, 2022d; Badr et al., 2022; Barykin et al., 2022a; Mehta et al., 2022; Kalinina et al., 2022; Shaikh et al., 2022; Mikhaylov et al., 2023; Nyangarika et al., 2022; Mikhaylov et al., 2022).

The scope and content of educational programs should be divided into categories of employees, which will ensure that the necessary knowledge in the field of energy conservation is obtained for a specific target group (Mikhaylov et al., 2022c; Mikhaylov, 2021a; Varyash et al., 2020; Zhao et al., 2021; An & Mikhaylov, 2020; Alwaelya et al., 2021; Yumashev & Mikhaylov, 2020; Yumashev et al., 2020; Mutalimov et al., 2021; An & Mikhaylov, 2021).

For example, non-production staff, which includes office workers, should know the modes of electric lighting, be able to effectively use household and office equipment, and also understand the basic principles of economy (Xu et al., 2022; Bhuiyan et al., 2022; Kou et al., 2022; Ermiş & Güven, 2022). The second category includes workers of production divisions, whose knowledge should include the modes of energy-efficient operation of technological equipment, key performance indicators of the site/division, opportunities and reserves of equipment for saving (Nie et al., 2020; Dayong et al., 2020; Mikhaylov et al., 2018; Nyangarika et al., 2018; Danish et al., 2020; Danish et al., 2021; An et al., 2021; Uyeh et al., 2021; Tamashiro et al., 2021; Tamashiro et al., 2023; Shaikh et al., 2021).

Technical specialists of production units belonging to the third category are required to know energy-efficient design solutions for developing new projects, the principles of forming key energy efficiency indicators, the possibility of using alternative (renewable) energy sources in metallurgy, and, of course, the basic principles of rationing. The latter category includes managers of various levels who deal with issues related to improving the energy efficiency of the departments entrusted to them and the enterprise as a whole (An et al., 2019a, 2019b; Mikhaylov & Tarakanov, 2020; An et al., 2020a, 2020b, 2020c; Moiseev et al., 2020; Moiseev et al., 2021; Gura et al., 2022; Dooyum et al., 2020; Mikhaylov, 2020a; Mikhaylov, 2020b; Mikhaylov, 2020c).

## 12.3 Human Resource Management to Improve the Quality of Energy Efficiency

The process of preserving human capital is aimed at retaining promising and highly competent employees who are able to show high performance in implementing the chosen strategy, are the driving force behind implementing changes and accumulate positive experience in managing energy efficiency.

It is obvious that in order to encourage and involve employees in energy saving processes, it is necessary to create responsibility centers, and in addition to collective responsibility (teams, sections, workshops), individual responsibility should be

formed. In this case, we mean determining the key energy efficiency indicators of an individual employee.

At the level of technical personnel, energy efficiency indicators are interrelated with the specifics of technological processes, so determining the energy saving potential is based on identifying the main processes and sources of costs. The search for these energy consumption objects is based on the available technical documentation and the results of energy surveys. The formation of a list of employees for setting performance indicators should be carried out using the principles of transparency, and the potential for energy saving is tied to the human factor.

At the level of management personnel, the effectiveness of teamwork should be considered. The list of indicators of managerial energy efficiency includes implemented projects to optimize management mechanisms and organizational structures. At the same time, the quality and effectiveness of teamwork is affected by the presence of stable communications between individual performers.

It can be assumed that after the implementation of the proposed key performance indicators, employees will be motivated to improve energy efficiency, and the presence of individual responsibility will encourage them to improve the culture of energy-efficient production.

Another area of energy efficiency management is the introduction of a system for continuously improving the energy consumption culture at a metallurgical enterprise. This tool is based on the principles of implementing a lean production system, but the main losses here are all possible losses of energy resources (technological deviations, transmission losses, irrational use, etc.) (Dong et al., 2022; Dinçer et al., 2022a, 2022b 2022c; Zhang et al., 2022; Yüksel & Dinçer, 2022). The main philosophy of the system is to involve the maximum number of employees in the energy saving process through training in energy efficiency tools, creating teams to implement changes, implementation of these changes on a specific site and subsequent replication in all structural divisions of the enterprise without exception. To increase the level of engagement and maximize the effectiveness of team members, it is necessary to apply measures of material and non-material incentives. The share of the received economic effect from the implemented changes can serve as a source of incentive funds. Of course, it is equally important to inform employees about the number and quality of implemented projects and their significance for the development of energy efficiency of the enterprise.

Building an organization's energy profile. Recommendations for building an improved energy profile of an organization may include a priority analysis of the accumulated energy-efficient human capital as part of staff motivation, or even as part of a separate section of the profile that will consider the effectiveness of training personnel at all levels, progress in developing competencies during mandatory certifications, and experience in promoting and applying energy-efficient technologies (Carayannis et al., 2022; Li et al. 2022a, 2022b, 2022c; Yüksel et al., 2022; Mikhaylov et al., 2022a).

A promising area of implementation of the energy efficiency management process is the formation of energy-efficient human resources as a source of innovative ideas and the main driving force in improving energy efficiency.

The paper reflects the main actions for planning, developing and preserving human resources, which contribute to improving the effectiveness of training processes, as well as motivate employees to use energy-efficient ways of working.

The introduction of key personnel energy efficiency indicators will reflect the effectiveness of the company's investments in personnel training and form professional competencies in the field of energy conservation. The paper offers a set of key indicators, an algorithm for their development and implementation, as well as a range of expected results of implementing these indicators (Eti et al., 2023; Li et al. 2022a, 2022b, 2022c; Haiyun et al., 2021; Yuan et al., 2021).

## 12.4 Conclusion

The system of continuous improvement of the energy consumption culture proposed for implementation will significantly increase the interest and involve the personnel of the metallurgical enterprise in the process of saving.

The issues of improving energy efficiency and creating an effective management mechanism are typical for all industrial enterprises, especially metallurgical ones, since they are the ones that are distinguished by high rates of energy resource consumption in the global economy. The global energy crisis of the late 70 s of the last century served as an impetus for the creation of a systematic approach to energy conservation issues. The fundamental document that dictates the basic principles of the management system is an international standard that is applicable for most countries and is relevant, including for Russia.

Metallurgical production is rightfully considered one of the most energy—intensive industries, which, according to research conducted by the International Energy Agency, has an energy saving potential of about 35–40%. The most promising ones in terms of reducing consumption are electric steelmaking shops, whose share in the total balance of the enterprise reaches 30%.

Based on the results of the theoretical study, three approaches to the implementation of the energy efficiency management process at the enterprise are identified: technocratic, systemic and innovative. All these approaches have a certain set of advantages and are based on the use of production and technical resources and the intellectual potential of employees. These tools form the basis of planning, consumption, and performance monitoring management processes.

## References

Alwaelya, S. A., Yousif, N. B. A., & Mikhaylov, A. (2021). Emotional development in preschoolers and socialization. *Early Child Development and Care, 191*, 16.

An, J., & Mikhaylov, A. (2020). Russian energy projects in South Africa. *Journal of Energy in Southern Africa, 31*(3), 58–64.

An, J., & Mikhaylov, A. (2021). Analysis of energy projects financial efficiency and renewable energy generation in Russia. *Finance: Theory and Practice, 25*(5), 79–91.

An, J., Mikhaylov, A., Dinçer, H., & Yüksel, S. (2022). Economic modelling of electricity generation: Long short-term memory and Q-rung Orthopair fuzzy sets. *Heliyon, 8*, e10759.

An, J., Mikhaylov, A., & Jung, S.-U. (2020b). The strategy of South Korea in the global oil market. *Energies, 13*(10), 2491.

An, J., Mikhaylov, A., & Jung, S.-U. (2021). A linear programming approach for robust network revenue management in the airline industry. *Journal of Air Transport Management, 91*, 101979.

An, J., Mikhaylov, A., & Kim, K. (2020c). Machine learning approach in heterogeneous group of algorithms for transport safety-critical system. *Applied Sciences, 10*(8), 2670.

An, J., Mikhaylov, A., & Moiseev, N. (2019b). Oil price predictors: Machine learning approach. *International Journal of Energy Economics and Policy, 9*(5), 1–6.

An, J., Mikhaylov, A., & Richter, U. H. (2020a). Trade war effects: Evidence from sectors of energy and resources in Africa. *Heliyon, 6*, e05693. https://doi.org/10.1016/j.heliyon.2020.e05693

An, J., Mikhaylov, A., & Sokolinskaya, N. (2019a). Machine learning in economic planning: Ensembles of algorithms. *Journal of Physics: Conference Series, 1353*, 012126.

Badr, A. M. N. A. A., Mohamed, T. I., Osman, N. A. Q., & Mikhaylov, A. (2022). A review of social media website users' interaction paths with governmental accounts during the COVID-19 pandemic. *Informatics, 9*, 50. https://doi.org/10.3390/informatics9030050

Barykin, S. E., Kapustina, I. V., Sergeev, S. M., Daniali, S. M., Kopteva, L. A., Semenova, G. N., Pryadko, I. P., Mikhaylov, A., Baboshkin, P., Datsyuk, P., & Senjyu, T. (2022a). Financial logistics models based on systematic approach improving management solutions. *F1000Research, 11*, 570. https://doi.org/10.12688/f1000research.111252.1

Barykin, S., Mikheev, A., Kiseleva, E., Putikhin, Y., Alekseeva, N., & Mikhaylov, A. (2022b). An empirical analysis of Russian regions' debt sustainability. *Economies, 10*(4), 296.

Bhuiyan, M. A., An, J., Mikhaylov, A., Moiseev, N., & Danish, M. S. S. (2021). Renewable energy deployment and COVID-19 measures for sustainable development. *Sustainability, 13*, 4418.

Bhuiyan, M. A., Dinçer, H., Yüksel, S., Mikhaylov, A., Danish, M. S. S., Pinter, G., et al. (2022a). Economic indicators and bioenergy supply in developed economies: QROF-DEMATEL and random forest models. *Energy Reports, 8*, 561–570.

Bhuiyan, M. A., Dinçer, H., Yüksel, S., Mikhaylov, A., Danish, M. S. S., Pinter, G., Uyeh, D. D., & Stepanova, D. (2022b). Economic indicators and bioenergy supply in developed economies: QROF-DEMATEL and random forest models. *Energy Reports, 8*(2022), 561–570.

Bhuiyan, M. A., Zhang, Q., Khare, V., Mikhaylov, A., Pinter, G., & Huang, X. (2022). Renewable energy consumption and economic growth nexus—A systematic literature review. *Frontiers in Environmental Science., 10*, 878394. https://doi.org/10.3389/fenvs.2022.878394

Candila, V., Maximov, D., Mikhaylov, A., Moiseev, N., Senjyu, T., & Tryndina, N. (2021). On the relationship between oil and exchange rates of oil-exporting and oil-importing countries: From the great recession period to the Covid-19 era. *Energies, 14*, 8065.

Carayannis, E., Kostis, P., Dinçer, H., & Yüksel, S. (2022). Balanced-scorecard-based evaluation of knowledge-oriented competencies of distributed energy investments. *Energies, 15*(21), 8245.

Conteh, F., Takahashi, H., Hemeida, A. M., Krishnan, N., Mikhaylov, A., & Senjyu, T. (2021). Hybrid grid-connected renewable power generation for sustainable electricity supply in Sierra Leone: Case study lungi town. *Sustainability, 13*(18), 1–20.

Daniali, S. M., Barykin, S. E., Kapustina, I. V., Khortabi, F. M., Sergeev, S. M., Kalinina, O. V., Mikhaylov, A., Veynberg, R., Zasova, L., & Senjyu, T. (2021). Predicting volatility index according to technical index and economic indicators on the basis of deep learning algorithm. *Sustainability, 2021*(13), 14011.

Danish, M. S. S., Bhattacharya, A., Stepanova, D., Mikhaylov, A., Grilli, M. L., Khosravy, M., & Senjyu, T. (2020). A systematic review of metal oxide applications for energy and environmental sustainability. *Metals, 10*(12), 1604.

Danish, M. S. S., Senjyu, T., Sabory, N. R., Khosravy, M., Grilli, M. L., Mikhaylov, A., & Majidi, H. (2021). A forefront framework for sustainable aquaponics modeling and design. *Sustainability, 13*, 9313.

Danish, M. S., Senjyu, T. S., Sabory, N. R., & Mikhaylov, A. (2022a). Lessons from COVID-19 conferring environmental re-engineering opportunity. In M. Danish & T. Senjyu (Eds.), *Eco-friendly and agile energy strategies and policy development* (pp. 99–118). IGI Global. https://doi.org/10.4018/978-1-7998-9502-2.ch005

Danish, M. S., Senjyu, T. S., Sabory, N. R., & Mikhaylov, A. (2022b). Interplay consequences of COVID-19 on global environmental sustainability. In M. Danish & T. Senjyu (Eds.), *Eco-friendly and agile energy strategies and policy development*. IGI Global. https://doi.org/10.4018/978-1-7998-9502-2.ch003

Dayong, N., Mikhaylov, A., Bratanovsky, S., Shaikh, Z. A., & Stepanova, D. (2020). Mathematical modeling of the technological processes of catering products production. *Journal of Food Process Engineering, 43*(2), 1–9.

Denisova, V., Mikhaylov, A., & Lopatin, E. (2019). Blockchain infrastructure and growth of global power consumption. *International Journal of Energy Economics and Policy, 9*(4), 22–29.

Dinçer, H., Aksoy, T., Yüksel, S., & Hacioglu, U. (2022a). Golden cut-oriented q-rung orthopair fuzzy decision-making approach to evaluation of renewable energy alternatives for microgeneration system investments. *Mathematical Problems in Engineering, 2022*, 2261166.

Dinçer, H., Yüksel, S., Çağlayan, Ç., Yavuz, D., & Kararoğlu, D. (2023). Can renewable energy investments be a solution to the energy-sourced high inflation problem?. In *Managing inflation and supply chain disruptions in the global economy* (pp. 220–238). IGI Global.

Dinçer, H., Yüksel, S., & Martínez, L. (2022b). Collaboration enhanced hybrid fuzzy decision-making approach to analyze the renewable energy investment projects. *Energy Reports, 8*, 377–389.

Dinçer, H., Yüksel, S., Mikhaylov, A., Barykin, S. E., Aksoy, T., & Hacioğlu, U. (2022c). Analysis of environmental priorities for green project investments using an integrated q-rung orthopair fuzzy modelling. *IEEE Access, 10*. https://doi.org/10.1109/ACCESS.2022.3174058

Dinçer, H., Yüksel, S., Mikhaylov, A., Pinter, G., & Shaikh, Z. A. (2022d). Analysis of renewable-friendly smart grid technologies for the distributed energy investment projects using a hybrid picture fuzzy rough decision-making approach. *Energy Reports, 8*, 11466–11477. https://doi.org/10.1016/j.egyr.2022.08.275

Dong, B., Ikonnikova, I., Rogulin, R., Sakulyeva, T., & Mikhaylov, A. (2021). Environmentaleconomic approach to optimization of transport communication in megacities. *Journal of Environmental Science and Health, Part A, 56*(6), 660–666.

Dong, W., Zhao, G., Yüksel, S., Dinçer, H., & Ubay, G. G. (2022). A novel hybrid decision making approach for the strategic selection of wind energy projects. *Renewable Energy, 185*, 321–337.

Dooyum, U. D., Mikhaylov, A., & Varyash, I. (2020). Energy security concept in Russia and South Korea. *International Journal of Energy Economics and Policy, 10*(4), 102–107.

Ermiş, A. M., & Güven, M. E. (2022). The role of green energy Investments in Energy Supply Security. In *Circular economy and the energy market* (pp. 67–77). Springer, .

Eti, S., Dinçer, H., Gökalp, Y., Yüksel, S., & Kararoğlu, D. (2023). Identifying key issues to handle the inflation problem in the healthcare industry caused by energy prices: An evaluation with decision-making models. *Managing Inflation and Supply Chain Disruptions in the Global Economy*, 162–178.

Eti, S., Dinçer, H., Yüksel, S., & Gökalp, Y. (2022). Analysis of the suitability of the solar panels for hospitals: A new fuzzy decision-making model proposal with the T-spherical TOP-DEMATEL method. *Journal of Intelligent & Fuzzy Systems, Preprint*, 1–13.

Fang, S., Zhou, P., Dinçer, H., & Yüksel, S. (2021). Assessment of safety management system on energy investment risk using house of quality based on hybrid stochastic interval-valued intuitionistic fuzzy decision-making approach. *Safety Science, 141*, 105333.

Gura, D., Mikhaylov, A., Glushkov, S., Zaikov, M., & Shaikh, Z. A. (2022). Model for estimating power dissipation along the interconnect length in single on-chip topology. *Evolutionary Intelligence, 15*, 2369–2373. https://doi.org/10.1007/s12065-020-00407-7

Haiyun, C., Zhixiong, H., Yüksel, S., & Dinçer, H. (2021). Analysis of the innovation strategies for green supply chain management in the energy industry using the QFD-based hybrid interval valued intuitionistic fuzzy decision approach. *Renewable and Sustainable Energy Reviews, 143*, 110844.

Huang, Y., Masrur, H., Shigenobu, R., Hemeida, A. M., Mikhaylov, A., & Senjyu, T. (2021a). A comparative design of a campus microgrid considering a multi-scenario and multi-objective approach. *Energies, 14*, 2853.

Huang, Y., Yona, A., Takahashi, H., Hemeida, A. M., Mandal, P., Mikhaylov, A., Senjyu, T., & Lotfy, M. E. (2021b). Energy management system optimization of drug store operate electric vehicles charging station. *Sustainability, 14*, 1217836.

Kafka, K. I., Dinçer, H., & Yüksel, S. (2022). Impact-relation map of innovative service development regarding the sustainable growth for emerging markets. *Journal of the Knowledge Economy*, 1–24.

Kalinina, O. V., Barykin, S. E., Sergeev, S. M., Semenova, G. N., Fatkullina, A., Mikhaylov, A., & De La Poza, E. (2022). Smart city perspectives in post-pandemic governance: Externalities reduction policy. *F1000Research, 11*, 1032. https://doi.org/10.12688/f1000research.123195.1

Kayacık, M., Dinçer, H., & Yüksel, S. (2022). Using quantum spherical fuzzy decision support system as a novel sustainability index approach for analyzing industries listed in the stock exchange. *Borsa Istanbul Review, 22*(6), 1145–1157.

Khan, A. A., Laghari, A. A., Gadekallu, T. R., Shaikh, Z. A., Javed, A. R., Rashid, M., Estrela, V. V., & Mikhaylov, A. (2022). A drone-based data management and optimization using metaheuristic algorithms and blockchain smart contracts in a secure fog environment. *Computers and Electrical Engineering, 102*, 108234. https://doi.org/10.1016/j.compeleceng.2022.108234

Khan, A. A., Shaikh, Z. A., Baitenova, L., Mutaliyeva, L., Moiseev, N., Mikhaylov, A., Laghari, A. A., Idris, S. A., & Alshazly, H. (2021). QoS-ledger: Smart contracts and metaheuristic for secure quality-of-service and cost-efficient scheduling of medical-data processing. *Electronics, 10*, 3083.

Kou, G., Yüksel, S., & Dinçer, H. (2022). Inventive problem-solving map of innovative carbon emission strategies for solar energy-based transportation investment projects. *Applied Energy, 311*, 118680.

Li, J., Dinçer, H., Yüksel, S., Mikhaylov, A., & Barykin, S. E. (2022a). Bipolar q-ROF hybrid decision making model with golden cut for analyzing the levelized cost of renewable energy alternatives. *IEEE Access, 10*, 35900–35900. https://doi.org/10.1109/ACCESS.2022.3168315

Li, W., Yüksel, S., & Dinçer, H. (2022c). Understanding the financial innovation priorities for renewable energy investors via QFD-based picture fuzzy and rough numbers. *Financial Innovation, 8*(1), 1–30.

Li, J., Yüksel, S., Dınçer, H., Mikhaylov, A., & Barykin, S. E. (2022b). Bipolar q-ROF hybrid decision making model with golden cut for analyzing the levelized cost of renewable energy alternatives. *IEEE Access, 10*, 42507–42517.

Liu, L., Kato, T., Mandal, P., Mikhaylov, A., Hemeida, A. M., & Senjyu, T. (2021a). Multi-area power system load frequency control by using model predictive control by introducing renewable energy sources. In *2021 International Conference on Science & Contemporary Technologies (ICSCT)*, pp. 1–6. https://doi.org/10.1109/ICSCT53883.2021.9642521.

Liu, L., Kato, T., Mandal, P., Mikhaylov, A., Hemeida, A. M., Takahashi, H., & Tomonobu, S. (2021b). Two cases studies of model predictive control approach for hybrid renewable energy systems. *AIMS Energy, 9*(6), 1241–1259.

Liu, Z.-J., Panfilova, E., Mikhaylov, A., & Kurilova, A. (2022a). COVID-19 crisis impact on the stability between parties in crowdfunding and crowdsourcing. *Wireless Personal Communications, 122*, 915–930.

Liu, Z., Panfilova, E., Mikhaylov, A., & Kurilova, A. (2022b). Assessing stability in the relationship between parties in crowdfunding and crowdsourcing projects during the COVID-19 crisis. *Journal of Global Information Management (JGIM), 30*(4), 1–18. https://doi.org/10.4018/JGIM.297905

Martínez, L., Dinçer, H., & Yüksel, S. (2022). A hybrid decision making approach for new service development process of renewable energy investment. *Applied Soft Computing, 133*, 109897.

Mehta, R., Verghese, J., Mahajan, S., Barykin, S., Bozhuk, S., Kozlova, N., Kapustina, I., Mikhaylov, A., Naumova, E., & Dedyukhina, N. (2022). Consumers' behavior in conversational commerce marketing based on messenger chatbots. *F1000Research, 11*, 647. https://doi.org/10.12688/f1000research.122037.1

Mikhaylov, A. (2018). The yield of the carry trade strategy. *Finance: Theory and Practice, 22*(3), 52–63. https://doi.org/10.26794/2587-5671-2018-22-3-52-63

Mikhaylov, A. (2020a). Cryptocurrency market analysis from the open innovation perspective. *Journal of Open Innovation: Technology, Market, and Complexity, 6*(4), 197.

Mikhaylov, A. (2020b). Geothermal energy development in Iceland. *International Journal of Energy Economics and Policy, 10*(4), 31–35.

Mikhaylov, A. (2020c). Cryptocurrency market development: Hurst method. *Finance: Theory and Practice, 24*(3), 81–91.

Mikhaylov, A. (2021a). Development of Friedrich von Hayek's theory of private money and economic implications for digital currencies. *Terra Economicus, 19*(1), 53–62.

Mikhaylov, A. (2021b). Lichens as indicators of atmospheric pollution in urban ecosystems. *Israel Journal of Ecology & Evolution, 67*(1–2), 60–68. https://doi.org/10.1163/22244662-bja10016

Mikhaylov, A. (2022a). Efficiency of renewable energy generation in Russia. *Anais da Academia Brasileira de Ciências, 94*(4), e20191226. https://doi.org/10.1590/0001-3765202220191226

Mikhaylov, A. (2022b). Sustainable development and renewable energy: A new view to a global problem. *Energies, 15*, 1397. https://doi.org/10.3390/en15041397

Mikhaylov, A., Bhatti, I. M., Dinçer, H., & Yüksel, S. (2022a). Integrated decision recommendation system using iteration-enhanced collaborative filtering, golden cut bipolar for analyzing the risk-based oil market spillovers. *Computational Economics*, 1–34.

Mikhaylov, A., Bhatti, I. M., Dinçer, H., & Yüksel, S. (2022c). Integrated decision recommendation system using iteration-enhanced collaborative filtering, golden cut bipolar for analyzing the risk-based oil market spillovers. *Computational Economics*. https://doi.org/10.1007/s10614-022-10341-8

Mikhaylov, A., Burakov, D., & Didenko, V. (2019). Relationship between oil price and macroeconomic indicators in Russia. *Finance: Theory and Practice, 23*(2), 105–116. https://doi.org/10.26794/2587-5671-2019-23-2-105-116

Mikhaylov, A., Dinçer, H., & Yüksel, S. (2023). Analysis of financial development and open innovation oriented fintech potential for emerging economies using an integrated decision-making approach of MF-X-DMA and golden cut bipolar q-ROFSs. *Financ Innov, 9*, 10. https://doi.org/10.1186/s40854-022-00234-w

Mikhaylov, A., & Grilli, M. L. (2022). Machine learning methods and sustainable development: Metal oxides and multilayer metal-oxides. *Metals, 12*(4), 17–33.

Mikhaylov, A., Sokolinskaya, N., & Nyangarika, A. (2018). Optimal carry trade strategy based on currencies of energy and developed economies. *Journal of Reviews on Global Economics, 7*, 582–592.

Mikhaylov, A., & Tarakanov, S. (2020). Development of Levenberg-Marquardt theoretical approach for electric network. *Journal of Physics: Conference Series, 1515*, 052006.

Mikhaylov, A., Yumashev, A., & Kolpak, E. (2022). Quality of life, anxiety and depressive disorders in patients with extrasystolic arrhythmia. *Archives of Medical Science, 18*(2). https://doi.org/10.5114/aoms.2020.101359

Moiseev, N., Mikhaylov, A., Dinçer, H., & Yüksel, S. (2023). Effects of market capitalization shocks for open innovation models in e-commerce industry: Golden cut QROF MCDM analysis. *Financ Innov, 9*, 32.

Moiseev, N., Mikhaylov, A., Varyash, I., & Saqib, A. (2020). Investigating the relation of GDP per capita and corruption index. *Entrepreneurship and Sustainability Issues, 8*(1), 780–794.

Moiseev, N., Sorokin, A., Zvezdina, N., Mikhaylov, A., Khomyakova, L., & Danish, M. S. S. (2021). Credit risk theoretical model on the base of DCC-GARCH in time-varying parameters framework. *Mathematics, 9*, 2423. https://doi.org/10.3390/math9192423

Mukhametov, A., Bekhorashvili, A., Avdeenko, A., & Mikhaylov, A. (2021). The impact of growing legume plants under conditions of Biologization and soil cultivation on chernozem fertility and productivity of rotation crops. *Legume Research, 44*, 12.

Mukhtarov, S., Yüksel, S., & Dinçer, H. (2022). The impact of financial development on renewable energy consumption: Evidence from Turkey. *Renewable Energy, 187*, 169–176.

Mutalimov, V., Kovaleva, I., Mikhaylov, A., & Stepanova, D. (2021). Assessing regional growth of small business in Russia. *Entrepreneurial Business and Economics Review, 9*(3), 119–133. https://doi.org/10.15678/EBER.2021.090308

Nie, D., Panfilova, E., Samusenkov, V., & Mikhaylov, A. (2020). E-learning financing models in Russia for sustainable development. *Sustainability, 12*(11), 4412.

Nyangarika, A., Mikhaylov, A., Muyeen, S. M., Yadykin, V., Mottaeva, A., Pryadko, I., Barykin, S., Fomenko, N., Rykov, G., & Shvandar, K. (2022). Energy stability and decarbonization in developing countries: Random Forest approach for forecasting of crude oil trade flows and macro indicators. *Frontiers in Environmental Science, 10*, 1031343. https://doi.org/10.3389/fenvs.2022.1031343

Nyangarika, A., Mikhaylov, A., & Richter, U. (2019a). Influence oil price towards economic indicators in Russia. *International Journal of Energy Economics and Policy, 9*(1), 123–129.

Nyangarika, A., Mikhaylov, A., & Richter, U. (2019b). Oil price factors: Forecasting on the base of modified auto-regressive integrated moving average model. *International Journal of Energy Economics and Policy, 9*(1), 149–159.

Nyangarika, A., Mikhaylov, A., & Tang, B.-J. (2018). Correlation of oil prices and gross domestic product in oil producing countries. *International Journal of Energy Economics and Policy, 8*(5), 42–48.

Saqib, A., Chan, T.-H., Mikhaylov, A., & Lean, H. H. (2021). Are the responses of sectoral energy imports asymmetric to exchange rate volatilities in Pakistan? Evidence from recent foreign exchange regime. *Frontiers in Energy Research, 9*, 614463. https://doi.org/10.3389/fenrg.2021.614463

Sediqi, M. M., Nakadomari, A., Mikhaylov, A., Krishnan, N., Lotfy, M. E., Yona, A., & Senjyu, T. (2022). Impact of time-of-use demand response program on optimal operation of Afghanistan real power system. *Energies, 15*, 296.

Shaikh, Z. A., Kraikin, A., Mikhaylov, A., & Pinter, G. (2022). Forecasting stock prices of companies producing solar panels using machine learning methods. *Complexity, 2022*, 9186265. https://doi.org/10.1155/2022/9186265

Shaikh, Z. A., Moiseev, N., Mikhaylov, A., & Yüksel, S. (2021). Facile synthesis of copper oxide-cobalt oxide/nitrogen-doped carbon (Cu2O-Co3O4/CN) composite for efficient water splitting. *Applied Sciences., 11*, 9974. https://doi.org/10.3390/app11219974

Sun, L., Peng, J., Dinçer, H., & Yüksel, S. (2022). Coalition-oriented strategic selection of renewable energy system alternatives using q-ROF DEMATEL with golden cut. *Energy, 256*, 124606.

Tamashiro, K., Alharbi, T., Mikhaylov, A., Hemeida, A. M., Krishnan, N., Lotfy, M. E., & Senjyu, T. (2021). Investigation of home energy management with advanced direct load control and optimal scheduling of controllable loads. *Energies, 14*, 7314. https://doi.org/10.3390/en14217314

Tamashiro, K., Omine, E., Krishnan, N., Mikhaylov, A., Hemeida, A. M., & Senjyu, T. (2023). Optimal components capacity based multi-objective optimization and optimal scheduling based MPC-optimization algorithm in smart apartment buildings. *Energy & Buildings, 278*, 112616. https://doi.org/10.1016/j.enbuild.2022.112616

Uyeh, D. D., Asem-Hiablie, S., Park, T., Kim, K.-M., Mikhaylov, A., Woo, S., & Ha, Y. (2021). Could japonica rice be an alternative variety for increased global food security and climate change mitigation? *Food, 10*, 1869. https://doi.org/10.3390/foods10081869

Varyash, I., Mikhaylov, A., Moiseev, N., & Aleshin, K. (2020). Triple bottom line and corporate social responsibility performance indicators for Russian companies. *Entrepreneurship and Sustainability Issues, 8*(1), 313–331.

Xu, X., Yüksel, S., & Dinçer, H. (2022). An integrated decision-making approach with Golden cut and bipolar q-ROFSs to renewable energy storage investments. *International Journal of Fuzzy Systems*, 1–14.

Yuan, G., Xie, F., Dinçer, H., & Yüksel, S. (2021). The theory of inventive problem solving (TRIZ)-based strategic mapping of green nuclear energy investments with spherical fuzzy group decision-making approach. *International Journal of Energy Research, 45*(8), 12284–12300.

Yüksel, S., & Dinçer, H. (2022). Identifying the strategic priorities of nuclear energy investments using hesitant 2-tuple interval-valued Pythagorean fuzzy DEMATEL. *Progress in Nuclear Energy, 145*, 104103.

Yüksel, S., Dinçer, H., Eti, S., & Adalı, Z. (2022). Strategy improvements to minimize the drawbacks of geothermal investments by using spherical fuzzy modelling. *International Journal of Energy Research.*

Yumashev, A., & Mikhaylov, A. (2020). Development of polymer film coatings with high adhesion to steel alloys and high wear resistance. *Polymer Composites, 41*(7), 2875–2880.

Yumashev, A., Ślusarczyk, B., Kondrashev, S., & Mikhaylov, A. (2020). Global indicators of sustainable development: Evaluation of the influence of the human development index on consumption and quality of energy. *Energies, 13*, 2768.

Zhang, Y., Zhang, Y., Gong, C., Dinçer, H., & Yüksel, S. (2022). An integrated hesitant 2-tuple Pythagorean fuzzy analysis of QFD-based innovation cost and duration for renewable energy projects. *Energy, 248*, 123561.

Zhao, Q., Cherkasov, S., Avdeenko, A., Kondratenko, L., & Mikhaylov, A. (2021). Integral estimate of the added value of agricultural crops in the synergetic agriculture on the example of Vicia faba (Vicia faba L.). *Polish Journal of Environmental Studies, 30*(5), 1–9. https://doi.org/10.15244/pjoes/131949