ABSTRACT AND REFERENCES

CONTROL PROCESSES

PROCESS OF RESOURCES PROVISION MANAGEMENT OF THE ENTERPRISE'S ACTIVITY WITH CONSIDERATION OF GENDER FACTOR (p. 6-19)

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The study of the process of resources provision management of enterprise activity taking into account the gender factor was conducted. It was determined that the present environment requires business entities to take into account the gender factor when managing the resource portfolio of the enterprise. Investigation of the role of women in enterprise activity suggests that in most cases, the involvement of women in the enterprise activity usually comes with gender stereotypes.

The peculiarities of the influence of gender aspects on resource provision of the enterprise activity were investigated. It was determined that for each economic entity, there are individual resource combinations that form resource asymmetry and increase the level of competitiveness of the enterprise. It is determined that the reasons of the increase of gender asymmetry are caused by the following factors: the development of society (demographic, technological, socioeconomic); gender (discriminatory factor), behavioral. Identification of components of the resource portfolio, taking into account the existing influence of the gender factor on the efficiency of business processes was conducted. The fundamental novelty in the systematization of elements of resource provision of the enterprise's activity is obtaining a set of weight coefficients, which allows evaluating the efficiency of the functioning of enterprises on the basis and taking into account the differentiation of components of the resource portfolio.

The expediency of using the method of solving the target task of managing resources provision activities of enterprises of the brewing industry is substantiated by determining the dependence of the indicator of enterprise efficiency on the volume of investment in private resources. It was proposed to construct a decision matrix using the comparative approach and the determined coefficients of the importance of the resource tree elements for assessing the effectiveness of the results of the resource provision of the enterprises of the brewing industry.

Keywords: resource provision management processes, gender, enterprise resource portfolio, resource asymmetry, heterogeneity.

References

1. Sarfaraz, L., Faghih, N., Majd, A. (2014). The relationship between women entrepreneurship and gender equality. Journal of Global Entrepreneurship Research, 2 (1), 6. doi: https://doi.org/10.1186/2251-7316-2-6

2. Jennings, J. E., Brush, C. G. (2013). Research on Women Entrepreneurs: Challenges to (and from) the Broader Entrepreneurship Literature? Academy of Management Annals, 7 (1), 663–715. doi: https://doi.org/10.5465/19416520.2013.782190

3. Zhong, R. Y., Xu, X., Klotz, E., Newman, S. T. (2017). Intelligent Manufacturing in the Context of Industry 4.0: A Review. Engineering, 3 (5), 616–630. doi: https://doi.org/10.1016/j.eng.2017.05.015

4. Andriushchenko, K. (2017). The formation of the system of intellectual capital management at enterprises. Technology Audit and Production Reserves, 2 (4 (34)), 4–9. doi: https://doi.org/10.15587/2312-8372.2017.98178

5. Andriushchenko, K., Shergina, L., Kovtun, V. (2018). Analysis of peculiarities and prospects of development of Ukraine in the concept of industry 4.0. Technology Audit and Production Reserves, 4 (5 (42)), 36–41. doi: https://doi.org/10.15587/2312-8372.2018.142354

6. Andriushchenko, K. (2018). The Impact of Gender Affiliation on Business Interaction in Entrepreneurship. II International scientific conference Economy and Society: a Modern Vectors of Development. Leipzig, 111–114.

7. Andriushchenko, K. (2018). Effective use of tools for knowledge of gender aspects in entrepreneurship. II International scientific conference "The modern trends in the development of business social responsibility". Lisbon, 65–67.

8. Andersén, J. (2010). Resource-based competitiveness: managerial implications of the resource-based view. Strategic Direction, 26 (5), 3–5. doi: https://doi.org/10.1108/02580541011035375

9. Koetter, F., Kochanowski, M. (2014). A model-driven approach for event-based business process monitoring. Information Systems and e-Business Management, 13 (1), 5–36. doi: https://doi.org/10.1007/s10257-014-0233-8

10. Koperek, J., Koperek, A., Kome, A. (2018). Today's threats of human rights in the context of protection of the right to life. Scientific Journal of Polonia University, 29 (4), 128–134. doi: https://doi.org/10.23856/2915

11. Baran, M., Kłos, M. (2014). Managing an intergenerational workforce as a factor of company competitiveness. Journal of International Studies, 7 (1), 94–101. doi: https://doi.org/10.14254/2071-8330.2014/7-1/8

12. Radko, V., Matsyura, S., Nikolaichuk, O., Viskers, E. (2017). Modern tools for evaluating of the company competitiveness resource based advantages theory. Scientific Journal of Polonia University, 24 (5), 76–81. doi: https://doi.org/10.23856/2408

13. Nikolaichuk, O., Matukova, G. (2016). Enterprise human capital management in the conditions of innovative economy. Scientific Journal of Polonia University, 18 (3), 137–144. doi: https://doi.org/10.23856/1815

14. Terpstra, D. E., Limpaphayom, W. (2012). Using Evidence-Based Human Resource Practices for Global Competitiveness. International Journal of Business and Management, 7 (12). doi: https://doi.org/10.5539/ijbm.v7n12p107

15. Andriushchenko, K. (2018). Global trends of gender parity for women entrepreneurs. International scientific conference The Formation of a Modern Competitive Environment: Integration and Globalization. Greenwich, 115–118.

16. Xiang, G., Bo, W. (2010). Research on enterprise human resource competitiveness based on BP ANN. 2010 3rd International Conference on Computer Science and Information Technology. doi: https://doi.org/10.1109/iccsit.2010.5564907

17. Francis, D. (2004). Culture, Power Asymmetries and Gender in Conflict Transformation. Transforming Ethnopolitical Conflict, 91–107. doi: https://doi.org/10.1007/978-3-663-05642-3_5

18. Davis, M. H., Capobianco, S., Kraus, L. A. (2010). Gender Differences in Responding to Conflict in the Workplace: Evidence from a Large Sample of Working Adults. Sex Roles, 63 (7-8), 500–514. doi: https://doi.org/10.1007/s11199-010-9828-9

19. Kark, R., Waismel-Manor, R., Shamir, B. (2012). Does valuing androgyny and femininity lead to a female advantage? The relationship between gender-role, transformational leadership and identification. The Leadership Quarterly, 23 (3), 620–640. doi: https://doi.org/10.1016/j.leaqua.2011.12.012

20. Ramadoss, K., Rajadhyaksha, U. (2012). Gender Differences in Commitment to Roles, Work-family Conflict and Social Support. Journal of Social Sciences, 33 (2), 227–233. doi: https://doi.org/10.1080/09718923.2012.11893101

21. Brenner, O. C., Tomkiewicz, J., Schein, V. E. (1989). Research notes. The relationship between sex role stereotypes and requisite management characteristics revisited. Academy of Management Journal, 32 (3), 662–669. doi: https://doi.org/10.2307/256439

22. Afzalur Rahim, M. (2002). Toward a theory of managing organizational conflict. International Journal of Conflict Management, 13 (3), 206–235. doi: https://doi.org/10.1108/eb022874

23. Carrieri, A. de P., Diniz, A. P. R., Souza, E. M. de, Menezes, R. S. S. (2013). Gender and work: representations of femininities and masculinities in the view of women brazilian executives. BAR – Brazilian Administration Review, 10 (3), 281–303. doi: https://doi.org/10.1590/s1807-76922013005000002

24. Brewer, N., Mitchell, P., Weber, N. (2002). Gender role, organizational status, and conflict management styles. International Journal of Conflict Management, 13 (1), 78–94. doi: https://doi.org/10.1108/eb022868

25. Sherifat, Y. O. (2013). Gender differentials in factors affecting performance of small-scale enterprises in Lagos state – Nigeria. Innovative Issues and Approaches in Social Sciences, 6 (2), 21–39.

26. Pinquart, M., Sorensen, S. (2006). Gender Differences in Caregiver Stressors, Social Resources, and Health: An Updated Meta-Analysis. The Journals of Gerontology Series B: Psychological Sciences and Social Sciences, 61 (1), P33–P45. doi: https://doi.org/10.1093/geronb/61.1.p33

27. Westermann, O., Ashby, J., Pretty, J. (2005). Gender and social capital: The importance of gender differences for the maturity and effectiveness of natural resource management groups. World Development, 33 (11), 1783–1799. doi: https://doi.org/10.1016/j.worlddev.2005.04.018

28. Metcalfe, B. D. (2007). Gender and human resource management in the Middle East. The International Journal of Human Resource Management, 18 (1), 54–74. doi: https://doi.org/10.1080/09585190601068292

29. Saati, T. (1989). Decision making by analyzing hierarchies. Moscow: Radio and communication, 316.

30. Seraya, O. V. (2010). Mnogomernye modeli logistiki v usloviyah neopredelennosti. Kharkiv: FOP Stecenko, 512.

31. Raskin, L. G., Seraya, O. V. (2008). Nechetkaya matematika. Kharkiv: Parus, 352.

32. Pawlak, Z. (1982). Rough sets. International Journal of Computer & Information Sciences, 11 (5), 341–356. doi: https://doi.org/10.1007/bf01001956

33. Sira, O. V., Al-Shqeerat, K. H. (2009). A New Approach for Resolving Equations with Fuzzy Parameters. European Journal of Scientific Research, 38 (4), 619–625.

34. Raskin, L., Sira, O. (2016). Fuzzy models of rough mathematics. Eastern-European Journal of Enterprise Technologies, 6 (4 (84)), 53–60. doi: https://doi.org/10.15587/1729-4061.2016.86739

35. Raskin, L., Sira, O. (2016). Method of solving fuzzy problems of mathematical programming. Eastern-European Journal of Enterprise Technologies, 5 (4 (83)), 23–28. doi: https://doi.org/10.15587/1729-4061.2016.81292

36. Teplyuk, M. (2016). Management of resource support of the activity of brewing enterprises in the conditions of globalization of the national economy. Collection of All-Ukrainian Scientific and Practical Conference with International Participation: "Strategies, Problems and Regulation of Economic Systems in Conditions of Macroeconomic Instability". Mykolaiv, 100–104.

37. Teplyuk, M. (2016). Modern tendencies of development of enterprises of the brewing industry of Ukraine. Collection of All-Ukrainian Scientific and Practical Internet. conference: "Innovative enterprise: the state and prospects of development" Kyiv.

DEVELOPMENT OF THE FUNCTIONAL MODEL TO CONTROL THE LEVELS OF ELECTRICITY CONSUMPTION BY UNDERGROUND IRONORE ENTERPRISES (p. 20-27)

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This paper reports results of the study into assessing the features and devising a tactic for the development of structures for the systems that control levels of electricity consumption by receivers at iron-mining enterprises employing the underground technique for extracting iron ore raw materials (IOR). It is shown that the advantages of the proposed structure, compared with existing variants, is the implementation within its functional of control solutions that are predefined by the specificity in the operational technology of electric energy (EE) receivers at these types of enterprises. The solution became possible based on the unification of the electrical energy complex of these enterprises into a single structure: electricity supply systems – EE receivers. A list of consumers has been compiled, which form a shape of daily timetables of electrical loads at an iron ore enterprise – the so-called stationary installations that consume more than 80 % of the total consumption of EE. It is these consumers that were included in the category of EE receivers-regulators. Individual optimization of operational modes of the work of these receivers over a day's underlies the logic of control over the levels of EE consumption. Such a structure of optimization appears appropriate based on the fact that a price for the EE consumed by an enterprise over 24 hours is formed by the energy-generating organization differentiated in a function of zonal tariffs: peak, half-peak, night. Upon determining a dependence of energy consumption levels by the receivers-regulators on controlling and perturbing variables, it has been established, and recommended for implementation, to control the level of EE consumption based on the substantiated and predefined criteria, whose essence comes down to the minimization of this indicator.

The present work has synthesized a mathematical model, based on which the algorithm of control was designed. This makes it possible to not only minimize the level of power consumption by taking into consideration the zonal tariff prices for the EE consumed, but to control flows in the cases of possible limitations for the levels of electricity supply by the side that supplies power to an energy system.

Keywords: control algorithm, optimization of electricity consumption by iron ore enterprises, functional-technological structure, zonal tariffs.

References

1. Babets, Ye. S., Melnykova, I. Ye., Hrebeniuk, S. Ya., Lobov, S. P.; Babets, Ye. S. (Ed.) (2015). Doslidzhennia tekhniko-ekonomichnykh pokaznykiv hirnychodobuvnykh pidpryiemstv Ukrainy ta efektyvnosti yikh roboty v umovakh zminnoi koniuktury svitovoho rynku zalizorudnoi syrovyny. Kryvyi Rih: vyd. R. A. Kozlov, 391.

2. Stohniy, B. S., Kyrylenko, O. V., Prakhovnyk, A. V., Denysiuk, S. P. et. al. (2011). Osnovni parametry enerhozabezpechennia natsionalnoi ekonomiky na period do 2020 roku. Kyiv: Vyd. In-tu elektrodynamiky NAN Ukrainy, 275.

3. Sinchuk, I. O., Guzov, E. S., Yalovaya, A. N., Boyko, S. N.; Sinchuk, O. N. (Ed.) (2016). Elektroeffektivnost' proizvodstva s podzemnymi sposobami dobychi. LAP LAMBERT Academic Publishing, 351.

4. Sinchuk, O. M., Boiko, S. M., Sinchuk, I. O., Karamanyts, F. I., Kozakevych, I. A., Baranovska, M. I., Yalova, O. M.; Sinchuk, O. M. (Ed.) (2018). Aspects of the problem of applying distributed energy in iron ore enterprises electricity supply systems. Warsaw, 77.

5. Avilov-Karnauhov, B. N. (1956). Elektroenergeticheskie raschety dlya ugol'nyh shaht. Moscow: Nedra, 103.

6. Gladilin, L. V. (1980). Osnovy elektrosnabzheniya gornyh predpriyatiy. Moscow: Nedra, 327.

7. Volotkovskiy, S. A., Belyh, B. P., Bun'ko, V. A., Varshavskiy, A. M., Kur'yan, A. I., Guryshev, B. F. (1972). Elektrifikaciya gornyh rabot. Moscow: Nedra, 472.

8. Prahovnik, A. V., Rozen, V. P., Degtyarev, V. V. (1985). Energosberigayushchie rezhimy elektrosnabzheniya gornodobyvayushchih predpriyatiy. Moscow: Nedra, 232.

9. Zhivov, L. G., Poltava, L. I. (1963). Opredelenie moshchnosti shtrekovyh podstanciy zhelezorudnyh shaht. Gorniy zhurnal, 2, 15–18.

10. Shchuckiy, V. I., Lyahomskiy, A. V. Egorov, D. A. (1989). Povyshenie tochnosti opredeleniya raschetnyh nagruzok elektroustanovok polimetallicheskih rudnikov. Izvestiya VUZov. Ser.: Elektromekhanika, 3, 109–112.

11. Jiang, S., Lian, M., Lu, C., Ma, Q. (2018). Optimization research of mine production energy control system based on synergy theory. Paper Asia, 2018 (3), 48–52.

12. Nel, A. J. H., Vosloo, J. C., Mathews, M. J. (2018). Financial model for energy efficiency projects in the mining industry. Energy, 163, 546–554. doi: https://doi.org/10.1016/j.energy.2018.08.154

13. Holmberg, K., Kivikytö-Reponen, P., Härkisaari, P., Valtonen, K., Erdemir, A. (2017). Global energy consumption due to friction and wear in the mining industry. Tribology International, 115, 116–139. doi: https://doi.org/10.1016/j.triboint.2017.05.010

14. Liu, X., Meng, X. (2018). Evaluation and empirical research on the energy efficiency of 20 mining cities in Eastern and Central China. International Journal of Mining Science and Technology, 28 (3), 525–531. doi: https://doi.org/10.1016/j.ijmst.2018.01.002

15. Vidal, O. (2018). Energy Requirements of the Mining and Metallurgical Industries. Commodities and Energy, 27–52. doi: https://doi.org/10.1016/b978-1-78548-267-0.50003-6

16. Widera, M., Kasztelewicz, Z., Ptak, M. (2016). Lignite mining and electricity generation in Poland: The current state and future prospects. Energy Policy, 92, 151–157. doi: https://doi.org/10.1016/j.enpol.2016.02.002

17. Yehorshyn, O. O., Maliarets, L. M. (2006). Matematychne prohramuvannia. Kharkiv: VD «INZhEK», 384.

18. Lavrinenko, N. M., Latynin, S. M., Fortuna, V. V., Beskrovnyi, O. I. (2010). Osnovy ekonomiko-matematychnoho modeliuvannia. Lviv: «Mahnoliya 2006», 540.

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The formalized system to select a strategy for the implementation of a capital construction project was developed. This is important because an error in making a strategic decision (in an intuitive rather than formalized way) critically affects the further course of events on a project and usually cannot be fixed through the efforts of tactical and operative control. Throughout the whole range of strategies, a number of those, which have characteristic features, and therefore affect specifically project initiators, were determined. Discreteness of the field of alternatives gives a possibility to avoid "fuzziness" in making decisions on the most appropriate strategy. The system became unified through the separation of two elements in it: (1) variable (movable) context that recognizes the features a specific business situation and the specificity of the analyzed project, (2) constant (unmovable) context that reflects the properties of each of the alternative strategies. The business process of comparative analysis involves three stages: assessment of the organization maturity, identification of the market development level, determining project priorities and conformity of a priority complex with the profiles of key contract-organizational models. The first stage gives an answer to the question: "Is it worth following a multi-variant contract-organizational scheme of project management?", the second one solves the problem "Is it worthwhile applying IPD in the current situation?" and the third one gives a response to the question "Which of the contract-organizational models of the analyzed project should be followed?" Thus, the conceptual model reflects all available alternatives of typical strategies that are applied in the international best practices. The total number of key basic contract-organizational alternatives includes 26 strategies. Both the project space, and the field of strategic alternatives are reflected in an integrated coordinate system "time–costs–value–risk" by the conceptual model. The formalized toolset formed the system of the project agreement-organization models COMPAS. The formalized system makes it possible to make unambiguous well-grounded decisions on project delivery strategies, which in practice will lead to better project results.

Keywords: engineering of business processes, multi-criteria analysis, strategic decision-making, project delivery models.

References

1. Strategic Analysis Tools. Topic Gateway Series No. 34 (2007). CIMA. Available at: https://www.cimaglobal.com/Documents/ImportedDocuments/cid_tg_strategic_analysis_tools_nov07.pdf.pdf

2. Manual "procurement strategy in construction" (2012). Leonardo da Vinci ToI project, Trane-to-cap. Available at: https://ru.scribd.com/document/343390835/Book1-PROCUREMENT-MANUAL-TTC-ENG-pdf

3. Building and Construction Procurement Guide. Principles and Options (2014). Austroads. Available at: http://www.apcc.gov.au/ALLAPCC/Building%20and%20Construction%20Procurement%20Guide.pdf

4. An Owner's Guide to Project Delivery Methods (2012). CMAA. Available at: https://cmaanet.org/sites/default/files/inline-files/owners-guide-to-project-delivery-methods.pdf

5. Portfolio, Programme and Project Management Maturity Model (P3M3®). Introduction and Guide to P3M3® (2010). OGC. Available at: http://miroslawdabrowski.com/downloads/P3M3/OGC%20branded/P3M3_v2.1_Introduction_and_Guide.pdf

6. Planning Construction Procurement. A guide to developing your procurement strategy (2015). New Zealand Government Procurement, Ministry of Business, Innovation and Employment. Available at: https://www.procurement.govt.nz/assets/procurement-property/documents/guide-developing-your-procurement-strategy-construction-procurement.pdf

7. Haji-Kazemi, S., Andersen, B., Krane, H. P. (2013). Identification of Early Warning Signs in Front-End Stage of Projects, an Aid to Effective Decision Making. Procedia – Social and Behavioral Sciences, 74, 212–222. doi: https://doi.org/10.1016/j.sbspro.2013.03.011

8. Erdogan, S. A., Šaparauskas, J., Turskis, Z. (2017). Decision Making in Construction Management: AHP and Expert Choice Approach. Procedia Engineering, 172, 270–276. doi: https://doi.org/10.1016/j.proeng.2017.02.111

9. Abdel-malak, F. F., Issa, U. H., Miky, Y. H., Osman, E. A. (2017). Applying decision-making techniques to Civil Engineering Projects. Beni-Suef University Journal of Basic and Applied Sciences, 6 (4), 326–331. doi: https://doi.org/10.1016/j.bjbas.2017.05.004

10. Lahdenperä, P. (2015). Project Delivery Systems in Finnish New Building Construction – A Review of the Last Quarter Century. Procedia Economics and Finance, 21, 162–169. doi: https://doi.org/10.1016/s2212-5671(15)00163-x

11. Mihic, M., Sertic, J., Zavrski, I. (2014). Integrated Project Delivery as Integration between Solution Development and Solution Implementation. Procedia – Social and Behavioral Sciences, 119, 557–565. doi: https://doi.org/10.1016/j.sbspro.2014.03.062

12. Hosseini, A., Lædre, O., Andersen, B., Torp, O., Olsson, N., Lohne, J. (2016). Selection Criteria for Delivery Methods for Infrastructure Projects. Procedia – Social and Behavioral Sciences, 226, 260–268. doi: https://doi.org/10.1016/j.sbspro.2016.06.187

13. Azhar, N., Kang, Y., Ahmad, I. U. (2014). Factors Influencing Integrated Project Delivery in Publicly Owned Construction Projects: An Information Modelling Perspective. Procedia Engineering, 77, 213–221. doi: https://doi.org/10.1016/j.proeng.2014.07.019

14. Haugen, A., Wondimu, P. A., Lohne, J., Lædre, O. (2017). Project Delivery Methods in Large Public Road Projects – A Case Study of E6 Jaktøyen – Sentervegen. Procedia Engineering, 196, 391–398. doi: https://doi.org/10.1016/j.proeng.2017.07.215

15. Pöyhönen, P., Sivunen, M Kajander, J.-K. (2017). Developing a Project Delivery System for Construction Project – A Case Study. Procedia Engineering, 196, 520–526. doi: https://doi.org/10.1016/j.proeng.2017.07.233

16. Götze, U., Peças, P., Schmidt, A., Symmank, C., Henriques, E., Ribeiro, I., Schüller, M. (2017). Life Cycle Engineering and Management – Fostering the Management-orientation of Life Cycle Engineering Activities. Procedia CIRP, 61, 134–139. doi: https://doi.org/10.1016/j.procir.2016.11.240

17. Aghazadeh, H. (2015). Strategic Marketing Management: Achieving Superior Business Performance through Intelligent Marketing Strategy. Procedia – Social and Behavioral Sciences, 207, 125–134. doi: https://doi.org/10.1016/j.sbspro.2015.10.161

18. Buhrov, O. V., Buhrova, O. O. (2012). Instytutsionalni mekhanizmy dosiahnennia tsilei budivelnykh proektiv. Upravlinnia rozvytkom skladnykh system, 12, 30–34.

19. Bugrov, O., Bugrova, O. (2017). Formation of a cumulative model for managing the value of construction projects. Eastern-European Journal of Enterprise Technologies, 5 (3 (89)), 14–22. doi: https://doi.org/10.15587/1729-4061.2017.110112

20. Halttula, H., Aapaoja, A., Haapasalo, H. (2015). The Contemporaneous use of Building Information Modeling and Relational Project Delivery Arrangements. Procedia Economics and Finance, 21, 532–539. doi: https://doi.org/10.1016/s2212-5671(15)00209-9

21. A guide to the project management body of knowledge (PMBOK guide) (2013). USA: Project Management Institute, 589.

22. Modelnyi kontrakt MTP dlia velykykh proektiv «pid kliuch» (2014). Kyiv: Asotsiatsiya «ZED», 184.

23. Bushuyev, S. D., Wagner, R. F. (2014). IPMA Delta and IPMA Organisational Competence Baseline (OCB). International Journal

of Managing Projects in Business, 7 (2), 302–310. doi: https://doi.org/10.1108/ijmpb-10-2013-0049

24. Nikolaiev, V. P., Nikolaieva, T. V. (2015). Informatsiyne modeliuvannia budivel: imperatyvy optymizatsiyi budivelno-ekspluatatsiynoho protsesu. Budivelne vyrobnytstvo, 59, 17–26.

SUBSTANTIATION OF QUANTITATIVE COMPOSITION OF CONSIGNMENTS IN ORGANIZING AGGREGATED SHIPMENTS IN CONTAINERS (p. 41-47)

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The task of substantiating quantitative composition of cargo batches during formation of aggregated shipments in containers was studied.

As a result of the study, a general formulation of the problem of substantiating quantitative composition of consignments during organization of LCL transportations was obtained, and particular versions of its interpretation were defined. To solve local production problems, some technologies have been developed that take into consideration peculiarities of situation and initial information on the planned shipment. The use of these technologies ensures maximum utilization of technical and operational capabilities of the container in formation of aggregated shipments of cargoes. For the first two versions of the task, the technology provides implementation of certain systems of equations and verification of obtained results with regard to the quality of utilization of the carrying capacity and freightage of the container. To solve the problem of the third and fourth versions of the developed mathematical models, implementation of the models ensures maximum utilization of technical parameters of the container due to the optimality criteria reflected in the corresponding objective functions. Therefore, verification of the obtained results with regard to the quality of utilization of carrying capacity and freightage of the container is not required.

Based on the proposed methodological provisions, experimental studies were carried out that have shown universality of solving problems of optimizing loading of consolidated containers.

The developed provisions are of scientific importance. They contribute to the development of a theory of transport processes and systems and are of practical interest for commercial departments of transport companies that provide cargo forwarding services. Introduction of these provisions will ensure an increase in efficiency of production activities of representatives of the transport business and will also enable formation of rational systems of cargo forwarding services for cargoes in regional, interregional and international transportation.

Keywords: container, less than container load (LCL) transportation, cargo forwarding activity, container loading.

References

1. Lavrukhin, O. V., Nemyrovskyi, B. M. (2017). Improvement of container terminals operation on the basis of introduction of intelligent advanced technologies. Transport systems and transportation technologies, 13, 46–51. doi: https://doi.org/10.15802/tstt2017/110768

2. Kirillova, O. V. (2014). Question for optimal distribution of container traffic between vessels serving transocean-feeder lines. Naukovyi visnyk Khersonskoi derzhavnoi morskoi akademiyi, 2 (11), 55–68.

3. Kirillova, Y. V., Meleshenko, Y. S. (2014). Justification of Financial Safety Analysis Approach in Cargo-and-Passenger Ferry Operations Management. Transport and Telecommunication Journal, 15 (2), 111–119. doi: https://doi.org/10.2478/ttj-2014-0010

4. Kirillova, Ye., Meleshenko, Ye. (2016). Development of an ecomomic and mathematical model of loading a freight and passenger ferry. Eastern-European Journal of Enterprise Technologies, 3 (4 (81)), 28–37. doi: https://doi.org/10.15587/1729-4061.2016.71215

5. Pavlenko, O. V. (2007). Rozrobka systemy dlia vyznachennia optymalnoho variantu transportno-ekspedytsiynoho obsluhovuvannia. Eastern-European Journal of Enterprise Technologies, 6 (30), 25–28.

6. Pavlenko, O. V. (2008). Analiz efektyvnosti bahatosilovoi modeli systemy transportno-ekspedytsiynoho obsluhovuvannia. Eastern-European Journal of Enterprise Technologies, 5 (35), 30–32.

7. Sramkova, Kolar, Hunak (2018). Container Shipping: The Evaluation of Quality Factors in Freight Forwarding Services. Transportation Journal, 57 (3), 258. doi: https://doi.org/10.5325/transportationj.57.3.0258

8. Tan, A. W. K., Zhao, Y., Halliday, T. (2018). A Blockchain Model for Less Container Load Operations in China. International Journal of Information Systems and Supply Chain Management, 11 (2), 39–53. doi: https://doi.org/10.4018/ijisscm.2018040103

9. Wei, Q., Xu, Y., Li, C., Zhang, Y. (2018). Efficiency Evaluation of LCL Transshipment at Port Railway Container Intermodal Terminal. Journal of Coastal Research, 83, 456–464. doi: https://doi.org/10.2112/si83-076.1

10. Pino, R., Gómez, A., Parreño, J., Fuente, D. D. L., Priore, P. (2013). Application of Genetic Algorithms to Container Loading Optimization. International Journal of Trade, Economics and Finance, 304–309. doi: https://doi.org/10.7763/ijtef.2013.v4.306

11. Bakaev, V. G. (1965). Ekspluataciya morskogo flota. Moscow: Transport, 560.

ALGORITHM FOR SELECTING THE WINNING STRATEGIES IN THE PROCESSES OF MANAGING THE STATE OF THE SYSTEM "SUPPLIER – CONSUMER" IN THE PRESENCE OF AGGRESSIVE COMPETITOR (p. 48-61)

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The issue examined in this work relates to the search for an optimal pricing strategy by an enterprise-supplier in case it faces a new competitor that offers products at a lower price. The emergence of such a problem necessitates looking for a rational way to reduce

its selling price, in order to prevent losing in an aggressive competitive environment, formed by new players entering the market with proposals that are obviously better. To resolve this problem, we have developed an algorithm for selecting the winning strategies based on the estimation of strategic capabilities of a competitor under conditions of uncertainty.

It has been proposed, in order to assess the cost of a product in the system "supplier-consumer", to apply the concept of the l-level scale. It is shown that, given such a representation, it becomes possible to employ a dimensionless estimation of product pricing, regardless of its type or natural cash value. For a formalized description of relations between an enterprise- supplier and a competing company, it is proposed to use the theory of strategic games, in which a game matrix is built based on universal regression equations. A feature of the proposed solutions is that the value of winning in the game matrix is defined by solving an optimization problem based on the regression equation that describes the impact of transportation costs, profit, and a value-added tax (VAT) on the price of the game. It has been established that, given such a description, the game that is played has a saddle point with the net price of the game $z=-0.5$. Based on mathematical modelling, it was established that the selection of a supplier company is limited by strategies at which own profit must be close to the average or the minimally possible value.

We have constructed a predictive model for strategic opportunities of a competitor in the system "supplier-consumer", representing a universal regression equation. Based on it, an adjustment of numerical indicators for the components in product pricing can be made. It is shown that such an adjustment allows the existence of multiple alternatives, neutralizing competitor's advantages. We have substantiated constraints for the solutions derived, related to two factors: an assumption about the accuracy of determining the pricing components of a competitor, and the presence of taxation specificity in international cargo transportation.

Keywords: system "supplier-consumer", l-level scale, strategic opportunities, optimal strategy, game price, regression equation.

References

1. Makarov, F. V. (1981). Puti sovershenstvovaniya planirovaniya novoy tekhniki. Voprosy sovershenstvovaniya upravleniya obshchestvennym proizvodstvom. Saratov, 180.
2. Murav'ev A. I. (1986). Planirovanie tekhnicheskogo razvitiya ob'edineniya. Moscow: Ekonomika, 64.
3. Demina, E. (1999). Formirovanie kriteriya celesoobraznosti tekhnicheskogo perevooruzheniya promyshlennogo proizvodstva. Vestnik Kharkivskoho gosudarstvennogo politekhnicheskogo universiteta. Tekhnicheskiy progress i effektivnost' proizvodstva, 95.
4. Oliver, K., Webber, M.; Christopher, M. (Ed.) (1982). Supply chain management: Logistics Catches up with Strategy. Logistics: The Strategy Issues. London: Chapman and Hall, 63–75.
5. Intrilligator, M. (2002). Matematicheskie metody optimizacii i ekonomicheskaya teoriya. Moscow: Ayris-Press, 553.
6. Supply Chain and Logistics Terms and Glossary (2005). Council of Supply Chain Management Professionals, 97.
7. Sjoerdsma, M., van Weele, A. J. (2015). Managing supplier relationships in a new product development context. Journal of Purchasing and Supply Management, 21 (3), 192–203. doi: https://doi.org/10.1016/j.pursup.2015.05.002
8. Zijm, H., Klumpp, M., Clausen, U., Hompel, M. (Eds.) (2016). Logistics and supply chain innovation. Springer. doi: https://doi.org/10.1007/978-3-319-22288-2
9. Gualandris, J., Kalchschmidt, M. (2014). Customer pressure and innovativeness: Their role in sustainable supply chain management. Journal of Purchasing and Supply Management, 20 (2), 92–103. doi: https://doi.org/10.1016/j.pursup.2014.03.001
10. Mentzer, J. T., DeWitt, W., Keebler, J. S., Min, S., Nix, N. W., Smith, C. D., Zacharia, Z. G. (2001). Defining Supply Chain Management. Journal of Business Logistics, 22 (2), 1–25. doi: https://doi.org/10.1002/j.2158-1592.2001.tb00001.x
11. Lambert, D. M. (2014). Supply Chain Management: Processes, Partnerships, Performance. Supply Chain Management Institute, 463.
12. Simchi-Levi, D., Kaminsky, P. (2008). Designing and managing the supply chain: concepts, strategies, and case studies. N.-Y.: McGraw-Hill Companies, 496.
13. Fedulova, L. (2013). Innovacionnoe razvitie: evolyuciya vzglyadov i problemy covremennogo ponimaniya. Ekonomicheskaya teoriya, 2, 28–45.
14. Postan, M. Ya., Malinovskiy, D. A. (2009). Model' optimal'nogo planirovaniya proizvodstva i dostavki produkcii predpriyatiya po raspredelitel'nym kanalam. Metodi ta zasobi upravlinnya rozvitkom transportnih system, 15, 19–28.
15. Kurudzhi, Y., Moskvichenko, I., Postan, M. (2017). Method of finding equilibrium solutions for duopoly of supply chains taking into account the innovation activity of enterprises. Eastern-European Journal of Enterprise Technologies, 3 (4 (87)), 25–30. doi: https://doi.org/10.15587/1729-4061.2017.103989
16. Szyszka, G. (2004). Sieci logistyczne – nowy wymiar logistyky. Logistyki, 3, 5–7.
17. Bosov, A., Khalipova, N. (2017). Formation of separate optimization models for the analysis of transportation-logistics systems. Eastern-European Journal of Enterprise Technologies, 3 (3 (87)), 11–20. doi: https://doi.org/10.15587/1729-4061.2017.103220
18. Dorigo, M., Stutzle, T. (2004). Ant Colony Optimization. MIT Press. doi: https://doi.org/10.7551/mitpress/1290.001.0001
19. Lei, K., Zhu, X., Hou, J., Huang, W. (2014). Decision of Multimodal Transportation Scheme Based on Swarm Intelligence. Mathematical Problems in Engineering, 2014, 1–10. doi: https://doi.org/10.1155/2014/932832
20. Ramadhani, T., Hertono, G. F., Handari, B. D. (2017). An Ant Colony Optimization algorithm for solving the fixed destination multi-depot multiple traveling salesman problem with non-random parameters. AIP Conference Proceedings. doi: https://doi.org/10.1063/1.4991227
21. Hassan, M. R., Islam, M. M., Murase, K. (2010). A New Local Search Based Ant Colony Optimization Algorithm for Solving Combinatorial Optimization Problems. IEICE Transactions on Information and Systems, E93-D (5), 1127–1136. doi: https://doi.org/10.1587/transinf.e93.d.1127
22. Ashouri, M., Yousefikhoshbakht, M. (2017). A Combination of Metaheuristic and Heuristic Algorithms for the VRP, OVRP and VRP with Simultaneous Pickup and Delivery. Brain: Broad Research in Artificial Intelligence and Neuroscience, 8 (2), 81–95.
23. Khalipova, N., Pasichnyk, A., Lesnikova, I., Kuzmenko, A., Kokina, M., Kutirev, V., Kushchenko, Y. (2018). Developing the method of rational trucking routing based on the modified ant algorithm. Eastern-European Journal of Enterprise Technologies, 1 (3 (91)), 68–76. doi: https://doi.org/10.15587/1729-4061.2018.123862
24. Konings, R., Priemus, H., Nijkamp, P. (2008) The Future of Intermodal Freight Transport. Operations, Design and Policy. Transport economics, management and policy. USA. doi: https://doi.org/10.4337/9781848441392
25. Hanssen, T.-E. S., Mathisen, T. A., Jørgensen, F. (2012). Generalized Transport Costs in Intermodal Freight Transport. Procedia – Social and Behavioral Sciences, 54, 189–200. doi: https://doi.org/10.1016/j.sbspro.2012.09.738
26. Akimova, O. V. (2014). An export and import scheme for container delivery by freight forwarding companies. Eastern-European Journal of Enterprise Technologies, 6 (3 (72)), 4–10. doi: https://doi.org/10.15587/1729-4061.2014.28862

27. Lysyy, A., Kotenko, V., Yakovtsev, S. (2018). Conceptual scheme for ensuring the energy efficiency principle in modern container fleet. EUREKA: Physics and Engineering, 6, 41–47. doi: https://doi.org/10.21303/2461-4262.2018.00749

28. Sweeney, E., Evangelista, P. (2005). 3PL definition and taxonomy. Technical Focus in Logistics Solutions. Journal of the National Institute for Transport and Logistics, 7 (2), 9–10.

29. Anan'ev, E. (2004). Est' u ekspeditorov zakon. Zhurnal Porty Ukrainy, 4, 15–17.

30. Blekuell, D., Girshik, M. A. (1958). Teoriya igr i statisticheskih resheniy. Moscow, 432.

31. Korshunov, Yu. M. (1980). Matematicheskie osnovy kibernetiki. Moscow: Energiya, 424.

32. Demin, D. (2017). Synthesis of optimal control of technological processes based on a multialternative parametric description of the final state. Eastern-European Journal of Enterprise Technologies, 3 (4 (87)), 51–63. doi: https://doi.org/10.15587/1729-4061.2017.105294

33. Raskin, L. G., Seraya, V. (2008). Nechetkaya matematika. Kharkiv: Parus, 352.

34. VIES VAT number validation. Available at: http://ec.europa.eu/taxation_customs/vies

CONSTRUCTION AND ANALYSIS OF THE MODEL FOR STOCHASTIC OPTIMIZATION OF INVENTORY MANAGEMENT AT A SHIP REPAIR YARD (p. 62-70)

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A stochastic model of work of inventory management system at a ship repair yard (SRY) has been developed. In order to account for factors related to uncertainties and risks (random moments of arrival of ships at SRY, random volumes of repairs), it has been proposed to apply the apparatus of Markov drift processes for modeling. These processes make it possible to take into consideration the discrete character of change in the number of vessels at SRY, as well as the ongoing character of fluctuation in the inventory level of materials in warehouse. In this case, docks at SRY are interpreted as a queueing system. It is also assumed that the restocking of materials at a warehouse and their utilization during repair of ships is carried out continuously, at constant intensities, but depending on the availability of a material in warehouse. The result of this study is the stated problem on stochastic optimization of intensities in the resupply of materials based on the criterion of minimum cumulative average current expenses of the yard, which also take into consideration the losses associated with additional downtime of ships due to the lack of materials in warehouse during repair. It has been shown that the results obtained are important to the practical operation of SRY supply department as they make it possible to build a strategy for the replenishment of materials in stock at SRY under conditions of time-dependent non-uniformity in the need for ship repairs. From a theoretical point of view, the obtained results demonstrate a possibility of using the apparatus of Markov drift processes to solve various problems on optimal inventory control under conditions of random fluctuations in the demand for materials in warehouse.

Keywords: shipyard, queueing system, materials stocks, risk of idle vessels, optimal inventory management.

References

1. Rynok sudoremonta: David protiv Goliafa. Porty Ukrainy. Available at: https://ports.com.ua/articles/rynok-sudoremonta-david-protiv-goliafa

2. Optimisticheskaya tragediya sudostroeniya Ukrainy. Available at: https://from-ua.com/articles/355758-optimisticheskaya-tragediya-sudostroeniya-ukraini.html

3. Shahov, A. V., Bokareva, M. O. (2014). Upravlenie riskami v sudoremontnyh proektah. Visnyk NTU «KhPI». Seriya: Stratehichne upravlinnia, upravlinnia portfeliamy, prohramamy ta proektamy, 2 (1045), 87–95.

4. Shahov, A. V., Chimshir, V. I. (2006). Proektno-orientirovannoe upravlenie funkcionirovaniem remontoprigodnyh tekhnicheskih sistem. Odessa: Feniks, 213.

5. Aleksandrovskaya, N. I., Shahov, V. I., Shahov, A. V. (2011). Risko-orientirovannaya strategiya tekhnicheskogo obsluzhivaniya i remonta sudov. Metody ta zasoby upravlinnia rozvytkom transportnykh system, 17, 7–17.

6. Kovalenko, I. I., Shved, A. V., Melnik, A. V. (2014). Probability analysis of risk-contributing factors in organizational tasks of ship repair. Shipbuilding and marine infrastructure, 2 (2), 111–119. doi: https://doi.org/10.15589/smi20140205

7. Charris, E. L. S., Arboleda, C. D. P. (2013). Simulation model of the supply chain on a naval shipyard. International Journal of Industrial and Systems Engineering, 13 (3), 280. doi: https://doi.org/10.1504/ijise.2013.052277

8. Pinha, D., Ahluwalia, R. (2014). Decision Support System for Production Planning in the Ship Repair Industry. Industrial and Systems Engineering Review, 2 (1), 52–61.

9. He, L., Huang, X., Liu, X. (2013). Production Management Modelling of Ship Repair Process Based on MAS. Information Technology Journal, 12 (3), 498–501. doi: https://doi.org/10.3923/itj.2013.498.501

10. Gholami, A., Mirzazadeh, A. (2018). An inventory model with controllable lead time and ordering cost, log-normal-distributed demand, and gamma-distributed available capacity. Cogent Business & Management, 5 (1), 1–17. doi: https://doi.org/10.1080/23311975.2018.1469182

11. Nasrabadi, M., Mirzazadeh, A. (2016). The Inventory System Management Under Uncertain Conditions and Time Value of Money. International Journal of Supply and Operations Management, 3 (1), 1192–1214.

12. Brodeckiy, G. L. (2011). Ekonomiko-matematicheskie metody i modeli v logistike: potoki sobytiy i sistemy obsluzhivaniya. Moscow: Akademiya, 272.

13. Gnedenko, B. V., Kovalenko, I. N. (2005). Vvedenie v teoriyu massovogo obsluzhivaniya. Moscow.: KomKniga, 400.

14. Postan, M. (2008). Application of Markov Drift Processes to Logistical Systems Modeling. Dynamics in Logistics, 443–455. doi: https://doi.org/10.1007/978-3-540-76862-3_43

15. Morozova, I., Postan, M., Shyryaeva, L. (2011). Optimization of Spare Parts Lot Size for Supply of Equipment's Park. Dynamics in Logistics, 105–113. doi: https://doi.org/10.1007/978-3-642-11996-5_10

16. Postan, M. Y. (2015). Application of Semi-Markov Drift Processes to Logistical Systems Modeling and Optimization. Lecture Notes in Logistics, 227–237. doi: https://doi.org/10.1007/978-3-319-23512-7_22

17. Postan, M., Kushnir, L. (2016). A method of determination of port terminal capacity under irregular cargo delivery and pickup. Eastern-European Journal of Enterprise Technologies, 4 (3 (82)), 30–37. doi: https://doi.org/10.15587/1729-4061.2016.76285

18. Postan, M. Ya. (1992). Ob odnom klasse smeshannyh markovskih processov i ih primenenie v teorii teletrafika. Problemy peredachi informacii, 28 (3), 40–53.

19. Cohen, J. W., Boxma, O. J. (2000). Boundary Value Problems in Queueing System Analysis. Elsevier, 404.

20. Avramchuk, E. F., Vavilov, A. A., Emel'yanov, S. V. et. al.; Emel'yanov, S. V. et. al. (Eds.) (1988). Tekhnologiya sistemnogo modelirovaniya. Moscow: Mashinostroenie; Berlin: Tekhnik, 520.

STUDY INTO CONDITIONS FOR THE INTERACTION BETWEEN DIFFERENT TYPES OF TRANSPORT AT INTERMODAL TERMINALS (p. 70-76)

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The study conducted into organization of the interaction among various types of transport at intermodal terminals found that it is necessary to improve the technological process of a terminal to achieve effective functioning of transshipment terminals. Specifically, it is necessary to provide basic requirements, such as continuity, rhythm, parallelism and sequenced-flow of all operations and maximum combination with the high quality of unconditional use. The study proved that achievement of appropriate conditions is possible when using the descriptive model of a two-port terminal. It operates due to the processes of self-synchronization of movement of automated platforms, which transport containers between a road portal and a railroad portal. The study established that we must solve the design problem of creation of perfect computer models for needs of organization of the interaction of various types of transport at intermodal terminals in a combination of descriptive model and analytical model. These models include software components and hardware components that provide conditions for implementation of the concept of self-synchronization movement of forklift trucks. Specifically, the study found that the self-timed control approach provides a greater degree of coordination in operation of a container terminal. That makes it possible to improve the parallelism of processes, that is, simultaneous implementation of events within a system.

The study showed a possibility for the formalization of processes of self-synchronization by means of Petri nets. This mathematical apparatus is very convenient for modeling dynamic discrete systems and makes it possible to explore the sequential execution of all processes, which occur at an intermodal terminal. Based on the simulation, the study proved that an average container demurrage at a terminal diminishes, which makes it possible to increase processing capacity and to reduce unit costs for processing a container at a terminal.

Thus, there is reason to state that it is quite possible to develop technologically complete "seaport-railroad portal-automobile portal" terminal structures in various configurations. The type of configuration depends on selected logistics routes for delivery of good. We should apply the method of organization of operation of a two-port terminal for this purpose.

Keywords: self-synchronization, Petri net, intermodal transportation, container terminal.

References

1. Petrushov, V. V., Kryvtsun, M. O. (2013). Problemy intermodalnykh perevezen v Ukraini. Visnyk NTU «KhPI». Seriya: Novi rishennia v suchasnykh tekhnolohiyakh, 70 (1043), 86–91.

2. Butko, T. V., Shander, O. E. (2014). Formalization of the process of freight car fleet management of operator company. Eastern-European Journal of Enterprise Technologies, 2 (3 (68)), 55–58. doi: https://doi.org/10.15587/1729-4061.2014.22798

3. Vasilenok, V. L., Negreeva, V. V., Shevchenko, Ya. V. (2015). Organization of intermodal transport: international and Russian experience. Nauchniy zhurnal NIU ITMO. Seriya: Ekonomika i ekologicheskiy menedzhment, 4, 77–88.

4. Dmitriev, A. V. (2009). Intermodal technologies in the logistics of freight forwarding services. Rossiyskoe predprinimatel'stvo, 16 (5), 787–798.

5. Belyaev, V. M., Mirotin, L. B., Nekrasov, A. G. Pokrovskiy, A. K. (2011). Upravlenie processami v transportnyh logisticheskih sistemah. Moscow, 127.

6. Li, L., Negenborn, R. R., De Schutter, B. (2015). Intermodal freight transport planning – A receding horizon control approach. Transportation Research Part C: Emerging Technologies, 60, 77–95. doi: https://doi.org/10.1016/j.trc.2015.08.002

7. Macharis, C., Van Hoeck, E., Pekin, E., van Lier, T. (2010). A decision analysis framework for intermodal transport: Comparing fuel price increases and the internalisation of external costs. Transportation Research Part A: Policy and Practice, 44 (7), 550–561. doi: https://doi.org/10.1016/j.tra.2010.04.006

8. Dragović, B., Tzannatos, E., Park, N. K. (2016). Simulation modelling in ports and container terminals: literature overview and analysis by research field, application area and tool. Flexible Services and Manufacturing Journal, 29 (1), 4–34. doi: https://doi.org/10.1007/s10696-016-9239-5

9. Yang, X., Low, J. M. W., Tang, L. C. (2011). Analysis of intermodal freight from China to Indian Ocean: A goal programming approach. Journal of Transport Geography, 19 (4), 515–527. doi: https://doi.org/10.1016/j.jtrangeo.2010.05.007

10. Cho, J. H., Kim, H. S., Choi, H. R. (2010). An intermodal transport network planning algorithm using dynamic programming – A case study: from Busan to Rotterdam in intermodal freight routing. Applied Intelligence, 36 (3), 529–541. doi: https://doi.org/10.1007/s10489-010-0223-6

11. Monios, J., Wilmsmeier, G. (2013). The role of intermodal transport in port regionalisation. Transport Policy, 30, 161–172. doi: https://doi.org/10.1016/j.tranpol.2013.09.010

12. Limao, N. (2001). Infrastructure, Geographical Disadvantage, Transport Costs, and Trade. The World Bank Economic Review, 15 (3), 451–479. doi: https://doi.org/10.1093/wber/15.3.451

13. Dooms, M., van der Lugt, L., de Langen, P. W. (2013). International strategies of port authorities: The case of the Port of Rotterdam Authority. Research in Transportation Business & Management, 8, 148–157. doi: https://doi.org/10.1016/j.rtbm.2013.06.004

14. Pogrebna, G., Petrushov, V. V. (2014). Improvement of the container terminal station in Kharkov-Lisky calculation and its ability processing. Zbirnyk naukovykh prats Ukrainskoi derzhavnoi akademiyi zaliznychnoho transportu, 145, 78–81.

15. Varshavskiy, V. I., Marahovskiy, V. B., Rozenblyum, L. Ya., Yakovlev, A. V. (1990). Aperiodicheskaya skhemotekhnika. Iskusstvenniy intellekt. Programmnye i apparatnye sredstva. Moscow, 199–213.

16. Peterson, G. (1984). The theory of Petri nets and modeling of systems. Moscow: Mir, 264.

17. Palagin, A. V., Opanasenko, V. N. (2007). Tekhnologiya rekonfiguriruemogo komp'yutinga. Kibernetika i sistemnyy analiz, 5, 72–86.