



Complex Production-Inventory Replenishment Problem with Uncertainty in Customer Behaviour

T. Adediran^a, A. Al-Bazi^{b,*}

^a Coventry University, Coventry CV1 5FB, United Kingdom;

^b Aston University, Birmingham B4 7ET, United Kingdom

References

- [1] G. Mirabelli and V. Solina, "Optimization strategies for the integrated management of perishable supply chains: A literature review," *Journal of Industrial Engineering and Management*, vol. 15, no. 1 pp. 58-91, 2022, doi: 10.3926/ijem.3603.
- [2] A. Sanders, C. Elangeswaran, and J. P. Wulfsberg, "Industry 4.0 implies lean manufacturing: Research activities in industry 4.0 function as enablers for lean manufacturing". *Journal of Industrial Engineering and Management*, vol. 9, no. 3, pp. 811-33, 2016, doi:10.3926/ijem.1940.
- [3] M. Crnjac, I. Veža, and N. Banduka, "From concept to the introduction of industry 4.0," *Int. J. Ind. Eng. Manag.*, vol. 8, no. 1, pp. 21-30, 2017.
- [4] R. Aldrighetti, D. Battini, D. Ivanov, and I. Zennaro, "Costs of Resilience and Disruptions in Supply Chain Network Design Models: A Review and Future Research Directions," *International Journal of Production Economics*, vol. 235, 108103, 2021, doi: 10.1016/j.ijpe.2021.108103.
- [5] L. Liu, "Outsourcing and Rescheduling for a Two-Machine Flow Shop with the Disruption of New Arriving Jobs: A hybrid Variable Neighborhood Search Algorithm," *Computers & Industrial Engineering*, vol. 130, pp. 198-221, 2019, doi: 10.1016/j.cie.2019.02.015.
- [6] I. R. Uhlmann, R. M. Zanella, and E. M. Frazzon, "Hybrid Flow Shop Rescheduling for Contract Manufacturing Services," *International Journal of Production Research*, vol. 60, no. 3, pp. 1069-1085, 2020, doi: 10.1080/00207543.2020.1851422.
- [7] M. E. Kara, A. Ghadge, and U. S. Bitüci, "Modelling the Impact of Climate Change Risk on Supply Chain Performance" *International Journal of Production Research*, vol. 59, no. 24, pp. 7317-7335, 2021, doi: 10.1080/00207543.2020.1849844.
- [8] S. R. Fartaj, G. Kabir, V. Eghujovbo, S. M. Ali, and S. K. Paul, "Modeling Transportation Disruptions in the Supply Chain of Automotive Parts Manufacturing Company," *International Journal of Production Economics*, vol. 222, 107511, 2020, doi: 10.1016/j.ijpe.2019.09.032.
- [9] M. J. Alvarado-Vargas, and K. J. Kelley, "Bullwhip Severity in Conditions of Uncertainty: Regional vs Global Supply Chain Strategies," *International Journal of Emerging Markets*, vol. 15, no. 1, pp. 131-148, 2019, doi: 10.1108/IJOEM-02-2017-0050.
- [10] A. I. Malik, and B. Sarkar, "Disruption Management in a Constrained Multi-Product Imperfect Production System," *Journal of Manufacturing Systems*, vol. 56, pp. 227-240, 2020, doi: 10.1016/j.jmsy.2020.05.015.
- [11] A. Brintrup, J. Pak, D. Ratiney, T. Pearce, P. Wichmann, P. Woodall, and D. McFarlane, "Supply Chain Data Analytics for Predicting Supplier Disruptions: A Case Study in Complex Asset Manufacturing," *International Journal of Production Research*, vol. 58, no. 11, 3330-3341, 2020, doi: 10.1080/00207543.2019.1685705.
- [12] T. V. Adediran, A. Al-Bazi, and L. E. Dos Santo, "Agent-Based Modelling and Heuristic Approach for Solving Complex OEM Flow-Shop Productions under Customer Disruptions," *Computers & Industrial Engineering*, vol. 133, pp. 29-41, 2019, doi: 10.1016/j.cie.2019.04.054.
- [13] S. Tadayonirad, H. Seidgar, H. Fazlollahtabar, and R. Shafaei, "Robust Scheduling in Two-Stage Assembly Flow Shop Problem with Random Machine Breakdowns: Integrated Meta-Heuristic Algorithms and Simulation Approach," *Assembly Automation*, vol. 39, no. 5, pp. 944-962, 2019, doi: 10.1108/AA-10-2018-0165.
- [14] Y. Li, Y. He, Y. Wang, F. Tao, and J. W. Sutherland, "An Optimization Method for Energy-Conscious Production in Flexible Machining Job Shops with Dynamic Job Arrivals and Machine Breakdowns," *Journal of Cleaner Production*, vol. 254, 120009, 2020, doi: 10.1016/j.jclepro.2020.120009.
- [15] Y. Yang, M. Huang, Z. Y. Wang, and Q. B. Zhu, "Robust Scheduling Based on Extreme Learning Machine for Bi-Objective Flexible Job-Shop Problems with Machine Breakdowns," *Expert Systems with Applications*, vol. 158, 113545, 2020, doi: 10.1016/j.eswa.2020.113545.

- [16] J. L. Andrade-Pineda, D. Canca, P. L. Gonzalez-R, and M. Calle, "Scheduling a Dual-Resource Flexible Job Shop with Makespan and Due Date-Related Criteria," *Annals of Operations Research*, vol. 291, no. 1, pp. 5-35, 2020, doi: 10.1007/s10479-019-03196-0.
- [17] J. M. Framinan, V. Fernandez-Viagas, and P. Perez-Gonzalez, "Using Real-Time Information to Reschedule Jobs in a Flowshop with Variable Processing Times," *Computers & Industrial Engineering*, vol. 129, pp. 113-125, 2019, doi: 10.1016/j.cie.2019.01.036.
- [18] Z. Liu, J. Yan, Q. Cheng, C. Yang, S. Sun, and D. Xue, "The Mixed Production Mode Considering Continuous and Intermittent Processing for an Energy-Efficient Hybrid Flow Shop Scheduling," *Journal of Cleaner Production*, vol. 246, 119071, 2020, doi: 10.1016/j.jclepro.2019.119071.
- [19] C. Rout, A. Paul, R. S. Kumar, D. Chakraborty, and A. Goswami, "Cooperative Sustainable Supply Chain for Deteriorating Item and Imperfect Production under Different Carbon Emission Regulations," *Journal of Cleaner Production*, vol. 272, 122170, 2020, doi: 10.1016/j.jclepro.2020.122170.
- [20] M. T. Islam, A. Azeem, M. Jabir, A. Paul, and S. K. Paul, "An Inventory Model for a Three-Stage Supply Chain with Random Capacities considering Disruptions and Supplier Reliability," *Ann Oper Res*, vol. 315, pp. 1703-1728, 2022, doi:10.1007/s10479-020-03639-z.
- [21] S. K. Paul, S. Asian, M., Goh, and S. A. Torabi, "Managing Sudden Transportation Disruptions in Supply Chains under Delivery Delay and Quantity Loss" *Ann Oper Res*, vol. 273, pp. 783-814, 2019, doi: 10.1007/s10479-017-2684-z.
- [22] D. Ivanov and M. Rozhkov, "Coordination of Production and Ordering Policies under Capacity Disruption and Product Write-Off Risk: An Analytical Study with Real-Data based Simulations of a Fast Moving Consumer Goods Company," *Ann Oper Res*, vol. 291, pp. 387-407, 2020, doi: 10.1007/s10479-017-2643-8.
- [23] Z. Wang, Y. Qi, H. Cui, and J. Zhang, "A Hybrid Algorithm for Order Acceptance and Scheduling Problem in Make-to-Stock/Make-to-Order industries," *Computers & Industrial Engineering*, vol. 127, pp. 841-852, 2019, doi: 10.1016/j.cie.2018.11.021.
- [24] E. Yagmur and S. E. Kesen, "A Memetic Algorithm for Joint Production and Distribution Scheduling with Due Dates," *Computers & Industrial Engineering*, vol. 142, 106342, 2020, doi: 10.1016/j.cie.2020.106342.
- [25] J. Yang, F. Guo, L. Luo, and X. Ye, "Bilevel Mixed-Integer Nonlinear Programming for Integrated Scheduling in a Supply Chain Network," *Cluster Computing*, vol. 22, pp. 15517-15532, 2019, doi: 10.1007/s10586-018-2673-2.
- [26] I. Pergher, E. A. Frej, L. R. P. Roselli, and A. T. de Almeida, "Integrating Simulation and FTTTradeoff Method for Scheduling Rules Selection in Job-Shop Production Systems," *International Journal of Production Economics*, vol. 227, 107669, 2020, doi: 10.1016/j.ijpe.2020.107669.
- [27] D. Bachtenkirch and S. Bock, "Finding Efficient Make-to-Order Production and Batch Delivery Schedules," *European Journal of Operational Research*, vol. 297, no. 1, pp. 133-152, 2022, doi: 10.1016/j.ejor.2021.04.020.
- [28] Y. Yin, D. Li, D. Wang, and T. C. E. Cheng, "Single-Machine Serial-Batch Delivery Scheduling with Two Competing Agents and Due Date Assignment," *Ann Oper Res*, vol. 298, pp. 497-523, 2021, doi: 10.1007/s10479-018-2839-6.
- [29] Y. Sang, J. Tan, and W. Liu, "A New Many-Objective Green Dynamic Scheduling Disruption Management Approach for Machining Workshop Based on Green Manufacturing," *Journal of Cleaner Production*, vol. 297, 126489, 2021, doi: 10.1016/j.jclepro.2021.126489.
- [30] Z. Wang, C. K. Pang, and T. S. Ng, "Robust Scheduling Optimization for Flexible Manufacturing Systems with Replenishment Under Uncertain Machine Failure Disruptions," *Control Engineering Practice*, vol. 92, 104094, 2019, doi: 10.1016/j.conengprac.2019.07.012.
- [31] C.T. Chang, J.T. Teng, and S.K. Goyal, "Optimal Replenishment Policies for Non-Instantaneous Deteriorating Items with Stock Dependent Demand," *International Journal of Production Economics*, vol. 123, no. 1, pp. 62-68, 2010, doi: 10.1016/j.ijpe.2009.06.042.
- [32] H. N. Soni "Optimal Replenishment Policies for Non-Instantaneous Deteriorating Items with Price and Stock Sensitive Demand under Permissible Delay in Payment," *International Journal of Production Economics*, vol. 146, no. 1, pp. 259-268, 2013, doi: 10.1016/j.ijpe.2013.07.006.
- [33] D. L. Shi, B. B. Zhang, and Y. Li, "A multi-objective flexible job-shop scheduling model based on fuzzy theory and immune genetic algorithm," *International Journal of Simulation Modelling*, vol. 19, no. 1, pp. 123-133, 2020, doi: 10.2507/IJSIMM19-1-CO1.
- [34] T. V. Adediran and A. Al Bazi, "Developing an agent-based heuristic optimisation system for complex flow shops with customer-imposed production disruptions," *Journal of Information and Communication Technology*, vol. 18, no. 2, pp. 291-322, 2018.
- [35] Z. A. Khan, M. T. Khan, I. Ul Haq, and K. Shah, "Agent-Based Fault Tolerant Framework for Manufacturing Process Automation," *International Journal of Computer Integrated Manufacturing*, vol. 32, no. 3, pp. 268-277, 2019, doi: 10.1080/0951192X.2019.1571235.
- [36] A. Pavlov, D. Ivanov, F. Werner, A. Dolgui, and B. Sokolov, "Integrated Detection of Disruption Scenarios, the Ripple Effect Dispersal and Recovery Paths in Supply Chains," *Ann Oper Res*, pp. 1-23, 2019, doi: 10.1007/s10479-019-03454-1.
- [37] M. E. Riddle, et al., "Agent-Based Modeling of Supply Disruptions in the Global Rare Earths Market," *Resources, Conservation and Recycling*, vol. 164, 105193, 2021, doi: 10.1016/j.resconrec.2020.105193.
- [38] L. Parv, B. Deaky, M. D. Nasulea, and G. Oancea, "Agent-Based Simulation of Value Flow in an Industrial Production Process," *Processes*, vol. 7, no. 2, p. 82, 2019, doi: 10.3390/pr7020082.
- [39] S. Namany, R. Govindan, L. Alfagih, G. McKay, and T. Al-Ansari, "Sustainable Food Security Decision-Making: An Agent-Based Modelling Approach," *J. Clean. Prod.*, vol. 255, 120296, 2020, doi: 10.1016/j.jclepro.2020.120296.
- [40] A. Pan, S. Y. S. Leung, K. L. Moon, and K. W. Yeung, "Optimal Reorder Decision-Making in the Agent-Based Apparel Supply Chain" *Expert Systems with Application*, vol. 36, no. 4, pp. 8571-8581, 2009, doi: 10.1016/j.eswa.2008.10.081.
- [41] A. Hall and K. Virrantaus, "Visualizing the workings of agent-based models: Diagrams as a tool for communication and knowledge acquisition," *Computers Environment and Urban Systems*, vol. 58, pp. 1-11, 2016, doi: 10.1016/j.compenvurbusys.2016.03.002.
- [42] Y. Liu, E. Dehghani, M. S. Jabalameh, A. Diabat, and C. C. Lu, "A Coordinated Location-Inventory Problem with Supply Disruptions: A Two-Phase Queuing Theory-Optimization Model Approach," *Computers & Industrial Engineering*, vol. 142, 106326, 2020, doi: 10.1016/j.cie.2020.106326.

- [43] T. E. Saputro, G. Figueira, and B. Almada-Lobo, "Integrating Supplier Selection with Inventory Management under Supply Disruptions," *International Journal of Production Research*, vol. 59, no. 11, pp. 3304-3322, 2021, doi: 10.1080/00207543.2020.1866223.
- [44] L. Shen, F. Li, C. Li, Y. Wang, X. Qian, T. Feng, and C. Wang, "Inventory Optimization of Fresh Agricultural Products Supply Chain Based on Agricultural Superdocking," *Journal of Advanced Transportation*, vol. 2020, 2724164, 2020, doi: 10.1155/2020/2724164.
- [45] A. Sadeghi, G. Suer, R. Y. Sinaki, and D. Wilson, "Cellular Manufacturing Design and Replenishment Strategy in a Capacitated Supply Chain System: A simulation-based analysis," *Computers & Industrial Engineering*, vol. 141, 106282, 2020, doi: 10.1016/j.cie.2020.106282.
- [46] X. Ai, Y. Yue, H. Xu, and X. Deng, "Optimizing Multi-Supplier Multi-Item Joint Replenishment Problem for Non-Instantaneous Deteriorating Items with Quantity Discounts," *PloS ONE*, vol. 16, no. 2, e0246035, 2021, doi: 10.1371/journal.pone.0246035.
- [47] S. Bardhan, H. Pal, and B. C. Giri, "Optimal Replenishment Policy and Preservation Technology Investment for a Non-Instantaneous Deteriorating Item with Stock-Dependent Demand," *Operational Research*, vol. 19, no. 2, pp. 347-368, 2019, doi: 10.1007/s12351-017-0302-0.
- [48] G. Li, X. He, J. Zhou, and H. Wu, "Pricing, Replenishment and Preservation Technology Investment Decisions for Non-Instantaneous Deteriorating Items," *Omega*, vol. 84, pp. 114-126, 2019, doi: 10.1016/j.omega.2018.05.001.
- [49] A. Türkyılmaz, Ö. Senvar, I. Ünal, and S. Bulkan, "A Research Survey: Heuristic Approaches for Solving Multi-Objective Flexible Job Shop Problems," *J Intell Manuf*, vol. 31, pp. 1949-1983, 2020, doi: 10.1007/s10845-020-01547-4.
- [50] M. Sharma and P. Kaur, "A Comprehensive Analysis of Nature-Inspired Meta-Heuristic Techniques for Feature Selection Problem," *Archives of Computational Methods in Engineering*, vol. 28, no. 3, pp. 1103-1127, 2021, doi: 10.1007/s11831-020-09412-6.
- [51] S. L. Geston, S. Brown, M. S. Barner, M. G. Abadi, and D. S. Hurwitz, "Factors Contributing to the Problem-Solving Heuristics of Civil Engineering Students," in *2019 ASEE Annual Conference & Exposition*, Tampa, Florida, 2019, pp. 1-18, doi: 10.18260/1-2-32833.
- [52] C. Almeder and R. F. Hartl, "A Metaheuristic Optimization Approach for a Real-world Stochastic Flexible Flow Shop Problem with Limited Buffer," *International Journal of Production Economics*, vol. 145, no. 1, pp. 88- 95, 2013, doi: 10.1016/j.ijpe.2012.09.014.
- [53] J. C. Aririguzo, "Fractal architecture for 'leagile' networked enterprises," Ph.D. dissertation, Sheffield Hallam University, United Kingdom, 2009.
- [54] S. S. Bakens, "Aggregate bottleneck capacity planning in the automotive industry," M.S. thesis, Eindhoven University of Technology, The Netherlands, 2016.
- [55] S. Nallusamy, R. Balaji, and S. Sundar, "Proposed Model for Inventory Review Policy through ABC Analysis in an Automotive Manufacturing Industry," *International Journal of Engineering Research in Africa*, vol. 29, pp. 164-174, 2017, doi: 10.4028/www.scientific.net/JERA.29.165.
- [56] C. Phillips, *Statistics 1: Economics, Management, Finance and the Social Sciences*. London, England: University of London Press, 2002.