Int j simul model 22 (2023) 1, 29-40
Review scientific paper

OPTIMISATION VIA SIMULATION APPLIED TO REVERSE LOGISTICS: A SYSTEMATIC LITERATURE REVIEW

Pinto, W. G. M.[#]; Montevechi, J. A. B.; Miranda, R. de C.; Santos, C. H. & Pereira, A. B. M.
Institute of Production Engineering and Management, Federal University of Itajubá (UNIFEI), 1303 BPS Avenue PO Box: 50, 37500-903 Itajubá, MG, Brazil
E-Mail: wesleygmp@unifei.edu.br ([#] Corresponding author), montevechi@unifei.edu.br, rafael.miranda@unifei.edu.br, chenrique.santos@unifei.edu.br, alysonmp@unifei.edu.br

Abstract
The objective of the study is to analyse the scientific production on optimisation via simulation (OvS) applied to reverse logistics. Therefore, a systematic literature review on this area was carried out based on articles published in the main scientific databases during the last 30 years. We analysed about 70 articles published in several journals, and the state of the art regarding the adoption of OvS in reverse logistics problems was explored. This article fills some important questions about the adoption of this approach and might be useful for researchers and professionals in their developments related to this research field. Finally, we highlight some issues and research opportunities.
(Received in July 2022, accepted in November 2022. This paper was with the authors 1 week for 1 revision.)

Key Words: Optimisation, Simulation, Reverse Logistics, Systematic Literature Review

1. INTRODUCTION

The Reverse Logistics (RL) area has been receiving attention from academics, researchers, and professionals, due to the current environmental challenges [1]. RL can be described as an efficient and economical process of planning, implementation, and flow control of feedstock. In this case, we consider the entire flow from the consumption point to the origin one, intending to promote better management practices [2].

Agrawal et al. [3] point out the importance of companies using RL as a strategic initiative because of the economic, sustainable, and social benefits. Govindan and Bouzon [4] highlight the importance of tools to support decision-making in this context. Considering the decision support tools [5-7], the optimisation via simulation (OvS) promotes better practices for decision-making. OvS is an instrument for helping decision-making since it captures the relationship among several entities in a complex system in the real world, allowing the identification of better solutions for complex problems [8].

Therefore, this paper aims to develop a systematic literature review (SLR) that approaches the main aspects of the adoption of OvS to support decisions related to Reverse Logistics (RL). In this case, several research questions (RQs) were proposed, covering key-elements related to this topic of research. The RQs explored the application areas, the nature of the problems, the simulation types and optimization methods adopted by the authors, as well as the dimensions of sustainability explored and some advantages, limitations and opportunities associated with the adoption of OvS in RL problems.

To answer the RQs, this paper contributes to the theoretical development of the use of OvS in RL problems and fills the gap in the literature on this theme. The rest of the paper is organised as follows: the research material and method are described in section 2. Section 3 presents results and discussions, as well as answers to the RQs. Finally, section 4 shows some conclusions and future directions.

2. MATERIAL AND METHOD

2.1 Research method: a Systematic Literature Review (SLR)

For implementing a SLR, researchers should follow a research protocol. In this sense, this paper presents a SLR based on the steps suggested by Amaral et al. [5]: (i) planning of objectives and research questions, (ii) searching and screening considering the defined criteria, (iii) analysis and synthesis of the results, and (iv) presentation of the results and main conclusions.

2.2 Planning

First of all, an exploratory search was carried out to comprehend the main terms referent to the analysed theme. In this case, we adopted the Scopus® database. The terms "Reverse Logistics", "Reverse supply chain", "Circular economy" and "Sustainable supply chain" were introduced by applying the Boolean logic "And", to identify the main discussions related to this theme. In this search, we focused on practical peer-reviewed papers published in scientific journals. Furthermore, other works referenced by the papers found in this first phase were read at an opportune time. In this phase, several meetings were also conducted in order to discuss and find out questions related to the use of OvS in the RL problems. These meetings were held by professors, professionals and doctorate students, who have vast knowledge in RL, optimisation, simulation, and related topics. Given the nomenclatures and approaches pointed out about RL and to complement the terminology related to RL, a word cloud was developed based on the papers analysed in the exploratory review. Therefore, we can identify those words associated with this SLR theme according to Fig. 1.

Figure 1: Word cloud about article screening of reverse logistics, reverse supply chain, circular economy and sustainable supply chain.

According to Fig. 1, it is possible to note several terms associated with RL, such as supply chains, sustainable development, recycling, logistics, waste management, reverse logistics, closed-loop supply chain, solid waste, etc. Furthermore, Islam et al. [9] present some terms used to represent RL, such as green logistics, reverse logistics, and closed loop supply chain. Plaza-Úbeda et al. [10] used the following terms: supply chain management, green supply chain management, reverse logistics and green reverse logistics. Considering the keywords mentioned, the following words were selected for this SLR: "reverse logistics", "reverse supply chains", "closed loop supply chain", "circular economy", and "sustainable supply chain".

Considering the keywords previously selected, we carried out a new exploratory search in Scopus® database, and we highlighted that the use of OvS applied to RL should be analysed, providing a theoretical background that may help future research on this area. In this sense, Fig. 2 presents some possible gaps associated with this theme.

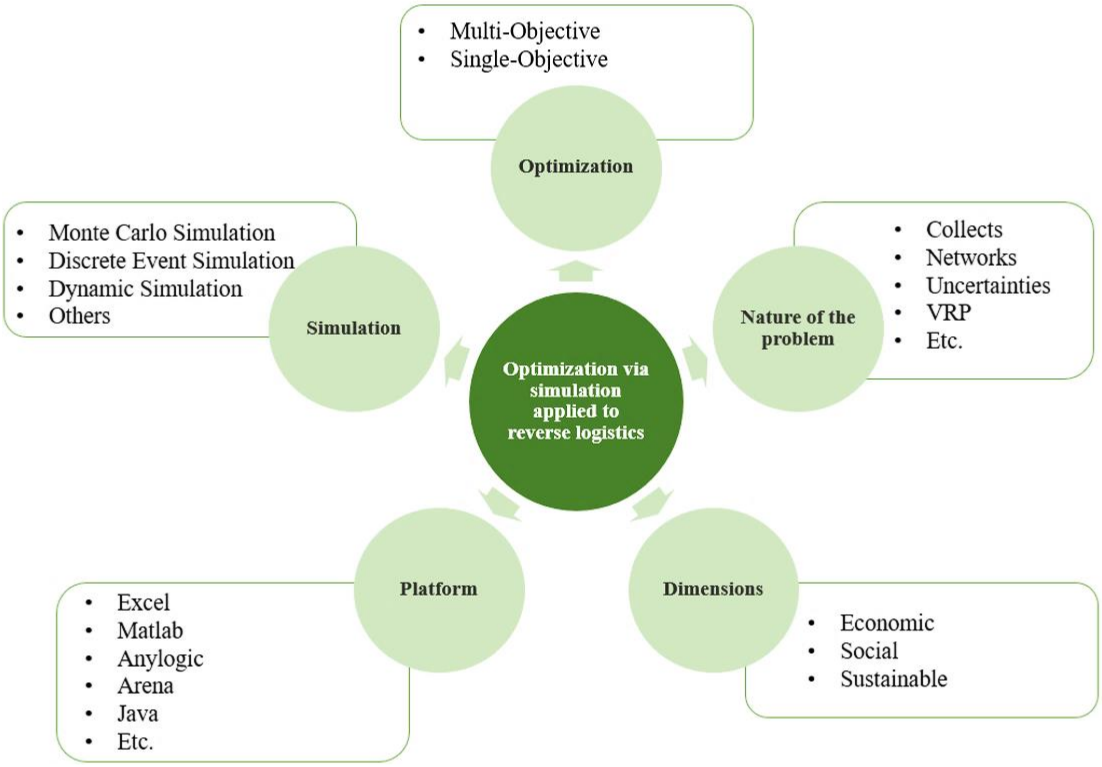

Figure 2: Theoretical gaps considering the use of OvS in RL problems.

Facing the previous considerations, this research has the following objectives:

- Develop extensive bibliographical research about the OvS in RL problems;
- Evaluate each paper considering the mentioned gaps;
- Create a theoretical background in the area;
- Identify future opportunities and directions.

Once the objectives were planned, the questions were defined:

(i) Which are the application areas and nature of the problem associated with the use of OvS in RL problems?
(ii) Which are the simulation types adopted in the OvS considering this context?
(iii) Which are the optimisation methods adopted to solve complex problems in RL?
(iv) What dimensions of Sustainability have been explored?
(v) Which are the main advantages, limitations and research opportunities associated with this research area?

2.3 Searching and screening

Among several available databases, we adopted for this phase the Scopus®, Scielo®, Web of Science®, Science Direct® and IEEE Xplore®. To obtain better precision in the search, simulation and optimisation terms were applied generically, which means that they were not stratified. Moreover, the terms that refer to RL were: "reverse supply chain", "closed loop supply chain", "circular economy", and "sustainable loop supply chain". We used “AND/OR” Boolean logic to obtain all combinations among the terms. The following criteria were adopted to select the paper: (i) the researched terms must be in the keywords, title and/or abstract; (ii) papers published during the last thirty years, considering the final date in June 2021; (iii) peer-reviewed papers published in scientific journals; (iv) only works in English.

In the first moment, about 300 papers that meet the research criteria were found. Then a screening step was carried out where we read the abstracts in order to identify those that are in line with the objectives of this work. In this phase, we excluded papers that did not line up with the defined criteria. After the screening step, about 70 papers were selected for full-text reading. Fig. 3 resumes the planning and searching / screening phases.

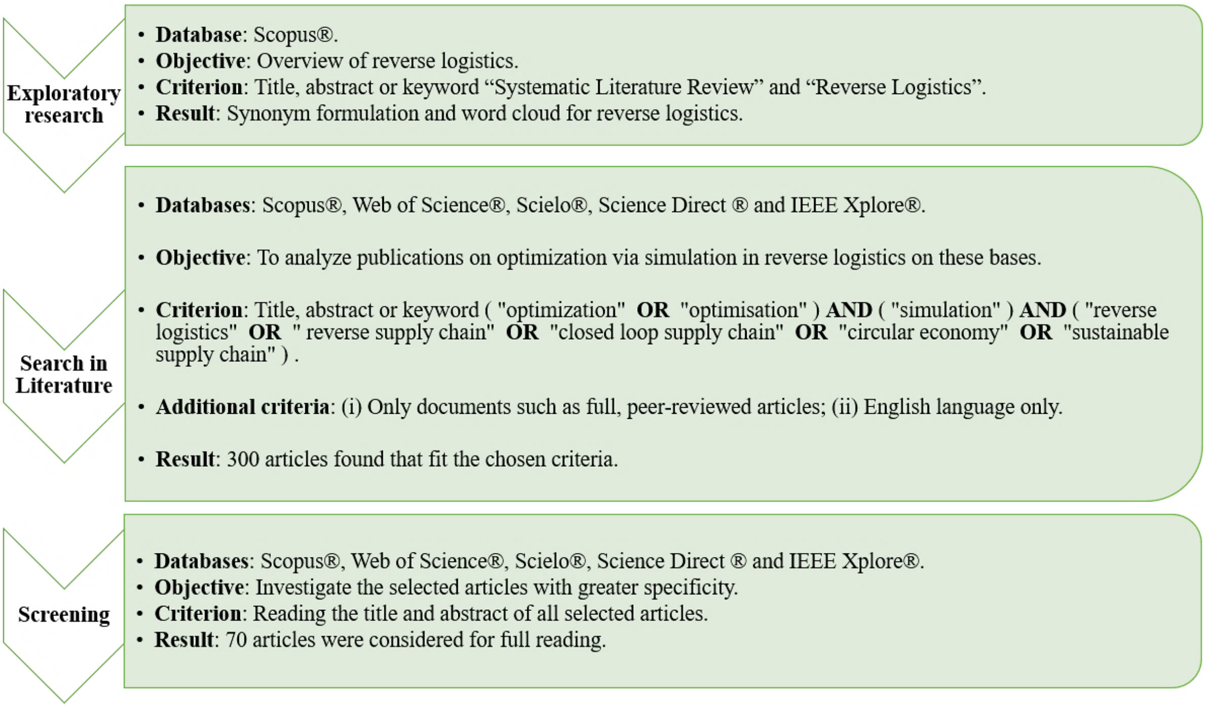

Figure 3: Activities carried out during the Planning and Searching / Screening phases.

2.4 Analysis and synthesis

We performed the analysis and synthesis of the results using a MS Excel® Spreadsheet. In this case, it was possible to extract information from the papers read. We registered each paper in the spreadsheet considering the answers of RQs. Finally, the results were analysed by descriptive statistics and showed the best practices and perspectives considering the adoption of OvS in RL problems.

2.5 Presentation (report)

The presentation is discussed in section 3 where each subsection corresponds to a RQ. We adopted tables and graphics to summarise the results. We highlight that the analysis and discussions are important to describe the evolution of the OvS in RL over the years, as well as the future perspectives of this approach. Besides the state of the art about the theme, we present some discussions about limitations, advantages and opportunities related to the use of OvS in RL problems.

3 RESULTS AND DISCUSSIONS

3.1 Application areas and problem nature related to the use of OvS applied to RL problems

It is possible to note that there is great diversity considering the application areas and problem characteristics. Based on the selected papers, application areas were divided as (i) manufacturing ; (ii) services; (iii) Agriculture; (iv) civil construction; (v) Energy (activities related to reuse residues for generating energy); (vi) Healthcare; (vii) Others (activities involving areas that do not fit with the other ones); (viii) not specified (correspond to papers that do not describe their application areas). In this sense, Fig. 4 shows a Pareto chart considering the publications related to these areas.

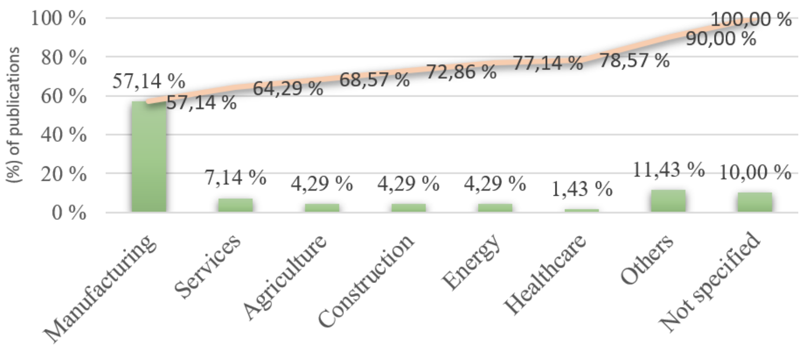

Figure 4: Pareto chart considering the main application areas.

We highlighted the three main application areas, manufacturing, services and agriculture, corresponding to 68.57 % of the related papers. In this case, manufacturing, which represents around 57.14 % of the papers, presents works that involve end-of-life products and organic domestic residues [11]. Moreover, about 35.90 % of the papers applied in manufacturing is associated with the electronic industry, such as the work from Mar-Ortiz et al. [12]. The services represents about 7.14 % of the papers and covers mainly strategic policies [13].

The third most representative area is agriculture, with about 4.29 %, covering works about wheat supply. With the same percentage, the civil construction has approaches to RL for construction and demolition residues [14]. In the energy area, OvS applied to RL was used in problems related to solar energy [15] and Waste Energy Residue [16]. In the healthcare area (1.43 % of the papers), the works include logistic processes applied to pharmacies. Finally, the other categories are composed of several applications.

Moreover, considering the nature of the problem, the paper from Abid and Mhada [17] is used to classify several difficulties faced in this area, such as vehicle routing problem (VRP), Planning and Production Control (PPC), Stock Control (SC), Network (N), Recovery (REC), Collection (C), Return Management (RM), Location (L), and Production and Scheduling (PS). Following this line, there is the vehicle routing problem from the Bottani and Casella [18] that applies an Optimisation in a simulation model that reproduces the transport flow of returnable items, assessing the environmental impact. Furthermore, we highlight the study of Elia et al. [19], which adopts a methodology based on simulation to compare different collection alternatives considering the waste of electric and electronic equipment.

Ahluwalia and Nema [20] proposed a tool to support decision-making in computer residue management aiming to solve difficulties related to environmental impacts through Rudimentary Recovery Methods. To better illustrate the observed problems, Fig. 5 shows the percentage of papers for each problem's nature.

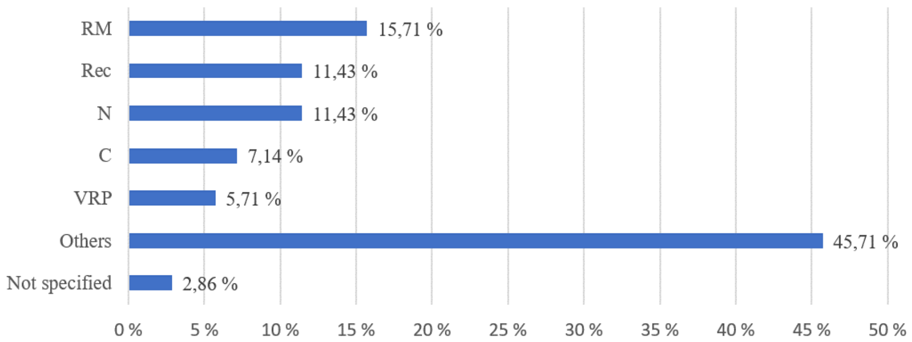

Figure 5: Pareto's chart of problem nature.

It is possible to note that the top five problems represent around 51.42 % of the read papers, and they are divided into return management (15.71 %), recovering (11.43 %), collection (7.14 %), VRP (5.71 %) and N (11.43 %). It is important to highlight that the "others" represents about 45.71 % of the analysed papers and, in this category, there are works that do not fit with the other categories or that mix some of them. In other words, some papers addressed more than one nature of the problem at the same time, such as RM and N, RM and VRP, among other combinations. In this case, we opted to compile these works in one category since they do not present a majority nature of the problem. Finally, we also observe that about 2.86 % of the analysed papers do not specify the problem.

3.2 The simulation types adopted in the OVS considering RL problems

When considering simulation types and platforms (software) to build simulation models that solve RL problems, using the OvS approach, we note several simulation types and software adopted by the analysed authors. Around 74 % of the analysed papers present at least one simulation type. Moreover, it can also be noticed that about 26 % of the papers does not present the adoption simulation type. Fig. 6 illustrates these results. In this case, Monte Carlo Simulation, Discrete Event Simulation (DES) and Dynamic Simulation (DS) are the top three main types, representing around 61 % of papers analysed.

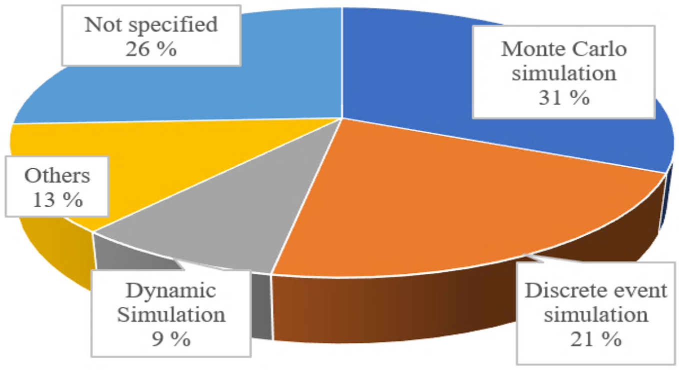

Figure 6: Papers that use simulation combined with optimisation.

Considering the use of Monte Carlo Simulation, there is the work proposed by Yang and Chen [21] that applied simulation to perform a trade-off investigation in an RL network, adjusting models for decision-making against uncertainties. Liu et al. [22] applied Monte Carlo simulation in a supply chain to build a sample mean approximation model and an approximation model of Mixed Integer Programming (MIP).

Regarding the analysed papers that adopt DES, Tozanli et al. [23] developed an under-demand disassembly system aiming to extract the expected costs from an exchange policy, modelling standardised imitations of the use of intelligent products and their components during the utilisation period. Another paper that adopts the same simulation technique is the work proposed by Ebner et al. [24], in which there is a closed loop supply chain model with the production being delivered to an open market that returns products for recycling and remanufacturing. Zolfagharinia et al. [25] also adopts DES, they proposed a Hybrid Variable Neighborhood Search method that combines simulation techniques with meta-heuristics algorithm to solve a new stock control model for joint purchase and remanufacture in a reverse supply chain.

In the third position, there is the DS which includes research such as Georgiadis and Athanasiou [26]. The authors seek to facilitate decision-making for managing investment strategies on a large scale, considering the capacity or low volume flexible strategy applying a dynamic optimisation approach of systems. Furthermore, Miao et al. [27] developed a model and simulated a Closed Loop Supply Chain to solve problems with electronic waste recycling. Finally, Mo et al. [28] applied a DS modelling on a manufacturing reverse supply chain in two stages, breeder and recycler. This simulation model seeks to analyse the supply chain to improve the structure and optimise important model parameters aiming to reduce operation costs and raise profits.

About the platforms (software) adopted to build the simulation models in the OvS structure, it is possible to note that about 69 % of publications include: Excel®, Arena®, Anylogic®, Matlab®, Aspen Plus®, ExtendSim®, gPROMS®, Java®, ModeFrontier®, PowerSim® among others according to Fig. 7. These commercial packages are preferred due to the easiness of model building, customised reports, graphical interfaces and mainly the functionalities disposition. Finally, the other 31 % of publications do not specify the adopted simulation platform.

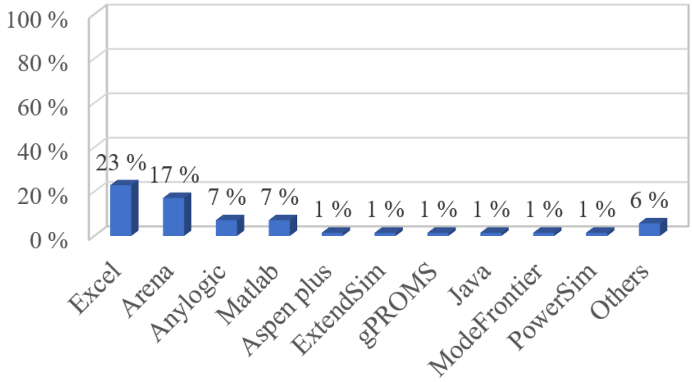

Figure 7: Papers that use simulation software.

3.3 The optimisation methods adopted to solve complex problems in RL

The optimisation methods may vary between single-objective and multi-objective. Fig. 8 demonstrates optimisation types adopted to solve RL problems. We note that around 30 % of the papers did not mention the optimisation type.

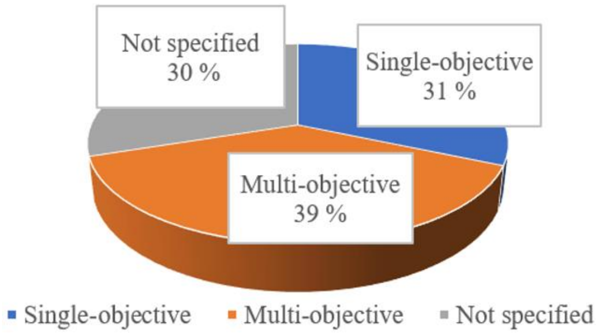

Figure 8: Optimisation types regarding the number of objectives.

Considering the optimisation objective for problems associated with the analysed papers, Table I demonstrates that about 17 % of the papers focused on maximisation functions and 33 % focused on minimisation functions. Among these papers, Tosarkani et al. [29] solved complex problems in the RL area using multi-objective optimisation, applying mixed-integer linear programming and adopting the CPLEX software. Wang et al. [30] maximise a problem associated with the RL network. They used Matlab software to build the Simulated Annealing (SA) algorithm that solves a single objective problem.

Considering the minimisation problems, Tozanli et al. [23] adopted the Lingo software and the mixed-integer linear programming algorithm to solve a problem involving the management of return in the supply chain area. Around 27 % of the analysed papers solve optimisation problems that involve maximisation and minimisation functions in the same problem. Costa-Salas et al. [31] applies DES, using Promodel software, to a collection problem. After simulating the scenarios, an objective function is extracted for optimisation through the software SimRunner, which is optimised by Genetic Algorithm. Finally, 23 % of the read papers does not specify the optimisation objective.

Table I: Optimisation objectives.

Optimisation objectives	Share
MAX	17 %
MAX and MIN	27 %
MIN	33 %
NOT SPECIFIED	23 %

Fig. 9 presents the optimisation software used in problems that involve OvS in RL. We note that the 5 main tools include: CPLEX, OPTQUEST, LINGO, MATLAB and ModeFRONTIER. These present around 46 % of the software used in the analysed papers. It is important to highlight that around 54 % of the read papers do not specify which software was adopted.

Figure 9: Optimisation software.

On the other hand, considering the optimisation techniques, Table II presents the main algorithms that solve OvS problems applied in RL. Among them, the most used was the Branch and Bound, with 21.43 % of the papers. Following, the Genetic Algorithm (GA), which represents around 8.57 % of the papers. Finally, the third most used algorithm, representing 5.71 % of the papers, was the Hybrid Algorithm, which is a combination of algorithms in the search for better solutions.

Table II: Optimisation algorithms.

Optimisation Algorithms	Share
Branch and Bound	21.3 %
GA	8.57 %
Hybrid Algorithm	5.71 %
Simulated annealing (AS)	4.29 %
Goal Programming	1.43 %
Multi-dimensional golden section search algorithm	1.43 %
Artificial Neural Network	1.43 %

The other algorithms that were used in the papers were also presented in Table II, and we noticed that the top 7 algorithms represent around 44.29 % of the papers. It is important to highlight that 55.71 % of the papers do not specify the adopted algorithm.

3.4 Sustainable dimensions explored

Sudarto et al. [32] describe in their research the impact of the behaviour of RL as a social responsibility in front of the capacity planning and the product life-cycle with their uncertainties, reassuring the results in the three sustainable dimensions: economic, social, and environmental. Aiming to comprehend how the analysed authors deal with these dimensions, Fig. 10 shows them in the reviewed papers. We note that the economic and environmental dimensions are the most frequent ones, corresponding to around 33 % of the papers.

Among the papers that involve economic and environmental dimensions, most of them intend to maximise the profits but minimise the environmental impacts, such as the papers proposed by Mar-Ortiz et al. [12] and Bottani et al. [33]. The authors also highlight the difficulties related to the trade-off between the dimensions during the decision-making process.

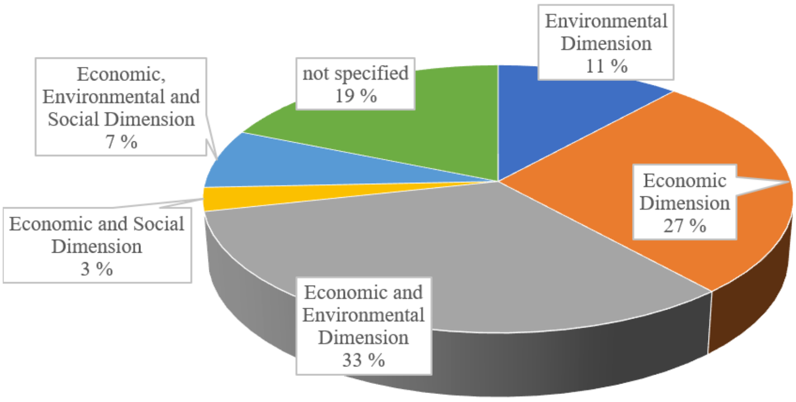

Figure 10: Sustainability dimensions.

We note that the second bigger dimension shown in Fig. 10 is economic, which represents around 27 % of the analysed works. The third dimension (11 % of the papers) is related to the environmental aspects, such as the work proposed by Haraguchi et al. [16] and Gajsek et al. [34]. Around 7 % of the papers is focused on the economic, environmental and social dimensions. Finally, 19 % of the analysed papers did not mention a sustainable dimension addressed.

3.5 Limitations, advantages and opportunities

Although the use of OvS applied in RL has been widely explored in the literature, we highlight theoretical and practical issues given the difficulties and challenges still associated with this approach. Therefore, the read papers were analysed from the advantages and limitations associated with the use of OvS applied in RL problems, as shown in Table III.

Table III: Main findings related to the OvS applied in RL problems.

	Findings
Advantages	✓ Makes possible stock management, less client demand accumulation and bigger operations. ✓ Allows a sensitivity analysis of the main decision parameters. ✓ Allows comprehending the dimensions associated with sustainability, and assessing the economic, social and environmental aspects. ✓ Allows integrating the simulation with optimisation to maximise or minimise one or more decision objectives. ✓ Allows for evaluation of several scenarios.
Limitations	✓ It may be necessary to consider uncertainty factors. ✓ The subjective weighting of decision-makers concerning the multi-criteria decision-making problems.

4. CONCLUSIONS

This work approached the use of OvS applied in RL through an SLR to explore the literature considering the main characteristics associated with publications in this field. We analysed 70 papers published in scientific journals and available in the main databases. The analyses were based on research questions (RQ) which were answered during the work. Considering the simulation types, Monte Carlo simulation stands out, followed by Discrete Event Simulation and Dynamic Simulation. Concerning the platforms adopted to build these simulation models, most of the papers refer to the use of commercial software such as Excel, Arena and Anylogic. There is also a considerable percentage of publications that adopt programming languages.

Regarding the optimisation methods adopted by the researchers, most of the publication seeks to solve problems that involve multi-objective problems. Regarding the objectives of the problem, we noted maximisation problems, minimisation problems or even both of them (i.e., maximum return, lowest cost and minimal environmental impact). Furthermore, considering the types of platforms used to develop the optimisation problems, it could be observed during the research that the main software were: CPLEX, OPTQUEST, LINGO, MATLAB and ModeFRONTIER. Finally, considering the sustainability dimensions addressed by the authors, we note studies that deal with all dimensions: economic, environmental and social.

Considering the advantages of the use of OvS in RL problems, we highlight the contribution to the strategic, tactical and operational planning of organisations. Moreover, it helps in the decision-making process, allowing the comprehension of the sustainability dimensions, integrating simulation and optimisation techniques to analyse several scenarios and optimise decisions.

Although the advantages related to the theme, some limitations emerge from this field. In this case, we highlight the uncertainty variables and factors related to the problems and the subjective ponderations from the decision-makers in multi-criteria problems. We also highlight some opportunities in this research field based on the analysed papers. There is a need for works focused on improving modelling details and focused on the integration of the three sustainable dimensions. Moreover, we also highlight the need for works focused on the adoption of Digital Twins models and Artificial Intelligence techniques, Santos et al. [35], aiming to improve decision-making considering the use of OvS for RL problems.

It is important to highlight that the presented results were based on the analysed papers which were selected considering some criteria defined by the authors, as described in this paper. In this case, the results might vary according to the selected criteria such as the keywords, the scientific base, and the publication time, among others. Therefore, we suggest other exploratory research and literature reviews, considering different criteria, in order to allow broader analysis with a different point of view.

ACKNOWLEDGEMENT

The authors are grateful to CAPES, CNPq, FAPEMIG, and the UNIFEI Postgraduate Program in Production Engineering for supporting this research.

REFERENCES

[1] Govindan, K.; Paam, P.; Abtahi, A.-R. (2016). A fuzzy multi-objective optimisation model for sustainable reverse logistics network design, *Ecological Indicators*, Vol. 67, 753-768, doi:10.1016/j.ecolind.2016.03.017

[2] Rogers, D. S.; Tibben-Lembke, R. (2001). An examination of reverse logistics practices, *Journal of Business Logistics*, Vol. 22, No. 2, 129-148, doi:10.1002/j.2158-1592.2001.tb00007.x

[3] Agrawal, S.; Singh, R. K.; Murtaza, Q. (2015). A literature review and perspectives in reverse logistics, *Resources, Conservation and Recycling*, Vol. 97, 76-92, doi:10.1016/j.resconrec.2015.02.009
[4] Govindan, K.; Bouzon, M. (2018). From a literature review to a multi-perspective framework for reverse logistics barriers and drivers, *Journal of Cleaner Production*, Vol. 187, 318-337, doi:10.1016/j.jclepro.2018.03.040
[5] Do Amaral, J. V. S.; Montevechi, J. A. B.; Miranda, R. C.; de Sousa, W. T. (2022). Metamodel-based simulation optimisation: a systematic literature review, *Simulation Modelling Practice and Theory*, Vol. 114, Paper 102403, 21 pages, doi:10.1016/j.simpat.2021.102403
[6] Oliveira, M. L. M.; Montevechi, J. A. B.; Pinho, A. F.; Miranda, R. C. (2017). Using hybrid simulation to represent the human factor in production systems, *International Journal of Simulation Modelling*, Vol. 16, No. 2, 263-274, doi:10.2507/IJSIMM16(2)7.378
[7] Lopes, H. S.; Lima, R. S.; Leal, F. (2020). Simulation project for logistics of Brazilian soybean exportation, *International Journal of Simulation Modelling*, Vol. 19, No. 4, 571-582, doi:10.2507/IJSIMM19-4-529
[8] Lin, J. T.; Chen, C.-M. (2015). Simulation optimisation approach for hybrid flow shop scheduling problem in semiconductor back-end manufacturing, *Simulation Modelling Practice and Theory*, Vol. 51, 100-114, doi:10.1016/j.simpat.2014.10.008
[9] Islam, M. S.; Moeinzadeh, S.; Tseng, M.-L.; Tan, K. (2021). A literature review on environmental concerns in logistics: trends and future challenges, *International Journal of Logistics Research and Applications*, Vol. 24, No. 2, 126-151, doi:10.1080/13675567.2020.1732313
[10] Plaza-Úbeda, J. A.; Abad-Segura, E.; Burgos-Jiménez, J.; Boteva-Asenova, A.; Belmonte-Ureña, L. J. (2021). Trends and new challenges in the green supply chain: the reverse logistics, *Sustainability*, Vol. 13, No. 1, Paper 331, 18 pages, doi:10.3390/su13010331
[11] Sakarika, M.; Spiller, M.; Baetens, R.; Donies, G.; Vanderstuyf, J.; Vinck, K.; Vrancken, K. C.; van Barel, G.; Bois, E. D.; Vlaeminck, S. E. (2019). Proof of concept of high-rate decentralised pre-composting of kitchen waste: optimising design and operation of a novel drum reactor, *Waste Management*, Vol. 91, 20-32, doi:10.1016/j.wasman.2019.04.049
[12] Mar-Ortiz, J.; Adenso-Diaz, B.; González-Velarde, J. L. (2011). Design of a recovery network for WEEE collection: the case of Galicia, Spain, *Journal of the Operational Research Society*, Vol. 62, No. 8, 1471-1484, doi:10.1057/jors.2010.114
[13] De Felice, F.; Petrillo, A. (2012). Hierarchical model to optimise performance in logistics policies: multi attribute analysis, *Procedia – Social and Behavioral Sciences*, Vol. 58, 1555-1564, doi:10.1016/j.sbspro.2012.09.1142
[14] Züst, S.; Züst, R.; Züst, V.; West, S.; Stoll, O.; Minonne, C. (2021). A graph based Monte Carlo simulation supporting a digital twin for the curatorial management of excavation and demolition material flows, *Journal of Cleaner Production*, Vol. 310, Paper 127453, 11 pages, doi:10.1016/j.jclepro.2021.127453
[15] Lameh, M.; Abbas, A.; Azizi, F.; Zeaiter, J. (2021). A simulation-based analysis for the performance of thermal solar energy for pyrolysis applications, *International Journal of Energy Research*, Vol. 45, No. 10, 15022-15035, doi:10.1002/er.6781
[16] Haraguchi, M.; Siddiqi, A.; Narayanamurti, V. (2019). Stochastic cost-benefit analysis of urban waste-to-energy systems, *Journal of Cleaner Production*, Vol. 224, 751-765, doi:10.1016/j.jclepro.2019.03.099
[17] Abid, S.; Mhada, F. Z. (2021). Simulation optimisation methods applied in reverse logistics: a systematic review, *International Journal of Sustainable Engineering*, Vol. 14, No. 6, 1463-1483, doi:10.1080/19397038.2021.2003470
[18] Bottani, E.; Casella, G. (2018). Minimisation of the environmental emissions of closed-loop supply chains: a case study of returnable transport assets management, *Sustainability*, Vol. 10, No. 2, Paper 329, 20 pages, doi:10.3390/su10020329
[19] Elia, V.; Gnoni, M. G.; Tornese, F. (2019). Designing a sustainable dynamic collection service for WEEE: an economic and environmental analysis through simulation, *Waste Management & Research: The Journal for a Sustainable Circular Economy*, Vol. 37, No. 4, 402-411, doi:10.1177/0734242X19828121

[20] Ahluwalia, P. K.; Nema, A. K. (2016). Multi-objective reverse logistics model for integrated computer waste management, *Waste Management & Research: The Journal for a Sustainable Circular Economy*, Vol. 24, No. 6, 514-527, doi:10.1177/0734242X06067252
[21] Yang, C.; Chen, J. (2020). Robust design for a multi-echelon regional construction and demolition waste reverse logistics network based on decision maker's conservative attitude, *Journal of Cleaner Production*, Vol. 273, Paper 122909, 17 pages, doi:10.1016/j.jclepro.2020.122909
[22] Liu, X.; Chu, F.; Dolgui, A.; Zheng, F.; Liu, M. (2021). Service-oriented bi-objective robust collection-disassembly problem with equipment selection, *International Journal of Production Research*, Vol. 59, No. 6, 1676-1690, doi:10.1080/00207543.2020.1723815
[23] Tozanlı, Ö.; Kongar, E.; Gupta, S. M. (2020). Trade-in-to-upgrade as a marketing strategy in disassembly-to-order systems at the edge of blockchain technology, *International Journal of Production Research*, Vol. 58, No. 23, 7183-7200, doi:10.1080/00207543.2020.1712489
[24] Ebner, J.; Young, P.; Geraghty, J. (2019). Intelligent self-designing production control strategy: dynamic allocation hybrid pull-type mechanism applicable to closed-loop supply chains, *Computers & Industrial Engineering*, Vol. 135, 1127-1144, doi:10.1016/j.cie.2019.04.005
[25] Zolfagharinia, H.; Hafezi, M.; Farahani, R. Z.; Fahimnia, B. (2014). A hybrid two-stock inventory control model for a reverse supply chain, *Transportation Research Part E: Logistics and Transportation Review*, Vol. 67, 141-161, doi:10.1016/j.tre.2014.04.010
[26] Georgiadis, P.; Athanasiou, E. (2013). Flexible long-term capacity planning in closed-loop supply chains with remanufacturing, *European Journal of Operational Research*, Vol. 225, No. 1, 44-58, doi:10.1016/j.ejor.2012.09.021
[27] Miao, S.; Wang, T.; Chen, D. (2017). System dynamics research of remanufacturing closed-loop supply chain dominated by the third party, *Waste Management & Research: The Journal for a Sustainable Circular Economy*, Vol. 35, No. 4, 379-386, doi:10.1177/0734242X16684384
[28] Mo, Y.; Li, L.; Huang, W. (2015). System dynamics modeling and simulation of two-stage remanufacturing reverse supply chain, *Proceedings of China Modern Logistics Engineering, Lecture Notes in Electrical Engineering*, Vol. 286, Springer, Berlin, 29-38, doi:10.1007/978-3-662-44674-4_3
[29] Tosarkani, B. M.; Amin, S. H.; Zolfagharinia, H. (2020). A scenario-based robust possibilistic model for a multi-objective electronic reverse logistics network, *International Journal Production Economics*, Vol. 224, Paper 107557, 22 pages, doi:10.1016/j.ijpe.2019.107557
[30] Wang, L.; Goh, M.; Ding, R.; Mishra, V. K. (2018). Improved simulated annealing based network model for e-recycling reverse logistics decisions under uncertainty, *Mathematical Problems in Engineering*, Vol. 2018, Paper 4390480, 17 pages, doi:10.1155/2018/4390480
[31] Costa-Salas, Y.; Sarache, W.; Überwimmer, M. (2017). Fleet size optimisation in the discarded tire collection process, *Research in Transportation Business & Management*, Vol. 24, 81-89, doi:10.1016/j.rtbm.2017.08.001
[32] Sudarto, S.; Takahashi, K.; Morikawa, K. (2017). Efficient flexible long-term capacity planning for optimal sustainability dimensions performance of reverse logistics social responsibility: a system dynamics approach, *International Journal of Production Economics*, Vol. 184, 179-192, doi:10.1016/j.ijpe.2016.12.013
[33] Bottani, E.; Montanari, R.; Rinaldi, M. (2019). Simulation and performance improvement of a reverse logistics system for waste electrical and electronic equipment: a case study in Italy, *International Journal of Simulation and Process Modelling*, Vol. 14, No. 3, 308-323, doi:10.1504/IJSPM.2019.101037
[34] Gajsek, B.; Dukic, G.; Kovacic, M.; Brezocnik, M. (2021). A multi-objective genetic algorithms approach for modelling of order picking, *International Journal of Simulation Modelling*, Vol. 20, No. 4, 719-729, doi:10.2507/IJSIMM20-4-582
[35] Dos Santos, C. H.; Montevechi, J. A. B.; de Queiroz, J. A.; Miranda, R. C.; Leal, F. (2022). Decision support in productive processes through DES and ABS in the Digital Twin era: a systematic literature review, *International Journal of Production Research*, Vol. 60, No. 8, 2662-2681, doi:10.1080/00207543.2021.1898691