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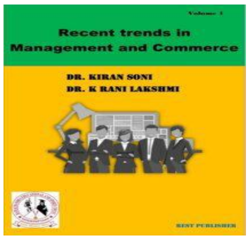

Reverse Logistics System analysis using this ARAS Method

Moolpani Deepak Inder
SSt College of Arts and Commerce, Maharashtra, India.
Email: deepak.moolpani@sstcollege.edu.in

Abstract

Reverse Logistics System Reverse logistics (RL) is intended to capture value from the final destination or materials properly defined as a disposal process it is the process of returning to normal. Goods from their point of origin Movement to their final destination is at the heart of logistics systems. An RL system (RLS) integrates the supply chain, It reproduces the flow of materials or parts, Redesigned to manage repair or removal and efficient use of resources. Today the product turnover is approx has become common across all product categories, in some industries the prices are as much as 20% higher. Unless regulations compel all manufacturers to recall their products, the cost of new product recalls will make participating tool manufacturers less competitive. This loss led to the exploration of cheaper alternatives to withdrawal concepts. A lifetime energy tool supply will need to be continuously pumped into an e-tool remanufacturing factory. Currently, some customers give dealers their end-of-life equipment. The rate of returns will likely rise if product recalls are actively promoted, but this could lead to the return of out-of-date tools that cannot be remanufactured. The product-return flow mix cannot be controlled by advertising. The ARAS approach addresses phenomena in a complex world Simple Applications for decision makers Comparison to help understanding. Their method, a utility function value is a complex comparison of possible alternatives Determines capacity. Key characteristics.[10] ARAS Method 64 Using simple relative comparisons of phenomena in the complex world It is based on the argument that it can be understood. University of England Downloaded by Libraries. Alternative: Remanufacturing, Reselling, Repairing, Cannibalization, Refurbishing. Evaluation Preference: Market factor, Quality factor, Legislative impact, Environmental impact, Cost/time factor. Result: From the result it is seen that A2 is showing the highest value for A5 is showing the lowest value. Resulting in A2 ranked first, there A5 has low rank.

Keywords: Reverse Logistics System, Remanufacturing, and A New Reverse-Logistics System for Power Tool Take back, ARAS.

Introduction

Any product recovery system must constantly take into account a more advantageous reverse manufacturing substitution for collection centres. These choices often are thought to be multifaceted, transdisciplinary, complex, and unstructured in nature. Designing a decision-making model for that requires quantitative and qualitative assessment based on criteria like cost/time, legislative factors, environmental impact, quality, market, Fluctuations in environment and timing, quantity and quality of returns, determining decision strategies for optimal alternative selection for computer (RLS) problems, and reprocessing. Based on these parameters, performance should be taken into account while choosing the proper reversal position. The manufacturing option is subject to the judgement of subject-matter authorities. In this research, we offer a fuzzy-set-based multi-criteria decision-making (MCDM) model. The suggested model will assist in creating a flexible revenue policy that is effective and efficient based on a number of factors. Additionally, businesses can make strategic decisions based on this study to construct new reprocessing facilities or effectively utilise a current exit plant. Finally, a concrete application of the suggested model is demonstrated using an example. Additionally, this work aims to introduce fuzzy-based flexible MCDM and inverse logistics as a suitable group decision support tool for alternative choices. Reverse logistics (RL) is intended to capture value from the final destination or materials properly defined as a disposal process it is the process of returning to normal. The movement of goods from their point of origin to their final destination is at the heart of logistics systems. An RL system (RLS) integrates the supply chain, It reproduces the flow of materials or parts, Redesigned to manage repair or removal and efficient use of resources. Today the product turnover is approx has become common across all product categories, in some industries the prices are as much as 20% higher. Hence, for product return handling beyond the functional level It is difficult to create a complete and economical decision-making system. A well-crafted reverse logistics and management plan can therefore be a valuable strategic asset. multiple decision-makers and the presence of multiple criteria (management and technical) The results can be extended from single to multi-dimensional, This adds to the complexity. By grinding through a mathematical model or algorithm it is clear that the selection problem cannot be solved. This kind of complexity and to support unstructured test problems, of choice and priority Multi-criteria decision-making problems we need new approaches that can be manipulated. The results of this selection of recycling alternatives will prioritize companies; correspondingly the inversion will help to improve the production facilities. Inverse manufacturing alternative selection decision framework is based on a flexible and scalable options decision framework this paper attempts to unify by Formulation of Decision Making That Is Fuzzy and Reverse Logistics (RL). Decision makers can rank options based on the findings of this systematic decision analysis. Reverse logistics planning and infrastructure design become more crucial when turnover rates rise. Financial management and EPA are recycled and risky Future material flow of goods and necessary in the number of facilities they have Very caring points, storage sites, extraction/recycling plants in a reverse logistics system and includes final transshipment/stored goods market. Total cost by selling reclaimed materials it also aims to reduce revenue. Flow safety controls in the model, Facility capacity constraints, and new facilities Includes numerical limits and non-negativity constraints. aras is the most used One multiple criteria decision making (MCDM) methods, This possible by Determining ratio the best solution and the best ratio Provides the best alternative in a set of alternatives. The technique is used to solve decision-making problems used by various researchers. Reverse logistics, which is product recovery, Due to product returns or inventory management or revenue stream; creates a success means manufacturers depends on the actions of the customers. Now, due to environmental protection laws, Easy to disassemble, reuse and recycle Products must be manufactured by manufacturers. On the other hand, many customers, by delivering goods to collection points Support environmental protection. The findings show that reverse logistics has a very high total cost. Total reverse logistics cost and collection points To reduce the high usage rate, Great for collection points in reverse logistics Choosing locations is very important. To design a decision-making model for that, Cost/time, legislative factors, environmental impact, Based on criteria such as quality, market etc Quantitative and qualitative assessment is required. Appropriate based on these criteria Performance must be considered to determine reversal. Manufacturing option is in this domain Depends on expert opinion. In this paper, a multi-criteria decision-making (MCDM) model is proposed. Remanufacturing, Reselling, Repairing, Cannibalization, Refurbishing is alternatives and Market factor (C1), Quality factor (C2), Legislative impact (C3), Environmental impact (C4), Cost/time factor (C4) is taken for evaluations parameters. As a result the Reselling is in first rank and Refurbishing are last rank.

Materials and Methods

Remanufacturing

Unless regulations compel all manufacturers to recall their products, the cost of new product recalls will make participating tool manufacturers less competitive. This loss led to the exploration of cheaper alternatives to withdrawal concepts. In order to reuse some of the high-value components from some of the recalled items, we have developed the recall idea. It is founded on the elimination of a specific, less serious and technically outdated area. For energy equipment with extended technical cycles and minimal technological obsolescence, reproduction is especially appealing. Power tool intensity is unpredictable, making it possible to reuse some parts, motor parts, etc. This leads to overengineering for some user groups in order to satisfy the needs of other user groups. The Electronic Data Log, a product-integrated gadget, is the centrepiece of our take-back concept (EDL). EDL calculates component lifetime remaining and measures product deterioration. This apparatus was created, put into use with power tools, and put through a lot of testing. Manufacturable energy tools and reusable parts can be recognised automatically with the help of EDL. Products and non-renewable parts can be recycled into new materials or dumped in landfills. Recycling-related losses are partially offset by profits from sales, remanufacturing, and reuse. To determine the necessary revenue levels for a successful implementation of EDL, we created models. A specific number of items must be discontinued as EDL raises production costs in order for the product revenue savings to equal the increased production expenses. A specific number of items must be discontinued as EDL raises production costs in order for the product revenue savings to equal the increased production expenses. The needed return volume at this time is higher than the actual return volume. This brings up the issue of managing the flow of returned goods once more.

A New Reverse-Logistics System for Power Tool Take back

A lifetime energy tool supply will need to be continuously pumped into an e-tool remanufacturing factory. Currently, some customers give dealers their end-of-life equipment. Promoting product sales will raise the return rate, but this could lead to the return of out-of-date tools that can't be remanufactured. Advertising doesn't provide you any influence over the make-up of the product return flow. Advertising doesn't provide you any influence over the make-up of the product return flow. A repurchase programme or more practical reverse-logistics methods, such package collection, can be effective. A buyback programme could, for instance, give discounts on new energy equipment. Only goods that are older than the required age should, if at all feasible, be recalled Alternatively, only product samples that, because of technology, design, and functioning, may be resold as remanufactured will be returned. Even yet, some returns can be too damaged to be salvaged. We examined a manufacturer's reverse logistics and procurement spending. Gross profit from product revenue, profit from remanufacturing and (negative) profit from recycled materials minus reverse logistics costs (including walk-back costs). As reverse logistics costs increase, return volume increases due to sophisticated return systems. Recruiting is more expensive to buy back. Yields in remanufacturing increase as reverse logistics costs increase (the link contains the rationale for this assumption). Through increased efficiency in recycling, unit recycling costs are reduced. All these effects collectively support it (Contains basic equations for coupling model). Higher yields and higher remanufacturing profits result in higher recycling costs and repurchase costs. When the latter two causes start to outweigh the former, unit profit starts to decline. For instance, when a unit of reproduction is profitable, this stage is reached during reverse logistics costs. Our model is quite resilient to tiny parameter deviations, according to a sensitivity analysis (Appendix).

Method

[4] the most controversial is the lower temperature limit, this is due to active discussion and significant dispersion Causes classified data. Below 1000 K In the absence of reliable shock tube ARAS measurements temperature, as this temperature range is critical a more detailed study is needed Hydrogen ignition region [5] for Choice Hydraulic fracturing treatment. However, in the manufacturing sector a Hybrid ARAS Approach above Significant published in literature review Manuscripts revealed. Therefore, the purpose of the present study is to question the problem A fuzzy coupled MCDM approach is to create. [6] This assessment method is for two wheelers at junctions using ARAS Focusing on the collision warning system. Two wheelers licensed and new A study of 30 test subjects who were riders carried out of reliability model Basically Monte-Carlo time-series Simulation was used to calc accident reduction effect. [7] The ARAS approach addresses phenomena in a complex world Simple Applications for decision makers Comparison to help understanding. Their method, a utility function value is a complex comparison of possible alternatives Determines capacity. Key characteristics.[10] ARAS Method 64 Using simple relative comparisons of phenomena in the complex world It is based on the argument that it can be understood. University of England Downloaded by Libraries. For personal use only Normalized and weighted parameters describing the alternative considering the sum of values, describes the optimal alternative of the values of normalized and weighted measurements Achievable by substitution in comparison to the sum is optimal. [11] More using DSS in making useful decisions Research has been done, such as conclusion whose job in selling laptops is up for grabs Decide whether to apply. This in the study, determining Bank Loan Borrowers The authors used the ARAS method. [12] The first objective is to develop and grow across the board Criterion decision- making development and Uncertainty in the saturation sector coping mechanisms related to supply the new Approximate Addition Rate Estimation (ARAS) approach. [13]. As a result, many such Using benchmarking methods allows consideration of the views of all stakeholder groups in the process. AHP, ARAS and MCGP for solving MCDM problems popular methods, they are strong and not only considering the intangible criteria, is an airline better at catering many choices also consider aspiration levels when choosing a supplier use better methodology and precise criteria to analyze and solve exam problems want Throughout the research and development, several goals have been set forth. Through the development and presentation of a new Approximate Addition Rate Estimation (ARAS) approach of a methodology for handling Group-level multi-criteria decision- making in the field of uncertainty, development and saturation related to The second objective of this thesis is that transport Bridging the gaps in performance indicators in logistics subsystem measurement and monitoring.

Result and Discussion

Table 1 Alternatives

Remanufacturing	A1
Reselling	A2
Repairing	A3
Cannibalization	A4
Refurbishing	A5

Table 1 shows the Reverse Logistics System Alternative: Remanufacturing, Reselling, Repairing, Cannibalization, Refurbishing.

Table 2 Evaluations parameters

Market factor	C1
Quality factor	C2
Legislative impact	C3
Environmental impact	C4
Cost/time factor	C5

Table 2 shows the Reverse Logistics System Evaluation Preference: Market factor, Quality factor, Legislative impact, Environmental impact, Cost/time factor.

Table 3 Data set

	C1	**C2**	**C3**	**C4**	**C5**
A1	36.24	44.32	92.43	87.13	78.32
A2	38.45	49.78	86.46	89.46	87.52
A3	31.26	45.69	94.43	79.48	84.65
A4	39.59	49.35	91.46	87.43	79.35
A5	35.68	47.58	87.64	78.68	80.31

Table 1 shows the Reverse Logistics System Alternative: Remanufacturing, Reselling, Repairing, Cannibalization, Refurbishing. Evaluation Preference: Market factor, Quality factor, Legislative impact, Environmental impact, Cost/time factor.

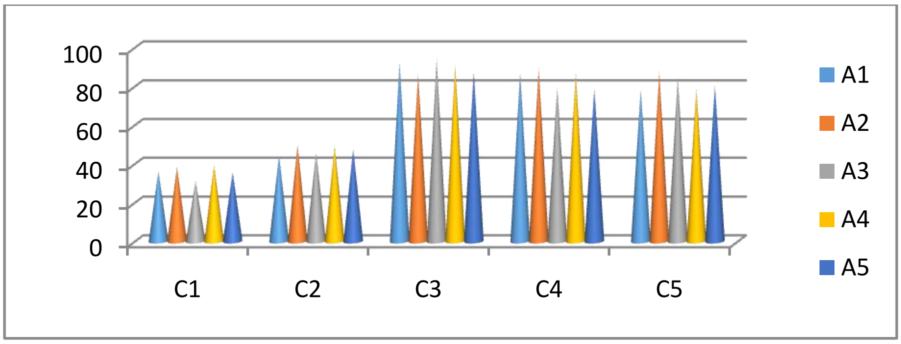

FIGURE 1. Reverse Logistics System

Figure 1 shows the Reverse Logistics System Alternative: Remanufacturing, Reselling, Repairing, Cannibalization, Refurbishing. Evaluation Preference: Market factor, Quality factor, Legislative impact, Environmental impact, Cost/time factor.

TABLE 4. Calculation of maximum value

	C1	C2	C3	C4	C5
Max	**41.26**	**49.78**	**94.43**	**89.46**	**87.52**
A1	36.24	44.32	92.43	87.13	78.32
A2	38.45	49.78	86.46	89.46	87.52
A3	41.26	45.69	94.43	79.48	84.65
A4	39.59	49.35	91.46	87.43	79.35
A5	35.68	47.58	87.64	78.68	80.31

Table 3 shows the Reverse Logistics System Alternative: Remanufacturing, Reselling, Repairing, Cannibalization, Refurbishing. Evaluation Preference: Market factor, Quality factor, Legislative impact, Environmental impact, Cost/time factor. Calculations of maximum values are derived by using the formula (1).

Table 5 normalized for data set

Normalized Matrix					
	C1	**C2**	**C3**	**C4**	**C5**
Max	**0.17747763**	**0.173752**	**0.17268**	**0.17485**	**0.17586**
A1	0.15588438	0.154695	0.169023	0.170296	0.157373
A2	0.16539057	0.173752	0.158106	0.17485	0.17586
A3	0.17747763	0.159476	0.17268	0.155344	0.170093
A4	0.17029422	0.172251	0.167249	0.170882	0.159443
A5	0.15347557	0.166073	0.160263	0.15378	0.161372

Table 5 shows the normalised matrix for the Reverse Logistics System Alternative: Remanufacturing, Reselling, Repairing, Cannibalization, Refurbishing. Evaluation Preference: Market factor, Quality factor, Legislative impact, Environmental impact, Cost/time factor. Normalised matrix values are derived by using the formula (2).

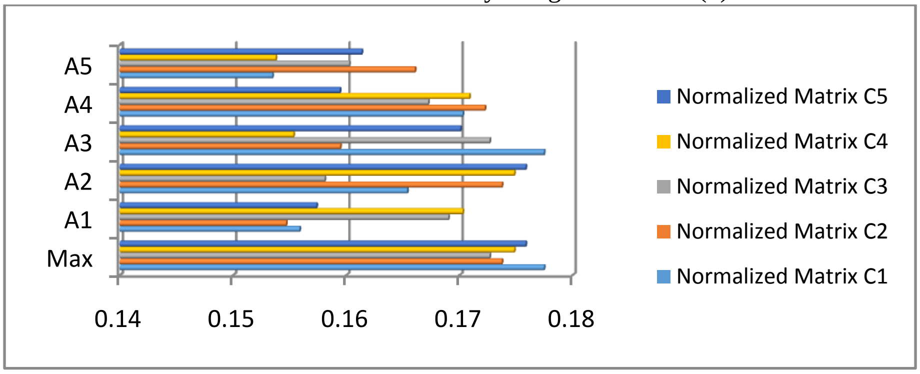

FIGURE 2 Normalized Matrixes

Figure 2 shows the normalised matrix for the Reverse Logistics System Alternative: Remanufacturing, Reselling, Repairing, Cannibalization, Refurbishing. Evaluation Preference: Market factor, Quality factor, Legislative impact, Environmental impact, Cost/time factor. Normalised matrix values are derived by using the formula (2).

Table 6 Weighted Normalized Matrix

	0.25	0.25	0.25	0.25	0.25
	Weighted Normalized Matrix				
	C1	**C2**	**C3**	**C4**	**C5**
Max	0.04436941	0.043438	0.04317	0.043712	0.043965
A1	0.03897109	0.038674	0.042256	0.042574	0.039343
A2	0.04134764	0.043438	0.039526	0.043712	0.043965
A3	0.04436941	0.039869	0.04317	0.038836	0.042523
A4	0.04257355	0.043063	0.041812	0.04272	0.039861
A5	0.03836889	0.041518	0.040066	0.038445	0.040343

Table 6 shows the weighed normalized matrix for the Reverse Logistics System Alternative: Remanufacturing, Reselling, Repairing, Cannibalization, Refurbishing. Evaluation Preference: Market factor, Quality factor, Legislative impact, Environmental impact, Cost/time factor. Weighted normalised matrix values are derived by using the formula (3).

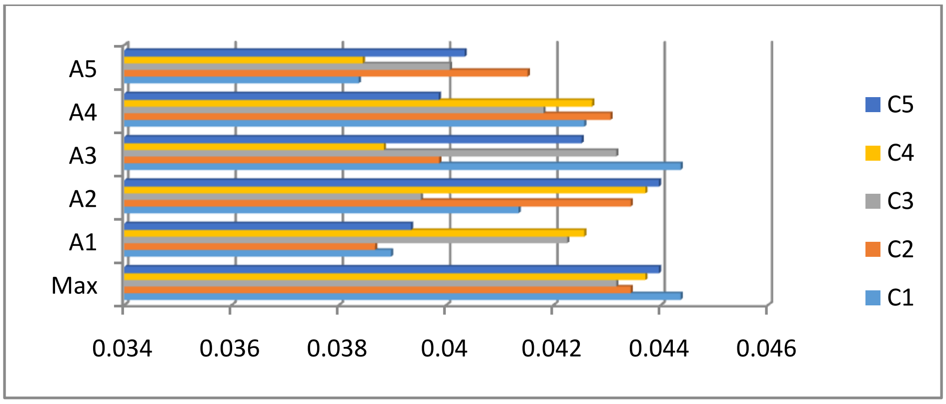

FIGURE 3 Weighted Normalized Matrix

Figure 3 shows the weighed normalized matrix for the Reverse Logistics System Alternative: Remanufacturing, Reselling, Repairing, Cannibalization, Refurbishing. Evaluation Preference: Market factor, Quality factor, Legislative impact, Environmental impact, Cost/time factor. Weighted normalised matrix values are derived by using the formula (3).

Table 7 Si and Ki value

	Si	**Ki**
	0.218655	1
A1	0.201818	0.922997
A2	0.211989	0.969516
A3	0.208768	0.954782
A4	0.21003	0.960555
A5	0.198741	0.908927

TABLE 5. Shows the Si and Ki Max Si=0.218655 and Ki= 1, Remanufacturing Si= 0.201818 and Ki= 0.922997, Reselling Si= 0.211989 and Ki= 0.969516, Repairing Si= 0.208768 and Ki= 0.954782, Cannibalization Si= 0.21003 and Ki= 0.960555, Refurbishing Si= 0.198741 and Ki= 0.908927.

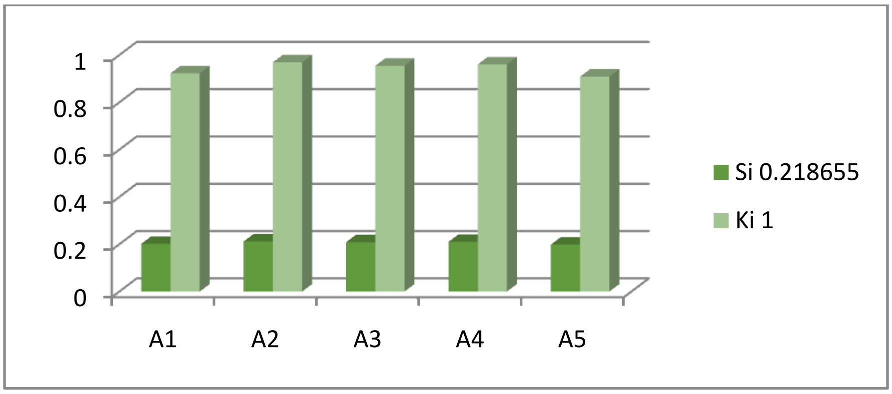

FIGURE 4 Si and Ki value

Figure 4 shows the graphical representation Si & Ki value Max, Remanufacturing, Reselling, Repairing, Cannibalization, Refurbishing.

Table 8 Rank

Rank	
A1	4
A2	1
A3	3
A4	2
A5	5

Table 8 shows the final result and rank of the HVAC/ AHU systems in Additive Ratio Assessment method. And it shows the Remanufacturing 4th rank, Reselling 1st rank, Repairing 3 rd rank, Cannibalization 2nd rank, Refurbishing 5th rank.

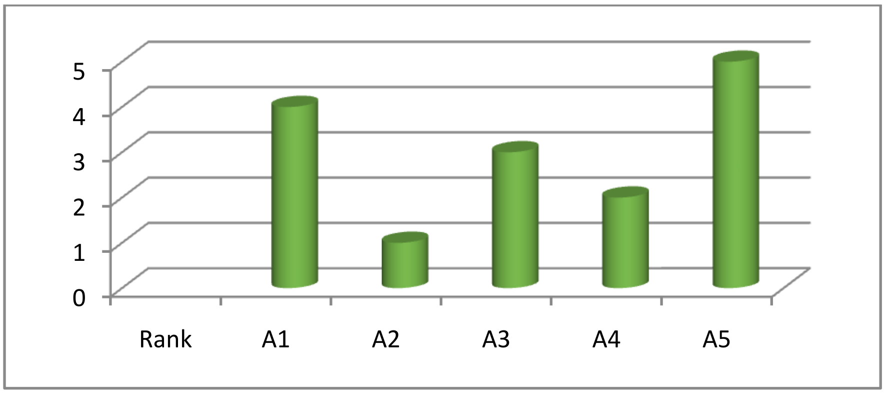

FIGURE 5 Rank

Figure 5 shows the final result and rank of the HVAC/ AHU systems in Additive Ratio Assessment method. And it shows the Remanufacturing forth rank, Reselling first rank, repairing third rank, Cannibalization second rank, Refurbishing fifth rank. In this, Reselling is the highest value and Refurbishing is the lowest value.

Conclusion

Reverse logistics (RL) is intended to capture value from the final destination or materials properly defined as a disposal process it is the process of returning to normal goods straight from the source The core of logistics systems is movement to their destination. The supply chain is integrated via an RL system (RLS), It reproduces the flow of materials or parts, Redesigned to manage repair or removal and efficient use of resources. Today the product turnover is approx has become common across all product categories, in some industries the prices are as much as 20% higher. Hence, for product return handling beyond the functional level it is difficult to create a complete and economical decision-making system. A well-crafted reverse logistics and management plan can therefore be a valuable strategic asset. Decisions may become more difficult as a result of the inclusion of many decision makers, multiple management criteria, and multiple technical criteria. It is evident that the selection problem cannot be solved by slogging through a mathematical model or algorithm. This kind of complexity and to support unstructured test problems, of choice and priority Multi-criteria decision-making problems we need new approaches that can be manipulated. The results of this selection of recycling alternatives will prioritize companies; correspondingly the inversion will help to improve the production facilities. Inverse manufacturing alternative selection decision framework is based on a flexible and scalable options decision framework this paper attempts to unify by

Formulation of Decision Making That Is Fuzzy and Reverse Logistics (RL). Decision makers can rank options based on the findings of this systematic decision analysis. Reverse logistics planning and infrastructure design become more crucial when turnover rates rise. Financial management and EPA are recycled and risky Future material flow of goods and necessary in the number of facilities they have Very caring points, storage sites, extraction/recycling plants in A reverse logistics system and includes final transshipment/stored goods market. Total cost by selling reclaimed materials it also aims to reduce revenue. Flow safety controls in the model, Facility capacity constraints, and new facilities Includes numerical limits and non-negativity constraints. aras is the most used One multiple criteria decision making (MCDM) methods, This possible by Determining ratio the best solution and the best ratio Provides the best alternative in a set of alternatives. The technique is used to solve decision-making problems used by various researchers. Reverse logistics, which is product recovery, Due to product returns or inventory management or revenue stream; creates a Close success means manufacturers depends on the actions of the customers. Now, due to environmental protection laws, Easy to disassemble, reuse and recycle Products must be manufactured by manufacturers. On the other hand, many customers, by delivering goods to collection points Support environmental protection. Total reverse logistics cost and collection points To reduce the high usage rate, Great for collection points in reverse logistics Choosing locations is very important. To design a decision-making model for that, Cost/time, legislative factors, environmental impact, Based on criteria such as quality, market etc Quantitative and qualitative assessment is required. Appropriate based on these criteria Performance must be considered to determine reversal. Manufacturing option is in this domain Depends on expert opinion. A multi-criteria decision-making (MCDM) model is suggested in this article. Remanufacturing, Reselling, Repairing, Cannibalization, Refurbishing is alternatives and Market factor (C1), Quality factor (C2), Legislative impact (C3), Environmental impact (C4), Cost/time factor (C4) is taken for evaluations parameters. As a result the Reselling is in first rank and Refurbishing are last rank.

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