

Foundational factors for planning and strategizing e-commerce reverse logistics under the effect of pandemic – A Study using AHP

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ABSTRACT

Reverse Logistics has now become an integral part of all supply chains, supply chains are now not limited from supplier's supplier to customers' customer but has become a loop where from customer it comes back in a few cases and can end at different stages. The effectiveness of reverse logistics plan is of utmost importance for ensuring customer satisfaction, as much as managing the direct flow of goods to customer is important for making profit the unwanted return of products holds an important position in maintaining the finances and also customer's loyalty. To provide efficient service the planning needs to be done in such a way that it contains all important aspects and in this pandemic time when travel was restricted in different phases and forms planning for the reverse logistics became an integral part. Already a few researchers have identified area specific or product specific factors for reverse logistics but in this pandemic time the scenarios have changed, ecommerce has seen a rise and that escalates the rise of return orders. Maintaining the reverse logistics will give business some unparalleled advantages if planning is done correctly. In this paper the result shows the factors (their rank) as per their importance level for planning out reverse logistics operations in ecommerce industry during tough times like this pandemic- COVID-19. All factors are necessary to be considered but the level of importance is different and thus our results (ranks) helps in decision making process. These factors will give an overall idea of areas which needs specific attention and also needs special attention in order to maintain safety with the continuous changing reverse logistics ecosystem. These factors will make supply chain more agile and will help reverse logistics supply chain to consider a lot of the uncertainties over the decision horizon.

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Introduction

The importance of reverse logistics is paramount as it increases profitability and keep the company in business (Frei et al., 2020). However, there are few basic conditions that are always there for the industry that needs to be kept in mind before planning out the exact reverse logistics process and its execution (Duberg et al., 2020). Planning with respect to a particular industry always needs to be done to maximize margins and to retain customers. Online ordering websites deal with a huge variety of items, and with a greater number of orders return orders also increases thus they have to extensively plan their reverse logistics. They need foundational factors, apart from one product-specific factors. This study is aimed to provide strategic factors with their level of importance for a company dealing with planning of reverse logistics for a variety of product types. The factors considered here are on the basis of various aspects like the customers' behaviour and personality, rules and regulations due to pandemic, safety aspect, industry specific factors, geographical factors and factors related to return policies. This cannot be emphasized more that a company must know their consumers properly to fulfil the needs of their customer, customers can be of different types and hence accordingly your system should react and specifically. In a reverse logistics supply chain in a competitive environment, consumers expectations are high as they want quick replacements, quick cashbacks and easy to return policies (Abbas & Farooque, 2020).

Logistics as a whole has been impacted due to the COVID-19 pandemic (Xu et al., 2020). There have been severe disruptions in the supply chain due to the restrictions

imposed on manufacturing, and logistics activities have been suspended in many places (Sube Singh et al., 2020). Thus, this pandemic calls for additional challenges in the logistics process, in addition to the existing ones, adding on to the complexity of the reverse logistics process.

The study used AHP methodology on 15 factors that have been identified as important factors influencing strategic decisions related to reverse logistics. Out of the 15 factors, 9 factors are related to customers' behaviour and personality, which builds a strong foundation for the plan because all organisations want to keep their customer happy and keeping customers happy helps the business grow. These ranks will tell that which factor to be given more weightage, as all the factors are important but not all carry equal weightage.

Section 2 of the paper talks about the importance of reverse logistics and the impact of the pandemic on the reverse logistics process. Section 3 talks about the factors chosen and the rationale behind the choice. Section 4 deals with the analysis. Section 5 is the discussion about the results. And after that conclusion in the section 6.

Literature Review

2.1 reverse logistics

As reverse logistics is now an essential part of all supply chains and it involves the process of planning, maintaining, implementing and executing the flow of products from customer to the organisation and sometimes back to the supplier which is actually the opposite of the service what a company generally wants to cater i.e., supplying products to customer and generating profit, that is why this process is

named as reverse logistics(Kaviani et al., 2020). Although a company would be willing that a customer doesn't returns a product but according to customer's needs, expectations and quality they want sometimes want to return a product back and providing this return service a company gains customer satisfaction, trust, brand image, company's growth and in future more orders(Abbas & Farooque, 2020).

In Reverse logistics we are close looping the supply chain for all the products that are returned by customer due to some defaults ((Kharde, n.d.); (Etse et al., 2021).), or some other reasons like mismatch of requirements or the end-of-cycle return((Etse et al., 2021)How industries are using reverse logistics to recycle the products and make environment healthyalso attract customer attention, brands social responsibility is catered by this step in a way as they collect scrap and recycle. The factors like laws and regulations, economics and reverse logistics, corporate citizen and a few that they have covered in the papers specific to the return of the products that re-used and now being returned for recycling.

Reverse logistics has now become a part of strategic planning, as a factor this is involved in demand forecasting, cost analysis, coupons or credit point techniques planning and overall profitability from reverse logistic function(Budak, 2020). It is now considered while inventory management and also while planning product lifecycle. With the advancement in the technologies like data analytics and machine learning, organisations are predicting their consumer's behaviour and predicting the sales and reverse logistics to increase efficiency of the entire supply chain(Quariguasi Frota Neto & Dutordoir, 2020).

Different factors are collected, and from the set of factors, the union of the factors can be separated first as they are important for all the industries. Following this, the specific factors are analysed. With this researcher got a fair idea that what generic factors are there in this case that needs to be examined for planning Reverse logistics

2.2 E-commerce industry and how pandemic has its impact

Ecommerce industry in India is growing with rocket speed and now almost 77% of Indians are using smart phones in their day to day life. Ecommerce industry has beautifully understood the need of changing environment of ordering goods online and has diversified the range of products such that people can now buy whatever they want sitting at their home(Wu & Hisa, 2008)(Wadhawan & Arya, 2020).

With this evolution competitiveness is really high and all the organisations are running the marathon in order to gain consumers' confidence, to attract more customer by luring them

with different coupons, offers, partnering with different brands and banks to provide special advantages to their customers (Niranjanamurthy et al., 2013)

Ecommerce industry has grown a lot and will grow manifolds in future, hence proper planning and strategies of all functions across the value chain will create more competitive advantage for the companies.

Now ecommerce has widen its wings across wide range of products ranging from food and grocery products, to clothes,

books, home services, to even construction machines and many more(Niu et al., 2020).

This pandemic has created a shift in the system in the year 2020, both demand and supply side was affected badly as this pandemic hit (Agarwal & Singh, 2020). India was trying to tackle the situation and safety and health of all Indians was of utmost importance and hence India has seen lockdowns in phases and strict rules and regulations for any movement and services to be provided.

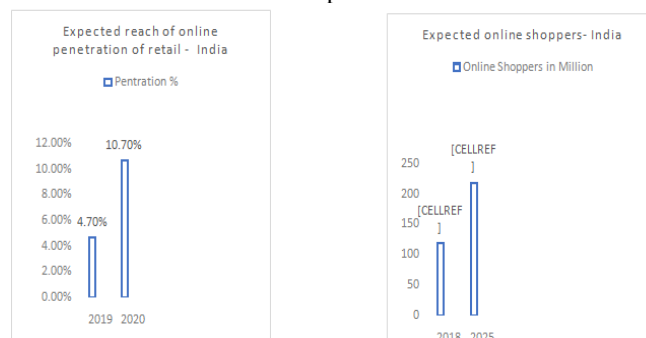


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<https://www.ibef.org/industry/ecommerce-presentation>

This whole situation had two aspects specifically for the ecommerce industry, first that initially people avoided going out and bought only necessary things there was a sense of postponement in the buying of all luxury or nonessential items. Secondly as lockdown ended and with rules and regulations people started buying goods, they preferred buying online to avoid contact and unnecessary travel. This has given a lot of challenges to the industry as whole but also one can capitalise this situation if they can make appropriate changes and plan things properly(Agarwal & Singh, 2020; Garg, 2020).

2.3 analytical hierarchy process (ahp)

AHP is a process that helps the organisations or any decision maker to make decisions using different factors that impact the decision. AHP was first developed by Thomas L. Saaty in the year 1970s, and after that it has been tweaked by a lot of people according to the needs since then (Abu-Taieh, 2017).AHP is used by different authors to perform detailed study of different industries and problem statements ((Shubham Singh et al., 2021)). First step is to identify the goal or problem statement, second to select the factors and different sub factors that will have an impact on your decision, then prepare a matrix which will compare the factors pairwise and you have to put weights for each factor. Last step is performing the analysis and ranking the factors. AHP helps in the analysis of factors quantitatively as well as qualitatively and connects the organisation goal with the end result.

ForAHP,a research((Jayant et al., 2014)(Gürçan et al., 2016)) have described the use of TOPSIS - AHP in their paper and explained an approach to select Reverse logistics service provider have highlighted four selection metrics quality,cost, delivery and technical ability and then explained AHP application for ranking them.

2.4 approach

To eat all the criticalities, we need to focus on the step wise solution and keenly observing and following it will give the best results((Ramanathan, 2013); (Abbas & Farooquie, 2020)). With all the points covered in the papers involving the AHP analysis and after a clear understanding of it, following is the approachfor the paper(refer Figure 3).

- 1. Defining a flow of returning a product.
- 2. Analysing all the factors to be considered and their sub factors and giving them a structure.
- 3. With all the research and by discussing with industry experts, providing weights to all the factors that are considered.
- 4. Evaluating all the subfactors with AHP.
- 5. Obtaining the rank for each factor and the conclusion based on the end result of AHP.

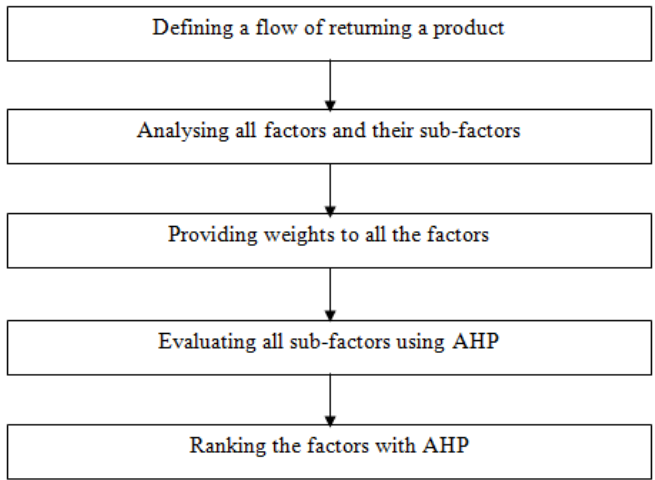


Figure 3.Approach for the analysis (Author’s Creation)

Research Methodology

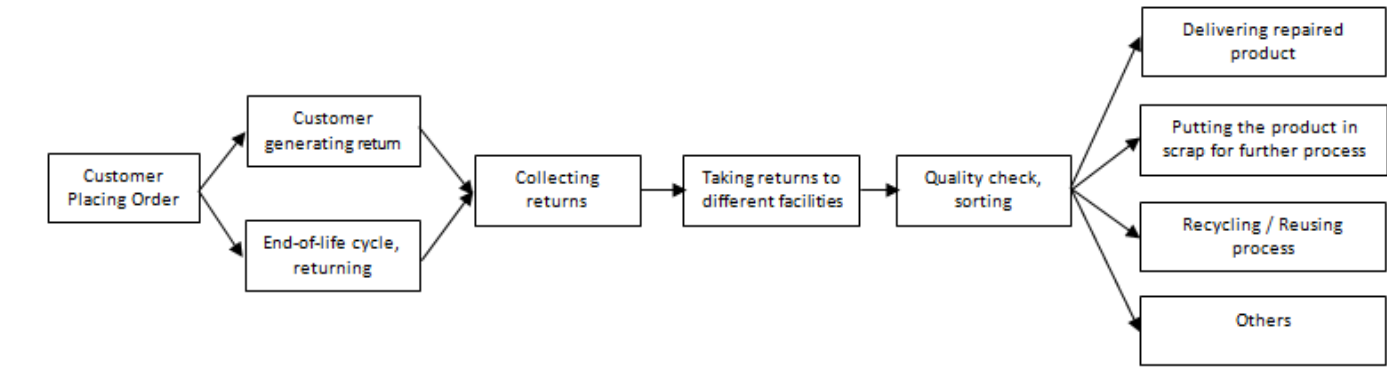


Figure 4. Flow of Reverse Logistics (Source: Authors Compilation)

3.2 factors

Based on the basic flow of reverse logistics and all the factors that change the planning or affect the planning strategies researcher have selected 5 factor categories and few sub factors in each category, in total 15 sub factors and they are as follows:

- 1. Rural/urban (F.1): In different areas there will be different infrastructure facilities available hence the time taken to reach the customer and the mode used for

3.1In this research the approach used is to start with a flow of reverse logistics refer Figure 4. The process starts with the customer placing orders and this can be an individual ordering a product or a company ordering in bulk to suppliers, then if he/she doesn’t like the product or the product doesn’t match the specifications,defective product, customer changed their mind or any other reason customer places the return order request. Company has to plan for collecting the return products from their customers and bringing them back to the company facilities and then doing quality check and sorting of products, and lastly they have to send the products as per the category they fall in (Scrap, recyclable, delivering to customer again, others),here the loop closes. These are the major steps that are there in a Reverse logistics process and based on these the major factors are selected that could be considered for theplanning reverse logistics operations.

transportation will keep on changing. ((Cao et al., 2018); (Fang et al., 2016))

- 2. Safety of employee and customer (F.2): Safety is the most crucial thing for each and every one during this pandemic, although work is resumed but each employee’s and customer’s heath has to be kept on priority(George, 2020). All safety measures and check points to be carefully mapped while planning for reverse logistics. How much time these checks will increase and that should reflect on customer’s as well as company’s portal is also important to keep a proper track(Givi et al., 2020).

3. Attitude (F.3): It has been observed over a time period that customer attitude can decide the next step they are going to take and hence knowing your customer and combining all the behavioural traits of the customers will divide your customer base in major parts and accordingly you can revise your strategies and plan out things also accordingly. Customers' loyalty also plays a big role. (Abratt & Goodey, 1990); (Kwon & Lennon, 2009))

4. Hot spots / Prohibited Areas (F.4): In this pandemic government has defined areas which has more number of cases than a certain number as "Covid-19 Hot spot area" (George, 2020). There has been numerous rules and regulations for these areas so while planning reverse logistics organisation has to see where they can enter and where not plus these areas keep on changing so the dynamic mapping has to be very effective to map routes and areas.

5. Product Type (F.5): The type of products a company deals with define the level of planning they need to have while planning the reverse logistics. Company can deal in Hazardous product, perishable product, size, recyclable products and for each product the time limit and frequencies will be different and the vehicles required will also be different. Hence this is one important factor to be considered while planning Reverse logistics. (Shabbir et al., 2019); (Basiri & Heydari, 2017))

6. Time period of return policy (F.6): Different companies have different time period planned for returning a product and also within a company different product will have different time period of returning a product. So, to forecast the returning of products can be aided by this factor. (Pei et al., n.d.)

7. Occupation (F.7): Customer occupation tells about their buying behaviour and the influence that he/she will have and sometimes their need also. ((N., 2016); (Sadikoglu, 2018))

8. Buying type of customers and Buying frequency (F.8): Few customers are impulse buyers, few buys after extensive decision making, few are routine buyers. Their buying behaviours will impact order return request frequencies and this will also tell you about your overall customer base. ((Aragoncillo & Orús, 2018); (Coley & Burgess, 2003)). Buying frequency of customers can affect the return inquiries they are generating and in case of recyclable products this is definitely going to happen. ((He et al., 2018))

9. Financial /economic condition (F.9): The buying behaviour is definitely linked with the economic conditions and the more they order the more chances of return will be there and planning for each category people will play a significant role in the overall planning (Voinea & Filip, 2011).

10. Life style and Cultural behaviours (F.10): Life style influences the decisions customer will make, to have a clarity of what type of your customers you have will ease out the strategic plan. The impact of advancing technology across every level of purchasing using constructs of e-lifestyles, websites, AI bots and e-satisfaction has their impact on buying and returning behaviours. ((Shulman et al., 2009); (Chawla, 2014)) Companies operate in different regions and they have customers that are of diverse background. In case of any specific environmental norms

the recycling policies, this will change the planning. ((Sadikoglu, 2018); (Habibi et al., 2016))

11. Reference group biases and Age Group (F.11): The age group of a customer in some companies can play a vital role as few products are specially designed for a specific age group. (Habibi et al., 2016); (Garanti & Kissi, 2019)). Reference group biases refers to the reference groups like friends, neighbours, peers they have (Abratt & Goodey, 1990).

12. Government rules and policies (F.12): Government has made multiple rules and regulations for almost all the services keeping in mind the safety aspect. These guidelines vary as per the state and regions, these guidelines needed to be followed whole logistics services to deliver their services be it parcel delivery or reverse logistic (Fellow & Energy, 2020; Resources Institute Impact of Covid-19 on Urban Mobility in India: Evidence From a Perception, n.d.).

13. Rail/road transport (F.13): Which mode you are using will decide the cost and the time between different stages of Reverse logistics, and this will change as per the industry and customers location and various other factors. ((Visser et al., 2014); (Teunissen et al., 2016))

14. Type of returns policy includes (F.14): In all phases of planning types of returns refers are considered, it refers to the exchange of products, or giving cashback in return of the product. In case of exchange you have to plan the entire journey of collecting the product and then delivering new product to the customer while in only return of product with cashback option one-way travel will be there only collecting the parcel (Pei et al., n.d.).

15. Return reasons (F.15): As each company can have different type of return reasons for their products for example Bottles manufacturing company wants their bottles back to recycle them after customer uses them and also to reduce waste. In this case planning would be different as they have to see their sales and average life of product to plan its return while an ecommerce company cannot predict accurately whether a customer will return a product or not so here, they have to plan differently as compare to the bottle manufacturing company. Hence this factor is considered. Types of returns could be product return due to product doesn't match customer expectations, failure within warranty period, services failure, returns made by companies, returns from manufacturing units, (EOL) end of life returns and end-of-use returns. (Blackburn et al., 2004); (De Giovanni & Zaccour, 2019))

Once all factors are decided, perform analysis by starting with AHP.

Analysis

All 15 factors are really necessary to be considered while planning for the reverse logistics so now with the discussion with industry specialists and reverse logistics planning experts the first step of AHP i.e., providing weightage to each factor as compared to other factors has to be done. The steps followed in AHP analysis are as follows and also the Consistency Ratio (CR) test has been done to check that the scores or weightage taken are consistent.

Step I: The first step is to prepare a pairwise comparison matrix including all 15 factors. (Refer table 1)

The weights to be given for all the factors should follow the below pattern,
Starting from 1 where both carries equal importance to 9 where one is extremely important as compared to the other

factor. Assign all the values from 1-9 as per the importance level of the factor as compared to the other factor, equally important, slightly more important, moderately important, highly important.

	F.1	F.2	F.3	F.4	F.5	F.6	F.7	F.8	F.9	F.10	F.11	F.12	F.13	F.14	F.15
F.1	1.00	0.33	4.00	4.00	0.33	4.00	4.00	3.00	3.00	3.00	4.00	0.33	0.33	0.50	4.00
F.2	3.00	1.00	4.00	4.00	4.00	4.00	5.00	4.00	3.00	4.00	4.00	1.00	0.33	0.50	1.00
F.3	0.25	0.25	1.00	1.00	0.50	0.50	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.50	1.00
F.4	0.25	0.25	1.00	1.00	4.00	0.33	4.00	1.00	1.00	3.03	3.03	0.25	0.33	1.00	1.00
F.5	0.25	0.25	2.00	0.25	1.00	0.33	4.00	1.00	1.00	4.00	3.00	0.50	0.33	0.50	1.00
F.6	0.25	0.25	2.00	3.00	3.00	1.00	0.33	1.00	1.00	3.00	5.00	0.33	0.33	0.50	1.00
F.7	0.25	0.20	1.00	0.25	0.25	3.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.50	1.00
F.8	0.33	0.25	1.00	1.00	1.00	1.00	1.00	1.00	1.00	3.00	5.00	1.00	0.33	0.50	3.00
F.9	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00	5.00	5.00	0.50	0.33	0.50	1.00
F.10	0.33	0.25	1.00	0.33	0.25	0.33	1.00	0.33	0.20	1.00	5.00	0.50	0.33	0.50	1.00
F.11	0.25	0.25	1.00	0.33	0.33	0.20	1.00	0.20	0.20	0.20	1.00	0.33	0.50	0.50	1.00
F.12	3.00	1.00	3.00	4.00	2.00	3.00	3.00	1.00	2.00	2.00	3.00	1.00	0.25	3.03	5.00
F.13	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	2.00	4.00	1.00	5.00	5.00
F.14	2.00	2.00	2.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	0.33	0.20	1.00	3.00
F.15	0.25	0.33	1.00	1.00	1.00	1.00	1.00	0.33	1.00	1.00	1.00	0.20	0.20	0.33	1.00
Sum	14.75	9.95	28.00	25.16	23.67	24.70	32.33	20.87	21.40	36.23	45.03	10.95	5.48	15.36	30.00

Table 1. Pair Wise Comparison Matrix

Step II: After preparing pairwise comparison matrix next step is to normalize the matrix, in this step take the column sum and divide value of each cell by its column sum; refer

table 2. And the sum of each column should be 1 in the normalized matrix

	F.1	F.2	F.3	F.4	F.5	F.6	F.7	F.8	F.9	F.10	F.11	F.12	F.13	F.14	F.15
F.1	0.068	0.034	0.143	0.159	0.014	0.162	0.124	0.144	0.140	0.083	0.089	0.030	0.061	0.033	0.133
F.2	0.203	0.101	0.143	0.159	0.169	0.162	0.155	0.192	0.140	0.110	0.089	0.091	0.061	0.033	0.033
F.3	0.017	0.025	0.036	0.040	0.021	0.020	0.031	0.048	0.047	0.028	0.022	0.030	0.061	0.033	0.033
F.4	0.017	0.025	0.036	0.040	0.169	0.013	0.124	0.048	0.047	0.084	0.067	0.023	0.061	0.065	0.033
F.5	0.017	0.025	0.071	0.010	0.042	0.013	0.124	0.048	0.047	0.110	0.067	0.046	0.061	0.033	0.033
F.6	0.017	0.025	0.071	0.119	0.127	0.040	0.010	0.048	0.047	0.083	0.111	0.030	0.061	0.033	0.033
F.7	0.017	0.020	0.036	0.010	0.011	0.121	0.031	0.048	0.047	0.028	0.022	0.030	0.061	0.033	0.033
F.8	0.023	0.025	0.036	0.040	0.042	0.040	0.031	0.048	0.047	0.083	0.111	0.091	0.061	0.033	0.100
F.9	0.023	0.034	0.036	0.040	0.042	0.040	0.031	0.048	0.047	0.138	0.111	0.046	0.061	0.033	0.033
F.10	0.023	0.025	0.036	0.013	0.011	0.013	0.031	0.016	0.009	0.028	0.111	0.046	0.061	0.033	0.033
F.11	0.017	0.025	0.036	0.013	0.014	0.008	0.031	0.010	0.009	0.006	0.022	0.030	0.091	0.033	0.033
F.12	0.203	0.101	0.107	0.159	0.085	0.121	0.093	0.048	0.093	0.055	0.067	0.091	0.046	0.197	0.167
F.13	0.203	0.302	0.107	0.119	0.127	0.121	0.093	0.144	0.140	0.083	0.044	0.365	0.182	0.325	0.167
F.14	0.136	0.201	0.071	0.040	0.085	0.081	0.062	0.096	0.093	0.055	0.044	0.030	0.036	0.065	0.100
F.15	0.017	0.033	0.036	0.040	0.042	0.040	0.031	0.016	0.047	0.028	0.022	0.018	0.036	0.022	0.033

Table 2. Normalized Scores

Step III: Now take the total and average of all the rows of the normalised matrix. Refer table 3.

	F.1	F.2	F.3	F.4	F.5	F.6	F.7	F.8	F.9	F.10	F.11	F.12	F.13	F.14	F.15	Total	Average /Priority Weights
F.1	0.068	0.034	0.143	0.159	0.014	0.162	0.124	0.144	0.140	0.083	0.089	0.030	0.061	0.033	0.133	1.416	0.094
F.2	0.203	0.101	0.143	0.159	0.169	0.162	0.155	0.192	0.140	0.110	0.089	0.091	0.061	0.033	0.033	1.840	0.123
F.3	0.017	0.025	0.036	0.040	0.021	0.020	0.031	0.048	0.047	0.028	0.022	0.030	0.061	0.033	0.033	0.491	0.033
F.4	0.017	0.025	0.036	0.040	0.169	0.013	0.124	0.048	0.047	0.084	0.067	0.023	0.061	0.065	0.033	0.851	0.057
F.5	0.017	0.025	0.071	0.010	0.042	0.013	0.124	0.048	0.047	0.110	0.067	0.046	0.061	0.033	0.033	0.747	0.050
F.6	0.017	0.025	0.071	0.119	0.127	0.040	0.010	0.048	0.047	0.083	0.111	0.030	0.061	0.033	0.033	0.856	0.057
F.7	0.017	0.020	0.036	0.010	0.011	0.121	0.031	0.048	0.047	0.028	0.022	0.030	0.061	0.033	0.033	0.547	0.036
F.8	0.023	0.025	0.036	0.040	0.042	0.040	0.031	0.048	0.047	0.083	0.111	0.091	0.061	0.033	0.100	0.810	0.054
F.9	0.023	0.034	0.036	0.040	0.042	0.040	0.031	0.048	0.047	0.138	0.111	0.046	0.061	0.033	0.033	0.761	0.051
F.10	0.023	0.025	0.036	0.013	0.011	0.013	0.031	0.016	0.009	0.028	0.111	0.046	0.061	0.033	0.033	0.488	0.033
F.11	0.017	0.025	0.036	0.013	0.014	0.008	0.031	0.010	0.009	0.006	0.022	0.030	0.091	0.033	0.033	0.378	0.025
F.12	0.203	0.101	0.107	0.159	0.085	0.121	0.093	0.048	0.093	0.055	0.067	0.091	0.046	0.197	0.167	1.633	0.109
F.13	0.203	0.302	0.107	0.119	0.127	0.121	0.093	0.144	0.140	0.083	0.044	0.365	0.182	0.325	0.167	2.523	0.168
F.14	0.136	0.201	0.071	0.040	0.085	0.081	0.062	0.096	0.093	0.055	0.044	0.030	0.036	0.065	0.100	1.196	0.080
F.15	0.017	0.033	0.036	0.040	0.042	0.040	0.031	0.016	0.047	0.028	0.022	0.018	0.036	0.022	0.033	0.462	0.031

Table3. Normalized Scores, total and average

Step IV: After normalized score calculation we will perform consistency analysis and the main objective of this analysis is to see that whether the scores taken are consistent.

For this analysis we will have to follow these steps:

a. Find Consistency Index (CI)

Start with multiplying the value of each column of the table 1 -Pairwise-Comparison-Matrix with the corresponding average/priority weights. In excel use the formula MMULT() to ease out the calculation part and name this column as Consistency Measure

Divide of sum of the row entries by the corresponding Average / Priority weight. Refer table 4.

Calculate the average of the values in Column Consistency Measure and denote it by λ_n , n is the number of factors and here it is 15

Now calculate CI

	F.1	F.2	F.3	F.4	F.5	F.6	F.7	F.8	F.9	F.10	F.11	F.12	F.13	F.14	F.15	Total	Average / Priority Weights	CM
F.1	0.068	0.034	0.143	0.159	0.014	0.162	0.124	0.144	0.140	0.083	0.089	0.030	0.061	0.033	0.133	1.416	0.094	17.51
F.2	0.203	0.101	0.143	0.159	0.169	0.162	0.155	0.192	0.140	0.110	0.089	0.091	0.061	0.033	0.033	1.840	0.123	18.00
F.3	0.017	0.025	0.036	0.040	0.021	0.020	0.031	0.048	0.047	0.028	0.022	0.030	0.061	0.033	0.033	0.491	0.033	17.07
F.4	0.017	0.025	0.036	0.040	0.169	0.013	0.124	0.048	0.047	0.084	0.067	0.023	0.061	0.065	0.033	0.851	0.057	17.29
F.5	0.017	0.025	0.071	0.010	0.042	0.013	0.124	0.048	0.047	0.110	0.067	0.046	0.061	0.033	0.033	0.747	0.050	16.88
F.6	0.017	0.025	0.071	0.119	0.127	0.040	0.010	0.048	0.047	0.083	0.111	0.030	0.061	0.033	0.033	0.856	0.057	17.53
F.7	0.017	0.020	0.036	0.010	0.011	0.121	0.031	0.048	0.047	0.028	0.022	0.030	0.061	0.033	0.033	0.547	0.036	17.56
F.8	0.023	0.025	0.036	0.040	0.042	0.040	0.031	0.048	0.047	0.083	0.111	0.091	0.061	0.033	0.100	0.810	0.054	17.05
F.9	0.023	0.034	0.036	0.040	0.042	0.040	0.031	0.048	0.047	0.138	0.111	0.046	0.061	0.033	0.033	0.761	0.051	17.34
F.10	0.023	0.025	0.036	0.013	0.011	0.013	0.031	0.016	0.009	0.028	0.111	0.046	0.061	0.033	0.033	0.488	0.033	16.89

$$CI = \frac{\lambda_n - n}{n-1}$$

$\lambda_n = 17.3482$, putting this in the above equation.

CI = 0.1565

b. Take Random Index (RI) for $n=15$, RI for $n=15$ is 1.59

c. Formula for Consistency-Ratio-(CR) is $CR = CI / RI$
the value of CR 0.1 or below is acceptable, it tells that yes, the scores taken were consistent.

Applying formula

$CR = 0.0985$, below 0.1 hence the score taken were consistent and we can now move ahead and rank the factors

F.11	0.017	0.025	0.036	0.013	0.014	0.008	0.031	0.010	0.009	0.006	0.022	0.030	0.091	0.033	0.033	0.378	0.025	16.42
F.12	0.203	0.101	0.107	0.159	0.085	0.121	0.093	0.048	0.093	0.055	0.067	0.091	0.046	0.197	0.167	1.633	0.109	17.95
F.13	0.203	0.302	0.107	0.119	0.127	0.121	0.093	0.144	0.140	0.083	0.044	0.365	0.182	0.325	0.167	2.523	0.168	17.64
F.14	0.136	0.201	0.071	0.040	0.085	0.081	0.062	0.096	0.093	0.055	0.044	0.030	0.036	0.065	0.100	1.196	0.080	17.68
F.15	0.017	0.033	0.036	0.040	0.042	0.040	0.031	0.016	0.047	0.028	0.022	0.018	0.036	0.022	0.033	0.462	0.031	17.43

Table 4. Consistency Measure (CM) Matrix

Step V: Ranking all the factors -Now rank the factors as per the value of Average/ Priority Weights. Highest value should be ranked 1, second highest should be ranked 2 and

then keep on giving ranks as the value of Average/Priority weights. Refer Table 5.

Table 5. Ranks of all the factors

In all these 15 factors covering customer behavioural factors,

	F.1	F.2	F.3	F.4	F.5	F.6	F.7	F.8	F.9	F.10	F.11	F.12	F.13	F.14	F.15	CM	Rank
F.1	0.068	0.034	0.143	0.159	0.014	0.162	0.124	0.144	0.140	0.083	0.089	0.030	0.061	0.033	0.133	17.51	7
F.2	0.203	0.101	0.143	0.159	0.169	0.162	0.155	0.192	0.140	0.110	0.089	0.091	0.061	0.033	0.033	18.00	1
F.3	0.017	0.025	0.036	0.040	0.021	0.020	0.031	0.048	0.047	0.028	0.022	0.030	0.061	0.033	0.033	17.07	11
F.4	0.017	0.025	0.036	0.040	0.169	0.013	0.124	0.048	0.047	0.084	0.067	0.023	0.061	0.065	0.033	17.29	10
F.5	0.017	0.025	0.071	0.010	0.042	0.013	0.124	0.048	0.047	0.110	0.067	0.046	0.061	0.033	0.033	16.88	14
F.6	0.017	0.025	0.071	0.119	0.127	0.040	0.010	0.048	0.047	0.083	0.111	0.030	0.061	0.033	0.033	17.53	6
F.7	0.017	0.020	0.036	0.010	0.011	0.121	0.031	0.048	0.047	0.028	0.022	0.030	0.061	0.033	0.033	17.56	5
F.8	0.023	0.025	0.036	0.040	0.042	0.040	0.031	0.048	0.047	0.083	0.111	0.091	0.061	0.033	0.100	17.05	12
F.9	0.023	0.034	0.036	0.040	0.042	0.040	0.031	0.048	0.047	0.138	0.111	0.046	0.061	0.033	0.033	17.34	9
F.10	0.023	0.025	0.036	0.013	0.011	0.013	0.031	0.016	0.009	0.028	0.111	0.046	0.061	0.033	0.033	16.89	13
F.11	0.017	0.025	0.036	0.013	0.014	0.008	0.031	0.010	0.009	0.006	0.022	0.030	0.091	0.033	0.033	16.42	15
F.12	0.203	0.101	0.107	0.159	0.085	0.121	0.093	0.048	0.093	0.055	0.067	0.091	0.046	0.197	0.167	17.95	2
F.13	0.203	0.302	0.107	0.119	0.127	0.121	0.093	0.144	0.140	0.083	0.044	0.365	0.182	0.325	0.167	17.64	4
F.14	0.136	0.201	0.071	0.040	0.085	0.081	0.062	0.096	0.093	0.055	0.044	0.030	0.036	0.065	0.100	17.68	3
F.15	0.017	0.033	0.036	0.040	0.042	0.040	0.031	0.016	0.047	0.028	0.022	0.018	0.036	0.022	0.033	17.43	8

Result

Ranks

Rail/road transport	1
Safety of employees and Customer	2
Government Policies and Regulations	3
Rural/urban	4
Return Reasons	5
Time period of return policy	6
Hot spot / Prohibited areas	7
Buying type of customers and Buying Frequency	8
Financial /economic condition	9
Product Type	10
Occupation	11
Attitude -	12
Life style and Cultural Behaviour	13
Type of returns policy includes	14
Reference group biases and Age Group	15

Table 6. Ranks

pandemic rules and regulations, safety, customer personality factors, geographical factors and type of return related factors, we know that each factor contribute to planning of reverse logistics but few factors are directly linked with cost and have high impact on the system; refer table 6. Few have high importance in terms of time taken to fulfil the service and few in terms of reaching the location due to hotspot and lockdown in few areas. Keeping in mind safety in this pandemic and in near future, time, cost and customer satisfaction this research has been done and finally we have the rank of the factors (Table 6). This will help in the planning step as the factors of top ranks shall be considered of utmost importance and given priority in the design to have a better end result of planning. This frame works integrates all the factors and provide an approach for the strategy phase.

We know how important it is to manage a proper reverse logistics as in these dark pandemic days there has been a rise in ecommerce industry and with this rise in the reverse logistics stats. Still many companies are not planning their strategies for reverse logistics, planning it properly can optimise the entire flow of goods (Rogers & Tibben-lembeke, 2001); (Branska et al., 2020).

It can't be emphasized more that how ecommerce companies revisit their planning to ensure evolving industrial changes and market trends so to have a model for planning will make revisiting and improvisation easier (Krumwiede & Sheu, 2002). Companies have started adding the return feature to stay competitive enough in the market as this has become an essential factor for customers to order but lack a lot in the systematic procedures, analysis and planning (Solutions & Reverse, 2020); (Kale et al., 2019)).

Benefits of doing this are:

- Reduction in the volume of product that is being returned again and again.
- To make profit these return products can be analysed and sold in different markets. If products are damaged instead of letting go the investment sell it out in secondary markets.
- Keeping a proper track of the reverse supply chain is very important as the company might be incurring a lot of cost in reverse logistics and specially in this pandemic time, they have additional cost at each step to make sure safety of their employees and customers. Proper structured approach like these factors will help in monitoring the cost and further it can be reduced (Branska et al., 2020).
- Having a better understanding of rules and regulations, transport facilities, on-going deliveries in the same area will reduce the pickup time and in return this will make a positive impact on customer.
- These small changes will make the reverse supply chain more educated and the cascading effect of this will be profitable.
- Proper tracking and planning will accumulate a lot of data which will prove to be an asset for analysing the company's trends and customer attitude and behavioural aspects. Increasing 4.0 techniques can be an aid to this process.

Conclusion

As this paper focuses on the strategy stage and if it is done right execution becomes easy and less problems are encountered. Every organisation has their own core competency and aligning decisions to their core competencies will give them maximum value surplus. Due to this pandemic the ecommerce companies can be benefitted if they analyse the situation well and take actions accordingly, after mapping your organisations current position in this pandemic and future goals each factor according to their rank can be taken ahead for further decision-making processes this will ease out the planning process and in return can yield more alignment. This approach can be broadly used by all the companies, it considers the type of product that you are dealing with, all pandemic rules and regulations, employee and customer safety, the return type, policies you have and also the geographical aspects. So, this will broadly tell you where to focus more. In the continuous changing reverse logistics ecosystem these factors will help in making changes to adapt to the new technologies and trends, also the future uncertainties in this evolving world. The returned products help in planning the investments decisions made in terms of quality and pricing. With

optimising the reverse logistics network design will impact the pricing and quality investments. Variable cost of the product will have more impact as with proper designing and optimisation we can minimize variability, thus impacting the overall cost. Effective execution of closed-loop supply chain requires setting up suitable co-ordination structures for the emerging progressions of utilized, recyclable and normal return items.

Future Scope

This paper is more focused towards the factors considered in reverse logistics planning and ranking the factors for that. Now further research for each and every factor to perform the execution can be done. As this paper broadly tells what a factor considers but a detail study on the parameters that a single factor can manage and how these parameters can be integrated into the system smoothly can also be focused upon. For times ahead, what all changes can occur to each factor can be analysed as this will align the company to new trends and evolving supply chains.

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