A study on innovative reverse logistics and its impact of customer satisfaction

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Abstract: Companies are also looking for new ways to enhance their operation, customer loyalty and remain ahead of the game with their rivals in the dynamic world of production. For the past decade or so, reverse logistics has been considered a method to bring these items to life.This thesis paper aims to shed some light on the fundamentals of reverse logistics and how a management approach can be used for reverse logistics. This paper highlights the basics of reverse logistics and discusses what kind of decisions today's logistics managers have to take to develop their logistics model on a daily basis.A increasing concern to control rising global emissions has been emerging, this paper also highlights some of the impact on the environment of reverse logistics decisions and vice versa. In the theoretical history portion, the study begins by collecting the work of scholars and logistics experts in the field of logistics.A small picture of the degree to which reverse logistics has entered the manufacturing world has been drawn through a study conducted in a few manufacturing firms in India.

Keywords: Reverse Logistics, Green Image, Corporate citizenship, Reverse Logistics activities, Returns.

INTRODUCTION

Critical research on reverse logistics and its effect on customer satisfaction. Businesses are constantly looking for new ways to enhance their operation, customer satisfaction and keep ahead of their rivals in the dynamic world of manufacturing. For the past decade or so, reverse logistics has been considered a method to bring these items to life.This thesis paper aims to shed some light on the fundamentals of reverse logistics and how a management approach can be used for reverse logistics. This paper highlights the basics of reverse logistics and discusses what kind of decisions today's logistics managers have to take to develop their logistics model on a daily basis. A increasing concern to control rising global emissions has been emerging, this paper also highlights some of the impact on the environment of reverse logistics decisions and vice versa. In the theoretical history portion, the study begins by collecting the work of scholars and logistics experts in the field of logistics. A small picture of the degree to which reverse logistics has entered the manufacturing world has been drawn through a study conducted in a few manufacturing firms in India.Our research idea is based on the rich knowledge acquired by our peer teams across the university.(A.C.Gomathi, S.R.Xavier Rajarathinam, A.Mohammed Sadiqc, Rajeshkumar, 2020; Danda et al., 2009; Danda and Ravi, 2011; Dua et al., 2019; Ezhilarasan et al., 2019; Krishnan and Chary, 2015; Manivannan, I., Ranganathan, S., Gopalakannan, S. et al., 2018; Narayanan et al., 2012, 2009; Neelakantan et al., 2013, 2011; Neelakantan and Sharma, 2015; Panchal et al., 2019; Prasanna et al., 2011; Priya S et al., 2009; Rajeshkumar et al., 2019; Ramadurai et al., 2019; Ramakrishnan et al., 2019; Ramesh et al., 2016; Venugopalan et al., 2014)

The method of planning, executing and managing the reliable, cost-effective movement of raw materials, in-process inventory, finished products and related information from the point of consumption to the point of origin for the purpose of the recovery or proper disposal of value.Rogers and Tibben-Lembke continue to suggest that the concept of reverse logistics may also involve remanufacturing and refurbishing. Reverse logistics, according to them, also involves the processing of returned products due to injury, seasonal inventory, restock, rescue, recalls, and excess inventory.Recycling projects, hazardous waste programmes, redundant disposal of facilities, and asset recovery are also included.

REVIEW OF LITERATURE

(Govindan et al., 2012) Due to growing economic environment and the introduction of new technologies in marketing, another topic of great interest to logistics today is the use of contract or third party services. In the complicated business world, the company is involved in reuse, recycling,and remanufacturing functions using a

third party logistics provider which has an impact on the total performance of the firm. In the development of the reverse logistics concept and practice, the selection of providers for the specific function of reverse logistics support

(Lavastre et al., 2012)The risk thematic is not new in management, but it is a recent and growing subject in supply chain management. Supply Chain Risk Management (SCRM) plays a major role in successfully managing business processes in a proactive manner. Supply chain risk has multiple sources including process, control, demand, supply and environment. Supply chain management, faced with these risks, requires specific and adequate responses such as techniques, attitude and strategies for management of risk.

(Fernandez and Kekale, 2008)Conceptual models, as simplifications of the reality they depict, never can include all the variables affecting some phenomenon. However, they should at least include the most important factors in order to make any practical sense. Typically, these conceptual models are built by observing the phenomena in practice or by studying the concepts theoretically and attempting to decide their relations and relative importance. The Analytic Hierarchy Process (AHP) method, although developed for decision-making under multiple conflicting priorities, can also be used in building conceptual models. This method requires a respondents' one organisation to cover a big enough variety of the specialists with understanding of the real phenomena

(Ravi et al., 2008)Considering the key issues involved in environmentally-friendly disposal of end-of-life (EOL)computers, its supply chain should be designed to incorporate the key dimensions of reverse logistics. An important managerial decision-making activity undertaken by reverse logistics managers is selection of feasible projects that could be completed according to the resources available. The reverse logistics project selection is a multi-criteria decision-making (MCDM) problem

(Mahaboob Sheriff et al., 2012)Reverse Logistics (RL) is the process of planning, implementing, and controlling the efficient, cost effective flow of obsolete materials referred to here as raw material, in-process inventory, finished goods and related information from the point of consumption to the point of origin for the purpose of recapturing value or proper disposal. The objective of this paper is to develop a framework to classify the various issues/parameters affecting strategic level decisions in RL and also to explore future research opportunities

(Dowlatshahi, 2012)Reverse Logistics (RL) is the process of returning products from their consumer destination to capture their value or proper disposal. This paper considers and analyses the current state of literature in warehousing. Warehousing, which is an operational factor in RL, has been analysed and evaluated in terms of the specific sub factors associated with it. The research methodology used was exploratory case study research. The qualitative data were collected by use of two in-depth case studies chosen from two different industries

(Srivastava and Srivastava, 2006)The paper develops a conceptual model and thereafter an integrated modeling framework borrowing from existing literature and industry practices. It utilizes product ownership data, average life cycle of products, past sales, forecasted demand and likely impact of environmental policy measures for estimating return flows. Informal interviews with 84 stakeholders are carried out to estimate significant parameters. Software packages, decomposition methods and heuristics are utilized for solution.

(Rubio et al., 2008)This paper aims to describe and analyse the main characteristics of articles on reverse logistics published in the production and operations management field, in order to determine the evolution of this current research over recent years and improve our understanding of this issue. We built up a database with the articles on reverse logistics published in the most relevant journals within the period 1995–2005,

(Pokharel and Mutha, 2009)This paper investigates the current development in research and practice in reverse logistics(RL) through content analysis of the published literature. We have used various web based search engines, books and conference proceedings to locate and review the literature. The review finds that research and practice in RL are focused on all aspects of RL—from collection of used products, their processing and finally to the outputs of processing, namely, recycled materials, spare parts, remanufactured products and waste material disposal

(Bernon et al., 2011)Purpose–From a synthesis of empirical findings and literature, the aim of this paper is to present a conceptual framework for managing retail reverse logistics operations. The framework is designed to assist both practitioners and academics in better understanding the key management aspects involved. The paper also identifies some future research directions that are derived from this conceptual framework.

RESEARCH METHOD

The primary data was gathered in this study through a standardised questionnaire. In order to obtain the primary data from 155 survey respondents from the general public, questionnaires divided into different parts such as demographic variables and the factors related to reverse logistics and the effect of customer satisfaction on the risks and possibilities involved were used. Alongside the primary results,or the study, secondary data was also obtained.

The idea was to review certain studies that study aspects of reverse logistics directly relevant to them. With this in mind, in the title, abstract or keywords of the papers appearing in the selected journals during the time of study, we conducted a literature search using the terms reverse logistics 'and/or' product recovery '.The use of the word product recovery 'is justified because we found that a large number of works were missing in a first search where

we included only the definition' reverse logistics ', works that were important despite not including the term' reverse logistics.This word has only gradually become consolidated, in parallel with the increasing appearance of research papers in these journals on the subject. In any event, in order to ensure that its emphasis was indeed on reverse logistics, each work resulting from the search was then carefully analysed. The approach followed in which the article was framed, the methods of analysis employed, The number of authors, their descent and the amount of references used. In addition, we examined complementary aspects of the research, such as information collection methods, sources of information used, the temporal and geographical scope of the study and the analysis unit used, in cases where it was appropriate.

A questionnaire is a method used by the population to gather sample responses. Questionnaire has several different kinds of questions, the current article aims to introduce readers to various kinds of questions that we plan to analyse in our Questionnaires that would usually be used. The questionnaire is split into different parts, such as demographic variables, Reverse logistics and the effect of customer loyalty are related factors.

The nominal scale and ordinal scale measurements were also used in this study. The ordinal scale was used to classify the demographic data, i.e. name, age, gender, etc., and the ordinal scale was used to describe the public's perspective on the researchers' questions.Both the ordinal and nominal scale include a number of variables that decide the customer's participation in Reverse Logistics, the reader was edited for ease after collection of data. The collected data was later placed in the table mode in this article to display the relationships using the graphs, pie diagrams, etc., which are achieved using the SPSS programme.

STATISTICAL TOOL USED FOR DATA ANALYSIS
The data collected was tabulated and analysed with statistical methods, such as statistical tools
- Frequency
- Mean analysis
- Independent sample T test
- One way ANOVA

Frequency
A frequency table is a way of summarising a data set. It is a record of how frequently each value (or value set) of the variables in question takes place. The addition of percentages that fall into each category may enhance it. For summarising categorical, nominal and ordinal data, a frequency table is used. It can also be used once the data set has been separated into sensible classes to summarise continuous data. A frequency table is often called a contingency table when we have more than one categorical variable in our data set since the figures found in the rows depend on (depending on) those found in the column.

Mean Analysis
Mean analysis is the same as variance analysis, but can be used for both normal distribution, which is a bell-shaped symmetrical curve representing the number of times in a data set a given sum of items or events occur, and binomial distribution, which is the number of times in a data set one of two potential effects occurs.

Independent Sample T-Test
The independent sample t-test compares the means of two independent groups in order to determine whether there is statistical evidence that associated population means are significantly different .The independent Sample t- test is a parametric test The variables used in this test are known as
- Dependent Variable or test variable
- Independent Variable or grouping variable

ONE WAY ANOVA
In statistics, one way analysis of variance is a technique used to compare means of tree or more samples. This technique can be used only for numerical data. The ANOVA tests the null hypothesis that samples in two or more groups are drawn from populations with the same mean values. The results of a one-way ANOVA can be considered reliable as long as the following assumptions are meet Response variable residuals are normally distributed.
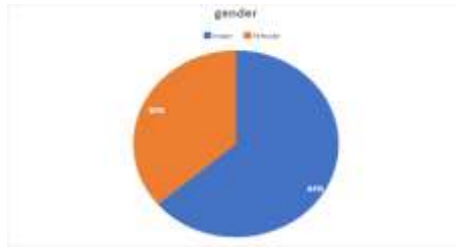
RESULT
Frequency analysis

Fig.1:

INTERPRETATION

This figure 1 shows the frequency analysis of Gender. From the table it is clear that the majority of the respondents are Male (63.8%) and female respondents are (36.2%).
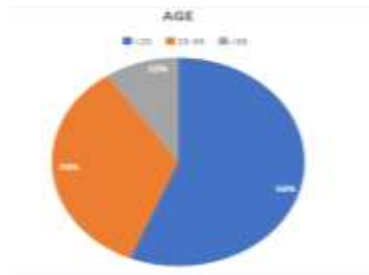
Frequency analysis of age

Fig.2:

INTERPRETATION

Figure 2 shows the frequency analysis of age. It is clear from the chart that the majority of the respondents are those whose age group is between <25 (56.2%) followed by the age which lies between 25-35 (34.3%), followed by the age group between >35 (9.5%) and above 50 years (7.1%). It is inferred from the table that the majority of respondents are from the age group of <25 years.
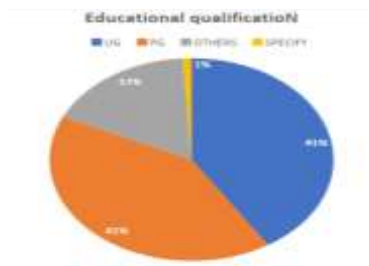
Analysis of education qualification

Fig.3:

INTERPRETATION

Figure 3 shows the frequency analysis of age. It is clear from the chart that majority of the respondents are those whose age group is between <25 (56.2%) followed by the age which lies between 25-35 (34.3%), followed by the age group between >35 (9.5%) and above 50 years (7.1%). It is inferred from the table that majority of respondents are from the age group of <25 years.

Mean analysis

Table 1:

Perception logistics	Towards	Mean rank
Reverse logistics is a fairly new concept and not until recently have researchers and logistics companies tried to focus on its effects on the managerial decisions.	2.0571	11
This section will also cover the role of reverse logistics and how developing a reverse logistics model for a specific product or group of products will affect the decisions taken by the companies.	2.0571	10
Mahindra Logistic Ltd is one of India's Largest 3PL solutions providers in the Indian	2.1333	8

logistics industry which was estimated at INR 6.40 trillion in Fiscal 2017, according to the CRISIL Report.		
Reverse logistics by analyzing the issue from four essential viewpoints; why, what, how and who. Why the things are returned, what is being returned, how reverse logistics works in practice and who is executing the reverse logistics activities.	2.3714	5
Transforms inherently negative customer experiences into a valuable strategic asset, and generates profits from returns that were previously a loss.	2.2667	7
Mahindra Logistics operates in two distinct business segments: Supply Chain Management(SGM) and corporate People Transport Solutions(PTS). It is fourth in the list of best logistics companies in India.	2.4190	3
There are several reason why reverse logistics are vital.Reverse logistics are the means to having an efficient supply chain and therefore, efficient asset recovery.	2.3048	6
Why do companies get involved in reverse logistics activities? • Economics (direct and indirect) • Legislation • Corporate citizenship.	2.5429	1
Companies are often searching for new ways to improve their process, customer satisfaction and stay ahead in the game with their competitors.	2.4286	2
Most challenges in managing reverse logistics can be traced to two broad categories-Process and Investment (Two Steps Forward, One Step Back...)	2.3905	4
A growing concern has been developing to control rising global pollution, this paper also brings out some of the effects of reverse logistics decisions on the environment and vice versa.	2.1048	9

The MEAN and RANK are displayed in the table 4.2.1 It shows variable effects on the managerial decisions includes the lowest mean score of (2.05) and the variable "This" includes the highest mean score of (2.54). And the rest of the mean scores are aligned in descending order from the highest mean score to the lowest mean score. All the mean scores lie between 3 to 4.

INDEPENDENT SAMPLE T – TEST
ANALYSIS OF PERCEPTION VS GENDER
H_0: There is no significant difference between male and female with respect to perception towards REVERSE LOGISTICS.
H_1: There is a significant difference between male and female with respect to perception towards REVERSE LOGISTICS.

ANALYSIS OF REVERSE INPUT VS GENDER

Table 2:

PERCEPTION	T – VALUE	SIGNIFICANCE
REVERSE INPUT	.397	.692

This table shows the independent T - Test analysis of Gender VS reverse input . It is visible that the Significance Value (.692) is lesser than 0.05 which means that there is a significant difference between the gender with respect to the Perception towards reverse logistics.

ANALYSIS OF REVERSE OUTPUT VS GENDER

Table 3:

PERCEPTION	T – VALUE	SIGNIFICANCE
REVERSE OUTPUT	.255	.799

This table shows the independent T - Test analysis of Gender VS reverse output. It is visible that the Significance Value (.799) is lesser than 0.05 which means that there is significant difference between the gender with respect to the Perception towards reverse logistics.

ANOVA ANALYSIS
Analysis of age vs perception of logistics and reverse logistics
H_0: There is no significant difference among age with respect to perception towards REVERSE LOGISTICS AND IMPACT OF CUSTOMER SATISFACTION .

H[1]: There is a significant difference among age with respect to perception towards REVERSE LOGISTICS AND IMPACT OF CUSTOMER SATISFACTION .

Table 4: Perception of logistics and reverse logistics based on age

COMPONENTS	F – VALUE	SIGNIFICANCE
LOGISTICS	**1.754**	**.178**
REVERSE LOGISTICS	**.073**	**.930**

This table shows the one-way ANOVA analysis of Age VS Consumer Buying Behaviour & Perception. From the analysis it is clear that both the significance values of Perception towards LOGISTICS (.178) and reverse logistics (.930) are greater than 0.05. It is interpreted that there is no significant difference among the Age with respect to perception towards logistics and reverse logistics. It is found that <25 years age group have given different response about Perception towards logistics and reverse logistics as compared to other age groups.

PERCEPTION OF REVERSE INPUT AND REVERSE OUTPUT BASED ON AGE
H0: There is no significant difference among age with respect to perception towards REVERSE INPUT and REVERSE OUTPUT.
H1: There is a significant difference among age with respect to perception towards REVERSE INPUT and REVERSE OUTPUT.

Table 5: Perception of reverse input and reverse output based on age

COMPONENT	F-VALUE	SIGNIFICANCE
REVERSE INPUT	3.258	.043
REVERSE OUTPUT	3.269	.042

This table shows the one-way ANOVA analysis of Age VS REVERSE INPUT and REVERSE OUTPUT. From the analysis it is clear that both the significance values of Perception towards reverse input (.043) and reverse OUTPUT (.042) are greater than 0.05. It is interpreted that there is no significant difference among the Age with respect to perception towards to reverse input and reverse output. It is found that <25 years age group have given different response about Perception towards reverse input and reverse output as compared to other age groups.

CONCLUSION
The basic concepts of reverse logistics and the advantages of making a successful reverse logistics method were attempted to bring together by this project. It was a tedious task to collect the necessary information to complete this project, starting from gathering the data for the theoretical context, going through various articles to find the correct type of information, knowing the concepts, Formulating the survey, getting the right individuals to respond on time, and eventually reviewing the information obtained. It was found that many of the reverse logistics techniques are in place in these organisations during the discussions with the survey participants, only that they are not aware that the tasks they conduct on a daily basis are collectively referred to as reverse logistics.As the cost of reverse logistics is about logistics, the reverse logistics processes are a small percentage but an incentive for change. And if it has to survive for a long period in the market, it is vital for every company to try to continue improving their operation.

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