Reverse logistics practices in Indian pharmaceutical supply chains: a study of manufacturers

Haidar Abbas*

Department of Business Administration and Accounting,
Al Buraimi University College,
Al Buraimi, Sultanate of Oman
Email: haideramu@gmail.com
*Corresponding author

Jamal A. Farooquie

Department of Business Administration,
Aligarh Muslim University,
Aligarh, India
Email: jamalfarooquie@yahoo.co.in

Abstract: The era of integration and globalisation forces one not to believe in a 'zero sum game'. Under the challenges like constantly increasing customers' expectations, fierce competition, high product variety, etc., winning the customers' delight and recapturing the value by their efficient reverse logistics process becomes inevitable. Such provision becomes of utmost importance when it is related with costly and health and/or life affecting products like medicines. Using suitable statistical tests, the data collected online from 65 senior level managers and entrepreneurs are analysed to identify and examine the various reverse logistics practices, drivers and barriers of thereof, and their performance parameters in Indian pharmaceutical sector. Redistribute, customer satisfaction, lesser predictability and helpful in image building are the most cited practice, driver, barriers and perceived performance indicator, respectively. Besides enriching the literature, the outcomes are expected to help the governments, regulatory bodies as well as pharmaceutical companies to ensure sustainable development.

Keywords: logistics; reverse logistics; pharmaceutical supply chains; pharmaceutical companies; Indian pharmaceutical supply chains.

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Biographical notes: Haidar Abbas has earned his PhD in Business Administration from the Aligarh Muslim University, Aligarh. His area of research is operations and supply chain management. His areas of teaching include international business, supply chain management, operations management and quantitative techniques. Apart from his exposure to teaching, he has credits to a number of national and international conferences, research papers published in some national and international journals and national level workshops. Currently, he is serving as an Assistant Professor (Business Administration) at the Al Buraimi University College, Oman.

Jamal A. Farooquie earned his PhD in Business Administration and MTech and BTech in Mechanical Engineering from the Aligarh Muslim University, Aligarh (India). His area of research is operations and supply chain management. The courses he regularly teaches include supply chain management, operations management, total quality management and quantitative techniques. Apart from his exposure to teaching, he has credits to a number of national and international conferences, research papers published in some national and international journals and national level workshops. Currently, he is serving as a Professor (Business Administration) at the Aligarh Muslim University, Aligarh (India).

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1 Introduction

Unsold products (at the end of a selling season/life), defective products, outdated products, used ones in exchange always make a re-entry. To facilitate the movement of returned products backwards, it requires a provision of another similar flow or chain called reverse logistics. "The process of planning, implementing, and controlling the efficient, cost-effective flow of raw materials, 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 (Rogers and Tibben-Lembke, 1999)."

Return for refund, exchange, treatment or disposal necessitates some kind of recovery and reverse logistics activities. To take care of the returning products is the legal obligation of producers in many parts of the world (Brito and Dekker, 2002; Demirel et al., 2016). Budijati et al. (2017) found that the environmental attitude had positive and significant influence on consumers' intentions. Janse (2008) termed it as extended producer responsibility (EPR). Walther and Spengler (2005) gave the examples of Germany who passed very stringent environmental laws making take-back program mandatory. Increasing environmental awareness and the government legislation are the two key drivers for reverse logistics practices (Sirisawat et al., 2015).

Despite being a new concept (Goncalves and Silva, 2016), reverse logistics has been of great important ever for product recalls. Heinz Baby Foods, Findus Pancakes and cars produced by those epitomes of quality, Mercedes and Rolls Royce have been practicing it for long. Product recall/withdrawn becomes more important particularly in case of pharmaceutical products where the health and/or life of the patients is, at time, at the risk if the defective drugs are not withdrawn rapidly. For example, in 1997, the world's best-selling weight-loss drugs, Redux and Pondimin, had to be withdrawn when evidence emerged that their use might lead to heart disease. While studying the reverse logistics in pharmaceuticals industry, Narayana et al. (2014) found a strong linkage between reverse logistics network design and key activities in returns management.

Being R&D-based division of chemical industry and being exceptionally science intensive, the pharmaceutical industry is classified as one of the most high-tech and capital-intensive industries in the world. The Indian pharmaceutical industry boasts of

holding the worlds' third-largest in terms of volume and 14th in terms of value. The Indian Pharmaceutical sector, comprised of more than 20,000 registered units, meets around 70% of the domestic demand (Sekhar, 2012). Multinational companies like Astrazeneca, Baxter, Aventis, Pfizer, Novartis, and Merck are also active in India's pharmaceutical market mainly through subsidiaries (Frost and Sullivan, 2011). Outside the USA, India is the only country having the highest number of USFDA approved plants for generic drugs' manufacturing.

Awareness about economic, environmental, social and regulatory compliance related benefits have allured the pharmaceutical manufacturers towards reverse logistics. For example, Ravi and Shankar (2015) found economic reasons for the adoption of reverse logistics by Indian manufacturing companies. Anne et al. (2015) found reverse logistics practices to curb waste, enhance cost savings thus increasing competitiveness. Hence, it becomes necessary to examine some major issues related with reverse logistics in the context of pharmaceutical supply chains. However, implementing the entire process is not free from obstacles. For example, Simões et al. (2017) noted that the biggest challenge to the implementation of reverse logistics was the lack of strategic planning by the companies on handling returned products. Regardless of the country of origin, these pharmaceutical supply chains are those companies which provide medicines to the end users in Indian Territory. Return and disposal practices, drivers, barriers and performance are the major issues related with reverse logistics management covered under this study.

Given the importance of the concept of reverse logistics, the pharmaceutical industry, the reverse logistics in pharmaceutical industry, the researchers found it interesting to explore and identify the actual status of the various reverse logistics practices and the reasons as to why companies do not simply consider it as a wastage of time, efforts and resources. The researchers were also keen in finding out the forces which deter these reverse logistics operations. After identifying the companies which formally have a reverse logistics program in place, the researchers also aimed to know about their perceived performance on certain parameters. With the outcomes of the study, the researchers expected to contribute significantly to the body of literature and drawing certain managerial implications as well.

This research paper began with the summary of the work (abstract) and briefly introduced the entire research topic in its first section. The second section deals with the literature review. The third section named as objectives and methodology contains three subsections namely research objectives, research hypotheses, and research design and sampling plan. The fourth section named as data analysis and interpretation contains three subsections namely reverse logistics practices, drivers and barriers for reverse logistics and perceived performance of reverse logistics. Fifth section named discussion highlights the findings to draw certain conclusions and put forth some feasible recommendations followed by the last section which provides a brief account of the limitations of the study and sets the directions for future research.

2 Review of literature

Reverse logistics is considered as a part of closed loop supply chain (CLSC) composed of five main components which are supplier, manufacturing plant, distribution centre/warehouse, retailers/customers and recovery facility (Tonanont, 2009). The major types of returns include B2C commercial returns (reimbursement guarantees), warranty

returns (Dissanayake and Singh, 2008; Janse, 2008), service returns (repairs, spare-parts), end-of-use returns and end-of-life returns, distribution returns-product recalls (Daugherty et al., 2001; Tonanont, 2009), B2B commercial returns (e.g., unsold products, wrong/damaged deliveries) (Li and Olorunniwo, 2007; Guarnieri et al., 2006), stock adjustments and functional returns (distribution items/carriers/packaging), and manufacturing returns include raw material surplus, quality-control returns and production leftovers/by-products. However, Putthinoi et al. (2015) stressed that there was a very poor reverse logistics of household items. Das and Chaudhari (2015) studies each element of reverse supply chain management activities in terms of time taken and cost incurred in order to identify the activities consuming maximum amount of time and cost.

The reasons for products' return include repair/service codes (factory repair, service/maintenance, agent order error, customer order error (Dissanayake and Singh, 2008), entry error, shipping error, incomplete shipment, wrong quantity, duplicate shipment, duplicate customer order, not ordered and missing part), damaged/defective (damaged, dead on arrival, defective) (Subramaniam et al., 2004), contractual agreements (stock excess, obsolete) and other (freight claim and miscellaneous-customer return/dissatisfaction (Mondragon et al., 2011), inaccurate forecasting, unreasonable pricing, slow information flow, lack of control over return frequency, quantity, and items, etc. (Verstrepen et al., 2007).

What drives the receiver receiving such returns include; *economic gains* (Guo, 2009; Kassem, 2011; Cespon et al., 2009; Erol et al., 2010), *legislation* (environmental legislation, consumer rights) (Geethan et al., 2011; Koetz et al., 2004; Salema et al., 2005; Grafton and Howe, 2008; Govindan et al., 2015), *corporate citizenship* (Brito and Koster, 2003; Ramezani et al., 2013; Agrawal et al., 2015), and *customer service* (Janse, 2008; Yellepeddi, 2007; Dissanayake and Singh, 2008) leading a company to implement reverse logistics. The fulfilment of obligation for environment protection and the improvement of customer service were found to be the driving forces in all the four companies under study (Lau and Wang, 2009). Chan and Chan (2008) found that majority of returned products instead of yielding profits add extra costs.

Explored literature suggests a list of some generic inhibitors which include awareness about reverse logistics, un-quantified reverse logistics costs, lack of reverse chain collaboration, lack of appropriate management systems (Sharma et al., 2011), lack of commitment by top management (González-Torre et al., 2010; Verstrepen et al., 2007; Rogers and Tibben-Lembke, 1999), financial constraints (Ravi and Shankar, 2006), limited forecasting and planning (Abdulrahman et al., 2014), lack of clear return policies and guidelines (Bouzon et al., 2015), company policies (Chan and Chan, 2008), lack of information technology support (Erol et al., 2010; Tan et al. 2003), lack of awareness concerning environmental legislations (Yacob et al., 2012), lack of laws (Lau and Wang, 2009), and differences in EPR between countries affects directly or indirectly the implementation of reverse logistics programs (Janse, 2008). Lack of modern information systems, poor management of intermediaries, and meeting recovery deadline are prime barriers to the implementation of reverse logistics programs (Dissanayake and Singh, 2008). Erol et al. (2010) found out that the most important hindrance coming into the way is the system inadequacies.

Erol et al. (2010) examined the various reverse supply chain practices which included collection/sorting/testing (Schultmann et al., 2003), transportation and distribution (Srivastava and Srivastava, 2006; Lieckens and Vandaele, 2007), warehousing, repair,

refurbish (Rogers and Tibben-Lembke, 2001; Stock and Mulki, 2009), reuse (Sahyouni et al., 2007), remanufacturing (Gandolfo and Sbrana, 2008; Ketzenberg et al., 2004; Blackburn et al., 2004), donate (Stuart et al., 2005), recycling (Tonanont, 2009; Subramaniam et al., 2004; Yang and Wang, 2007), disposal (Verstrepen et al., 2007; Dat et al., 2012), spare parts management, redistribution/resale (Saibani, 2010; Janse, 2008) and the information management (Ferguson and Browne, 2001). Rogers and Tibben-Lembke (1999) considered the common reverse logistics activities as product related (return to supplier, resell, sell via outlet, salvage, recondition, refurbish, remanufacture, reclaim materials, recycle and landfill) and packaging related (reuse, refurbish, reclaim materials, recycle and salvage). Reverse logistics in the pharmaceutical product is different from other common products in that when those products are recalled or returned, they can be repaired, resold, or donated whereas pharmaceuticals, in contrast, are generally destroyed (Kabir, 2013). Koh et al. (2003) mentioned two technology options for bio-medical waste treatment namely incineration technology and non-incineration technology (Hosseini et al., 2015) were very critical about the current status of reverse logistics focus. These researchers admitted that despite a huge body of knowledge on this topic, operational aspects of reverse logistics had veiled certain strategic prerequisites for the success of reverse logistics systems.

Pulansari et al. (2018) acknowledged that the reverse logistics had been successfully implemented in some companies, however, no clear key performance indicator of a successful reverse logistics was provided. Improved customer satisfaction (Janzen and Rosier, 2008; Olorunniwo and Li, 2010), cost containment (Gecker and Vigoroso, 2007; Genchev, 2007; Richey et al., 2005), increased service profitability (Hsu, 2005), increased efficiency and effectiveness (Ritchie et al., 2000; Lee and Lam, 2012), value recovery (Saibani, 2010), improved corporate image (Gandolfo and Sbrana, 2008; Nukala and Gupta, 2007), source of competitive advantage (Jack et al., 2010), environmental and social contribution (Olugu et al., 2010; Huang et al., 2012; Yellepeddi, 2007; Hsu et al., 2016), regulatory compliance (Daugherty et al., 2003), improved information sharing (Soto et al., 2005), improved service quality (Genchev, 2007; Daugherty et al., 2001) are the major benefits of successful execution of reverse logistics process. Gecker and Vigoroso (2007) found improved customer satisfaction/retention being the most significant benefit realised by all the studied industries except Telecom/utilities.

3 Objectives and methodology

This section contains the following three subsections namely research objectives, research hypotheses and research design and sampling plan.

3.1 Research objectives

Within their limited reach, researcher could not find any single study dealing with different issues of reverse logistics in one place and that too, in the context of pharmaceutical supply chains in operating in India. This scenario indicates a scope to study the subject further. Hence, the researcher has framed the following objectives for this study in the context of pharmaceutical supply chains in India.

- To identify and examine reverse logistics practices.
- To establish drivers and barriers of reverse logistics.
- To evaluate the reverse logistics performance.

The idea behind these objectives was to identify and establish the various reverse logistics practices, various drivers and barriers of reverse logistics, and the reverse logistics performance. Having identified and established these, the researchers are interested to extend this study to study an interaction among these factors.

3.2 Research hypotheses

The following hypotheses are formulated and tested while working on the above-mentioned objectives.

$H_0$1 Barriers are equally deterrent for all sizes of manufacturers (pharmaceutical companies) in successful implementation of their reverse logistics.

$H_0$2 Performance of reverse logistics is perceived equally by all sizes of manufacturers.

Here the researchers aim to examine whether the manufacturers perceive all the obstacles equally hindering their operations irrespective of their size and whether their perceived performance is equal regardless of their sizes.

3.3 Research design and sampling plan

The nature of this study suggests a descriptive research design for this research (Malhotra and Dash, 2007). Using referral sampling technique using method (Richey et al., 2005), a structured questionnaire was administered over 102 managers/owners considering it as an average sample size (Tull and Hawkins, 2005) based on the previous similar studies (Breen, 2006; Skinner et al., 2008; González-Torre et al., 2010; Erol et al., 2010). Out of which, the researcher succeeded in getting only 65 usable responses after editing the received 72 responses. As a part of pilot survey for improving the questionnaire, the researcher contacted ten experts; seven from industry and three from academia. Since the objectives were related to identification and establishment of the reverse logistics practices, drivers, barriers and performance, the data was analysed using descriptives, weighted scores analysis, two independent sample t-test, ANOVA and factor analysis.

4 Data analysis and interpretation

This section contains the following three subsections namely reverse logistics practices, drivers and barriers for reverse logistics and perceived performance of reverse logistics.

4.1 Reverse logistics practices

Having faced with the excess stock of medicines for one or more reason(s), the manufacturers opt for one of the five options; *redistribute if non-defective*, *redistribute*

after required refurbishing, *donate if safe*, *recycle for recovery* and *dispose of*. However, *redistribute as it is if non-defective* emerged as the most frequent practice and dispose of is a choice only when these medicines have no recoverable value (Table 1). To know the overall frequency of its use, researcher has calculated the weighted score for each practice using same following formula.

$$WSi = \sum i \sum Pj * Rj]$$

where WSi is the weighted score of i^{th} practice, Pj is its rank (1 to 4) given by R number of respondents.

Table 1 Preference among reverse logistics practices

Manufacturers practices	*f1*	*f2*	*f3*	*f4*	*f5*	*Weighted score*	*Rank*
Dispose of	0	0	0	0	65	325	5
Donate	1	1	21	42	0	234	4
Recycle for recovery	2	4	36	23	0	210	3
Redistribute after required refurbishing	14	43	8	0	0	124	2
Redistribute as it is if non-defective	48	17	0	0	0	82	1

Note: f1 – no. of respondents ranking 1, f2 – no. of respondents ranking 2; f5 – no. of respondents ranking 5.

4.2 Drivers and barriers for reverse logistics

Respondents were also asked about the reasons for their engagement in reverse logistics practices. Results show that customer satisfaction and competitive factors are stronger than any other reason (Table 2). Social responsibility factors are the least cited. However, for ideal manufacturing practices, all the four factors should mean almost same.

Table 2 Importance of reverse logistics drivers

Reverse logistics drivers for manufacturers	*Responses (approx. %)*
Customer satisfaction	62 (95%)
Competitive factors	61 (94%)
Regulatory factors	46 (71%)
Social responsibility factors	39 (60%)

Using a five point Likert scale, researchers also asked about their concerns regarding the successful and result-oriented execution of reverse logistics program. The *lesser predictability about returning medicines* and the *lack of commitment of top management* emerged as the most significant barriers (Table 3).

After checking the sample adequacy (KMO = 0.729) and other important statistics (approx. chi-square statistic = 239.734, df = 21, sig. = 0.00), researchers conducted the factor analysis (principal component analysis) which reduced these seven variables into two reliable factors ($\alpha > 0.75$) which accounted for a cumulative 74.670% of the total variance. Named as *non-financial* and *financial barriers*, the former consists of the concerns like resource constraints, lack of commitment of top management, poor

enforcement of government regulations, poor coordination among various entities of supply chain and lesser predictability about returning medicines while the later includes the higher costs and negligible gains (Table 4).

Table 3 Importance of reverse logistics barriers

Reverse logistics barriers for manufacturers	*Mean*
Resource constraints	3.25
Lack of commitment of top management	4.18
Poor enforcement of government regulations	2.95
Higher costs	1.85
Negligible gains	1.51
Poor coordination among various entities of supply chain	3.83
Lesser predictability about returning medicines	4.38

Table 4 Classification of reverse logistics barriers

Factors	*Variance explained*	*Factor loading*	*Cronbach's α*
Non-financial barriers	48.788		.878
Resource constraints		.875	
Lack of commitment of top management		.874	
Poor enforcement of government regulations		.868	
Poor coordination among supply chain members		.754	
Lesser predictability about returning medicines		.749	
Financial barriers	25.882		.767
Higher costs		.934	
Negligible gains		.934	

The number of samples (the categories of independent variables) was more than two which required the researchers to go for one way ANOVA.

It is evident from Table 5 that manufacturers perceive almost same about financial as well as non-financial barriers as their individual mean scores for the two types of barriers do not vary significantly.

Table 5 Average perceived differences about barriers

Barriers for manufacturers		*Sum of squares*	*df*	*Mean square*	*F*	*Sig.*
Non-financial obstacles	Between groups	1.216	2	.608	.525	.594
	Within groups	71.845	62	1.159		
	Total	*73.062*	*64*			
Financial obstacles	Between groups	4.034	2	2.017	3.000	.057
	Within groups	41.681	62	.672		
	Total	*45.715*	*64*			

4.3 Perceived performance of reverse logistics

Based on the highest mean values, one may deduce that manufacturers find the execution of their reverse logistics programs as 'helpful in image building'. However, the otherwise expected performance parameter 'regulatory compliance' seems secondary which shows that there are certain factors other than the regulatory compliance which are driving the manufacturers to get involved in reverse logistics process (Table 6).

Table 6 Perceived reverse logistics performance

Reverse logistics performance parameters	*Mean*
Cost containment	3.98
Leads to profitability	3.85
Minimises total cycle time	2.86
Provides valuable information	3.08
Compliant to government regulations	3.98
Satisfy supply chain partners	3.97
Helps in image building	4.25

Table 7 Classification of performance parameters

Factors	*Variables*	*Variance explained*	*Factor loading*	*Cronbach's α*
Non-financial performance	Satisfy supply chain partners	40.631	.818	.818
	Helps in image building		.782	
	Provides valuable information		.766	
	Minimises total cycle time		.704	
	Compliant to government regulations		.653	
Financial performance	Leads to profitability	29.323	.928	.896
	Cost containment		.921	

Having checked the sample adequacy (KMO = 0.760) and other important statistics (approx.chi-square statistic = 202.007, df = 21, sign. = 0.00), researchers again conducted factor analysis (principal component analysis) to reduce the seven performance parameters into two reliable factors ($\alpha > 0.80$). The two factors extracted so namely non-financial and financial performance account for a cumulative 69.954% of the total variance. Non-financial performance parameters consist of *satisfy supply chain partners*, *helps in image building*, *provides valuable information*, *minimises total cycle time and compliant to government regulations* while the financial performance parameters include *leads to profitability* and *cost containment*.

The performance related hypothesis was tested into two parts using one-way ANOVA-test; one for non-financial performance parameters and other for financial performance parameters. Non-rejection of these null hypotheses (Table 8) means that all the three respondent classes have almost same opinion about these performance parameters.

Table 8 Average perceived differences about performance

Performance vs. size		*Sum of squares*	*df*	*Mean square*	*F*	*Sig.*
Non-financial parameters	Between groups	1.074	2	.537	.630	.536
	Within groups	52.836	62	.852		
	Total	*53.910*	*64*			
Financial parameters	Between groups	.026	2	.013	.015	.985
	Within groups	52.259	62	.843		
	Total	*52.285*	*64*			

One or more items were excluded from final analysis and discussion at this stage as these were just playing the role of fillers and connectors.

5 Discussion

In this section, findings are subordinated with the conclusions, necessary recommendations and implications. The flow of the discussion strictly follows the sequence of objectives and questions asked in the research instrument (attached).

The accumulation of unused/unsold stocks of medicines at manufacturers' end requires a system which could redistribute or reverse distribute such stock at appropriate time. The customers' return comes out to be the prime reason for the occurrence of unused stocks of medicines at manufacturers' end. Obviously, the customers for the manufacturers are in fact their business partners or sales channel members like dealers, distributors, carrying and forwarding agents and stockists. Therefore, channel members as well as manufacturers need to examine the sales practices and investigate the reasons behind the creation of such and devise appropriate ways to minimise it.

For *regulatory* and *operational reasons*, most of the manufacturers adopted the safest disposal method-*land filling after treatment* which somehow corroborates the Walther and Spengler (2005). However, there are also manufacturers who are practicing other less safe disposal method which necessitates the regulatory authorities to be extra careful for the larger interest of the society. Emergence of *competitive reasons* as a driving force is in congruence with the outcomes of Anne et al. (2015). *Social responsibility* as a reason for the adoption of a particular disposal method and as a driving force behind the manufacturers' involvement in reverse logistics activities is least cited. It indicates that there is a weak sense of ownership and accountability among the manufacturers towards the society. Hence, besides ensuring impeccable regulatory compliance, government may also re-orient the manufacturers, encourage and motivate them by introducing and implementing certain incentive-based system.

As discussed in the previous section that *lesser predictability about returning medicines* and the *lack of commitment of top management* may be two barriers at least for some of the manufacturers. The *lack of commitment of top management* as highlighted by Abdulrahman et al. (2014) as well may be one of the strongest reasons leading to the lack of advance information and communication technology which ultimately results into the poor coordination among various entities of supply chain. This poor coordination may further expected to be a key reason resulting into the lesser predictability of returning

medicines. Given the increased *commitment of top management* and ICT advancement alone being properly taken care of as the first step, the pharmaceutical companies may found their reverse logistics operations improved to certain extent.

Manufacturers' supply chains were perceived as underperforming on two parameters namely *minimisation of total cycle time* and *generation of valuable information for manufacturers*. Their underperformance on these two parameters may impact their performance on other parameters in general and the overall effectiveness in particular. In addition to this, the non-generation of any additional information for the manufacturers is something which should be seriously checked. Therefore, it is highly recommended that the manufacturers should take care of such issues before they create a big problem.

One of the most noticeable parts of this study has been the results of hypotheses testing. It is really worth thinking that the perception of various groups of manufacturers does not vary about the barriers to reverse logistics implementation or about their performance. In other words, irrespective of their size, resource base or worth, they feel about these issues indifferently. However, it is generally expected that as the firms grow in size and resources, their processes and activities get standardised, systematised, environmentally conscious and socially accountable. Hence, it may be deduced here that the government, regulatory bodies as well as the pharmaceutical companies must join hand in hand to work towards the promotion of a sustainable development state where the manufacturers could also make fair money and the social objectives of the states are also achieved.

6 Limitations of the study and directions for future research

The major limitations of this study include the non-probabilistic sampling approach, determination of sample size through unscientific approach, geographical limitations, time and budget. Future researchers may address these limitations in their studies. The researchers plan to extend this study to study the interaction among these established practices, barriers, drivers and the overall performance. Other researchers may extend it by taking other industry or taking other region, modifying the scope of this study or choosing to make any comparative kind of study.

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Appendix

Questionnaire

Dear Respondent,

In the context of this current study, reverse logistics means "the process of planning, organising, implementing and controlling the efficient and cost effective backward flow of medicines and related information from the point of consumption to the point of origin for the purpose of complying with the legislation, recapturing value, improving the company's image or the proper disposal."

Now, I humbly request you to extend your kind favour by sparing few of your precious minutes and filling your responses against each question. I will be highly grateful for your kind assistance.

Q1 With respect to the stock of unwanted medicines, rank the following practices on the basis of your preference where 1-most preferred and 5-least preferred. No two items should get the same rank.

a)	Redistribute as it is if non-defective	b)	Redistribute after required refurbishing
c)	Donate	d)	Recycle for recovery
e)	Dispose of		

Q2 What % of medicines annually sold by you is received back by you?

a)	< 2	b)	2–4
c)	4–6	d)	≥ 6

Q3 At times, you have excess stocks of medicines for various reasons like production defects, supply error (Supply of undesired medicines, defective medicines, expired medicines, etc.), customer returns and others (like documentation error, launch of better substitutes, withdrawal, overstocking, etc.). Rank among the following reasons as per your experience about such stocks on the basis of a scheme where 1 stands for most important, 2-important, 3-somewhat important and 4-least important.

a)	Production defects	b)	Supply error
c)	Customer returns	d)	Others

Q4 Which of the following disposal methods is mostly practiced by you?

a)	Engineered landfill	b)	Sewer after treatment
c)	Controlled incineration		

Q5 Why do you use this method? (You may tick more than one)

a)	Strategic reasons	b)	Operational reasons
c)	Regulatory reasons	d)	Social responsibility reasons

Q6 What do you think about the following disposal methods with respect to environment? Rate your opinion on a Likert five point scale where 1-most unsafe, 2-unsafe, 3-neither unsafe nor safe, 4-safe and 5-most safe.

Disposal methods	*1*	*2*	*3*	*4*	*5*
a) Engineered landfill					
b) Sewer down after treatment					
c) Controlled incineration					

Q7 Which factors are acting as a driving force for your decision to implement reverse logistics in your company?

a)	Customer satisfaction	b)	Competitive factors
c)	Regulatory factors	d)	Social responsibility factors

Q8 Rate the following barriers (deterring you in successfully implementing RLP) in terms of their effectiveness on a five point scale where 1 stands for most ineffective, 2-ineffective, 3-Neither ineffective not effective, 4-effective and 5 stands for most effective?

Barriers	*1*	*2*	*3*	*4*	*5*
a) Resource constraints					
b) Lack of commitment of top management					
c) Higher costs					
d) Negligible gains					
e) Poor enforcement of government regulations					
f) Poor coordination among various entities of supply chain					
g) Lesser predictability about returning medicines					

Q9 Show your agreement or disagreement regarding the following statements on a five point scale where 1 stands for strongly disagree to 5 for strongly agree.

Statements	*1*	*2*	*3*	*4*	*5*
a) Our RL process results in the cost containment.					
b) Our RL process contributes significantly to the overall profits of the company.					
c) Our RL process minimises the total cycle time.					
d) Our RL process provides us valuable information.					
e) Our RL process is compliant to government regulations.					
f) Our R L process leads to the satisfaction of our supply chain partners.					
g) Our RL process proved helpful in image building.					

Respondent's profile

A. Total work experience (years)

a) < 10 c) ≥ 10

B. Approximate annual turnover of your company (Rs in Crores)

a) < 1,000 b) 1,000–2,000 c) ≥ 2,000