# Improving reverse logistics performance in e-retailing: a consumer's perspective


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**Abstract.** Unlike conventional shopping, in online shopping, consumers make buying decisions based solely on pictures and descriptions provided in the website. Unclear description of the goods, images and specifications might fail to please the consumer which will eventually cause high return rate. E-retailers need to consider their return policy and reverse logistics strategy, since e-retailer's return policies play major role in gaining gain consumer's intention. This study is aimed at studying factors that play a role in determining the strategy and performance of the company's reverse logistics of return products, based on the consumer's perspective. On the e-retailer's side, processing the returned item will generate a significant cost to manage their reverse logistics. This study was conducted in two stages. At first stage, factors which drive consumers to return the purchased item were evaluated. Then, in the next stage, e-retailer's efforts to improve their reverse logistics performance were evaluated. This paper utilizes the Interpretive Structural Modeling (ISM) methodology to understand e-retailing reverse logistics performance based on consumer's perspective. This research provides valuable information for e-retailing to design their reverse logistics strategy.



**Keywords:** reverse logistics, logistics performance, e-retailing, interpretive structural modeling


## 1. INTRODUCTION

Over the past decade, the Internet has developed as a vast global marketplace for the exchange of goods/services. E-commerce phenomenon has drawn more retailers to join the e-marketplace and it has drawn a positive response from the consumers due to its convenience. Transactions in e-commerce do not require a direct meeting between retailers and buyer in order to negotiate, pay and deliver goods. E-commerce growth has changed people's behavior in purchasing goods. However, in online trade, consumers who are willing to purchase products cannot directly and physically inspect the product. Thus, the consumer make purchasing decisions based solely on information and descriptions provided by e-retailers in the website.

Since consumer lost the benefits of physically inspecting the products, which may lead to consumer dissatisfaction, product return is considered essential in fulfilling customer satisfaction (Pei et al., 2014). Some literatures suggest that in B2C e-commerce, return policy plays important role in consumer satisfaction, especially for e-retailers. Wood (2001) found that e-retailer's returns policy has a significant effect on consumer order decision and shows that the return leniency can increase consumer expectation of pre-receipt product quality. It has been argued that returns are more relevant in online retailing than offline retailing given that consumers do not have the opportunity to physically examine the product (Dholakia et al., 2005).

Most reference which studied the relation between e-retailers return policies and their profits showed that return of product from customers enables the merchant to recapture higher value, enhances customer relationship, and play role as strategic marketing (Hsu, 2005). Although not widely mentioned in literature, reverse logistics management is an important feature of e-business. However, managing return product is not an easy task. It involves complex returns management process. Returns management is defined as a set of activities associated with returns, planning the reverse logistics issues, and avoidance that are managed within the firm and across key members of the supply chain (Rogers et al., 2002). In e-retailing business, product returns can be categorized as commercial returns, product recalls, warranty returns, manufacturing returns, service returns and end-of-use and end-of life returns (de Brito and Dekker, 2002).

Therefore, e-retailer abilities to efficiently and quickly handle return product is considered critical. The challenge faced by e-retailer in managing return product, is in how to set up infrastructure and procedures for reverse logistics. Reverse logistics is defined as a process in which a producer, supplier or retailer systematically accepts previously shipped parts or products from the point of consumption for resealing, recycling, remanufacturing or disposal (Dowlatshahi, 2000). An effective reverse logistics process in e-retailing is believed will affect direct benefits, such as improved customer satisfaction, decreased resource investment levels, and distribution cost (Pei, at al., 2014).

The objective of this paper is to understand the consumer necessity in returning purchased product. Based on those factors, a model for improving e-retailer's reverse logistics performance is developed. Factors affecting return product operations are analyzed using Interpretive Structural Modeling (ISM) technique, a tool to structure the collective knowledge on a sequence. It also identifies the areas of improvement in the reverse supply chain operations in the selected domain. This research provides a guide for e-retailers management in taking appropriate action to improve their reverse logistics performance.

## 2. LITERATURE REVIEW

Returns are an essential part of e-retailing because customers can't check the item out before making a purchase decision. Thus, for e-retailers, whose product return flow is usually diversified depending on consumer's shipping location, the process of managing product return services requires a broad knowledge and understanding of customer base characteristics and behaviors (Blumberg, 1999). Most e-retailers are struggling with issues associated return systems that increase visibility and speed of the return process to maximize asset recovery for commercial returns, especially for seasonal or short life-cycle products and processing costs that are difficult to manage (Toktay, 2004).

Besides defective and damage products, returns were driven by other factors, such as product representation often do not accurately or effectively represent a product's color, size, or features, leading consumers to feel that the product they purchased is not the product they received. Retailer's return policies can have a significant impact on the consumer's willingness to make returns, due to issues of convenience, and cost (O'neill and Chu, 2001). Returning mismatched merchandise can be costly for consumers. First, there is the opportunity cost of time associated with the return process. Second, there is the disutility associated with not having a matching product for the duration of time from the initial purchase till the return. Third, not all return policies are lenient.

Online return rates will grow as consumers become more comfortable with online shopping experience, making the returned product problem more noticeable. Moreover, return policies can differ in terms of number of restrictions imposed upon consumers. First, laws and regulations to standardize the protection of the consumer's right. Second, e-retailers realize the importance of managing their reverse logistics to improve customer satisfaction and to enhance competitive advantage. Third, the asymmetric information, where consumers can only see the electronic images or statement of the reference products, which cause the consumers cannot fully understand the characteristics of the purchased products, has also increased the possibility of misleading (Jian Xu, 2009). Bower and Maxam (2012), compare retailer's return policy between the normative assumptions about consumers that underlie equity-based return shipping policies with the more realistic, positivist expectations as predicted by attribution, equity, and regret theories. Return of products for the consumer for non-performance, upgrade/modification, repairs, recycling and mismatched items are certain key situations where reverse logistics are important (Abas & Farooquie, 2013)

Reverse logistics can be defined as the processes of receiving returned components or products for the purpose of recapturing value or proper disposal. In Industry, a lot of firms have declared the successful implementation of reverse logistics and get many benefits. Meanwhile, in e-commerce, reverse logistics process can be extremely complicated, it involves both economic and customer service issues. It also combines relevant policies, information technology systems and coordination among supply chain members. Moreover, each return may require different treatment, depending on consumer location, product problems, product categories, or suppliers Hsu (2005). Stock (2001) investigates reverse logistics as a way to increase revenues, increase consumer satisfaction, reduce costs, and facilitate companies to gain market advantage. Moreover, better integration between the reverse logistics and appropriate information system will provide an up-to-date information among supply chain members. Hsu (2005) divides reverse logistics performance into two dimensions: proactive and reactive dimensions that influence company reverse logistics performances, which finally conclude that in managing return e-tailers can better focus on developing distinctive capabilities to sustain competitive advantages.

Effective reverse logistics can result in direct benefits, including decreased inventory levels, reductions in storage, transportation, and distribution costs as well as improving customer satisfaction (Daugherty et al., (2005). They also measured the performance of reverse logistics in terms of improved customer relations, higher profitability, product recovery, and reduced inventory cost and investigated the impact of information support on operating/financial and satisfaction performances of reverse logistics with both economic and service quality performances. Sharma, et al (2011) investigates the difficulties in implementing successful reverse logistics, which caused by management inattention, product quality issue, lack of appropriate performance management system, lack of personal resources, company policies, administrative and financial burden of tax, these variables are key barriers in the successful implementation of effective reverse logistics.

Interpretive Structural Modeling (ISM) is a computer-assisted learning process that allows individuals or groups to develop a map of the complex relationship between various criteria involved in a complex environment. ISM is often used to provide a basic understanding of complex situations, and to develop measures to solve the problem ISM is an interactive learning process where a set of criteria are arranged in a comprehensive model, then determining the order and purpose to the complex relationships between criteria in the system (Pfohl et al., 2011). ISM method transforms unclear and poorly articulated models of systems into visible, structured and well-defined models which useful for many purposes. The basic idea of ISM, is to use an experienced expert and using their individual knowledge thorough extracted from the process of group discussion or an analysis to interpret a complicated system into several sub-systems and construct a multi-level structural model (Gorane & Kant, 2013).

Pramod et al., (2012) analyze the deployment of ISM in Supply Chain Management, and found that ISM can be used for modeling supply chain integration. Ravi (2005) studied ISM implementation to explore the variables in reverse logistics. Past research on the relationship risks in the supply chain has been done by Pfohl et al (2011), they discuss about how to model the structure of the relationship between risks in the supply chain using ISM method by identifying element risk using Supply Chain Management Process. Implementation of the results of research this were conducted using case studies in German industrial company and in the trade company. The results of the two case studies has been proven that the ISM method is a powerful method for structuring the supply chain risk in an easy way and with a distributed approach which can also be performed on the steps in the process in several stages in manufacturing.

## 3. REVERSE LOGISTICS PERFORMANCE

Reverse logistics performance can be measured based on environmental issues, processing costs, communications, top management support, customer support, and operation timing and validated program. Research in reverse logistics performance research is lacking in determining key factors of customer preference in a reverse logistics, which will impact customer relations and the firm’s reputation. Thus, the development of reverse logistics and its integration throughout the supply chain member should be considered priorities. Determining customer’s preference is important and it can be a key to aligning reverse logistics processes to meet consumer expectation, which may be different than what the company was initially planned. Based on literature, several factors affecting reverse logistics performance are provided in Table 1.

Table 1. Literature review of ISM in logistics management.

| Authors | Subject | Method | Factors |
|---|---|---|---|
| Sharma et. Al., (2011) | Reverse logistics barriers in Indian industries | Interpretive Structural Modeling | Lack of awareness, management inattention, product quality, financial constraint, personal resources, performance management system, information technology system, company policy, legal issue, forecasting and planning. |
| Ali (2015) | Pharmaceutical industry | Interpretive Structural Modeling | Lack of regulation enforcement, public awareness regarding reverse logistics, lack of economic support from government, lack of dedicated workers and facilities for handling returns, long processing time. |
| Daugherty et al (2005) | IT capability | Structural Modeling | Resource Commitment, IT Capability, Economic Performance, Service Quality |

## 4. INTERPRETIVE STRUCTURAL MODELING

ISM is used to understand the behavior of the system as a whole after the identification of relationships between sub-element and element of the system. The various steps, of the development of an ISM model, are illustrated below:

1. First, identify and define the criteria and sub-criteria whose relationships between them, will be modeled. Element and sub-element of return process are obtained from literature review and discussion with the experts.
2. Analyze the contextual relationship among sub-element (sub-element i) and their sub-criteria (sub-element j). Contextual relationships are obtained from expert's opinions with following symbols:
   V: sub-criteria i support the existence of sub-criteria j, but not vice versa
   A: sub-element j support the existence of sub-criteria i, but not vice versa
   X: sub-criteria i and j are mutually supportive
   O: sub-criteria i and j are not interconnected
   Structural Self Interaction Matrix (SSIM) is then made based on contextual relationships.
3. SSIM is transformed into a binary matrix (reachability matrix) by substituting V, A, X, O symbols, with code 0 and 1, which corresponds to the following rules:
   - If the sub-element (i, j) on SSIM is filled by V, then the sub-element (i, j) in reachability matrix becomes 1 and sub-criteria (j, i) becomes 0.
   - If the sub-element (i, j ) on SSIM is filled by A, then the sub-element (i, j) in reachability matrix becomes 0 and the sub-element (j, i) becomes 1.
   - If the sub-element (i, j) the SSIM is filled by X, then the sub-element (i, j) in reachability matrix becomes 1 and sub-criteria (j, i) becomes 1
   - If the sub-element (i, j) on SSIM is filled by O, then the sub-element (i, j) in reachability matrix becomes 0 and the sub-element (j, i) becomes to 0.

   Contextual transitivity relationships were then checked to obtain the final reachability matrix.
4. From the final reachability matrix, reachability set and Dependence sets are derived. The reachability set consists of the factor itself and other factor which it may impact. The Dependence set consists of the factor itself and other factor which may impact it. Then, intersection of these sets is derived for all the factors, to find the top-level factors. Once the top-level factor is identified, it is removed from consideration. The same process is repeated until the level of each factor is found.
5. The structural model was made of the final matrix reachability. If there is a relationship between sub-criteria i and j, then the arrow are made. This image is called as a digraph. After transitivity eliminated, digraph converted into a model based on the ISM.

In order to fully understand target consumers, e-tailers must understand consumers online purchase behavior, that might influenced by several factors, such as product related problem, transaction process, and consumer characteristics issues. There also a gap between consumer expectation and management's perception. First, management cannot fully understand what features represent high quality to consumers, what features e-retailers must have in order to meet consumer needs, or what levels of performance are expected to consumers. Second, there is a gap between management insight of customer's definition of quality and the information given to the service provider. Last, there is a gap between service delivery specifications and the actual service delivery (Kang & Johnson, 2009).

There are a limited number of researches evaluating the consumer perspectives criteria on e-retailers return/ reverse logistics. The available literature on customer perspectives aspects is mainly focused on return policy leniency and how it affects consumer's purchase decision. Based on literature review and discussion with expert who work in e-commerce and online business, reverse logistics performance in e-retailing, can be considered based on consumer insight and e-retailers effort in managing their reverse logistics. Thus, the criteria used in this research was divided into 2 major aspects, based on consumer insight of what they expect on return process and based on e-retailers reverse logistics processing, provided in Table 2.

Table 2. Criteria

| | | |
|---|---|---|
| I | Consumer insight | 1. Online interactivity between buyer and seller |
| | | 2. Perceived product quality |
| | | 3. Accurate information and product description |
| | | 4. Accurate and reliable product delivery system |
| | | 5. Easy accessibility (navigation, and search of products and services) |
| | | 6. Simple and unambiguous return process |
| | | 7. Return policy leniency |
| II | E-retailers Reverse logistics processing | 8. Personnel awareness, |
| | | 9. Management attention, |
| | | 10. Product quality, |
| | | 11. Financial constraint, |
| | | 12. Reverse logistics personal resources, |
| | | 13. Performance management system, |
| | | 14. Information technology system, |
| | | 15. Company policy on reverse logistics |

Table 3. Structural self-interaction matrix (SSIM)

| No | Criteria | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Online interactivity between buyer and seller | | V | V | O | X | A | O | A | A | O | O | A | X | A | A |
| 2 | Perceived product quality | | | A | O | O | O | O | O | A | A | O | O | A | A | O |
| 3 | Accurate information and product description | | | | O | A | O | O | A | A | O | O | O | O | A | A |
| 4 | Accurate and reliable product delivery/return system | | | | | O | O | V | O | A | O | O | A | V | A | A |
| 5 | Easy accessibility | | | | | | V | X | A | A | O | O | A | A | A | A |
| 6 | Simple and unambiguous return process | | | | | | | A | A | A | O | A | A | V | A | A |
| 7 | Return policy leniency | | | | | | | | V | A | A | A | A | A | A | X |
| 8 | Personnel awareness, | | | | | | | | | A | V | A | A | V | V | A |
| 9 | Management attention, | | | | | | | | | | V | X | X | A | V | V |
| 10 | Product quality, | | | | | | | | | | | A | A | O | O | O |
| 11 | Financial constraint, | | | | | | | | | | | | V | V | V | A |
| 12 | Reverse logistics personal resources, | | | | | | | | | | | | | V | V | A |
| 13 | Performance management system, | | | | | | | | | | | | | | X | A |
| 14 | Information technology system, | | | | | | | | | | | | | | | A |
| 15 | Company policy on reverse logistics | | | | | | | | | | | | | | | |

Table 4. Final reachability matrix

| No | Criteria | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | Driving Power | Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Online interactivity between buyer and seller | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 5 | 7 |
| 2 | Perceived product quality | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 9 |
| 3 | Accurate information and product description | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 9 |
| 4 | Accurate and reliable product delivery/return system | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 8 |
| 5 | Easy accessibility | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 8 |
| 6 | Simple and unambiguous return process | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 8 |
| 7 | Return policy leniency | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 6 | 6 |
| 8 | Personnel awareness, | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 8 | 4 |
| 9 | Management attention, | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 12 | 1 |
| 10 | Product quality, | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 3 | 8 |
| 11 | Financial constraint, | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 9 | 3 |
| 12 | Reverse logistics personal resources, | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 11 | 2 |
| 13 | Performance management system, | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 8 | 5 |
| 14 | Information technology system, | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 9 | 3 |
| 15 | Company policy on reverse logistics | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 11 | 2 |
| Dependence power | | 10 | 7 | 6 | 5 | 9 | 8 | 10 | 6 | 4 | 6 | 2 | 3 | 8 | 7 | 3 | 94 | |
| Rank | | 1 | 4 | 5 | 6 | 2 | 3 | 1 | 5 | 7 | 5 | 9 | 8 | 3 | 4 | 8 | | |

SSIM was discussed between experts and practitioner who work in big e-retailers company and frequent online consumers. During discussion step, group members were consulted to understand ISM and the direction of contextual relationship among reverse logistics management criteria. Consultation and discussion with those respondents, helped in identifying the relationships among identified criteria. Based on their responses, the final SSIM was constructed and presented in Table 3.

Afterward, SSIM was transform into binary matrix, in order to build reachability matrix. Herein, driving power and dependence power were calculated for each criterion. The driving power of a criterion is derived by summing up the number of ones in the rows, and the dependence power is derived by summing up the number of ones in the columns. Then, criteria were ranked based on their sum of driving and dependence power. Final reachability matrix is presented in Table 4.

Table 5. Level partition of driver

| No | Criteria | Reachability set | Dependence set | Interaction set | Level |
|---|---|---|---|---|---|
| 2 | Perceived product quality | 2 | 1,2,3,9,10,13,14 | 2 | I |
| 1 | Online interactivity between buyer and seller | 1,2,3,5,13 | 1,2,3,5,6,8,9,12,13,14,15 | 1,2,3,5,13 | II |
| 3 | Accurate information and product description | 2,3 | 1,3,5,8,9,14,15 | 3 | II |
| 5 | Easy accessibility | 1,3,5,6,7 | 1,5,7,8,9,12,13,14,15 | 1,5,7 | III |
| 6 | Simple and unambiguous return process | 1,6,13 | 5,6,7,8,9,11,12,14,15 | 6 | III |
| 10 | Product quality, | 2,7,10 | 7,8,9,10,11,12 | 10 | III |
| 4 | Accurate and reliable product delivery/ return system | 4,7,13 | 4,9,12,14,15 | 4 | IV |
| 8 | Personnel awareness, | 1,3,5,6,8,10,13,14 | 7,8,9,11,12,15 | 8 | V |
| 13 | Performance management system, | 1,2,5,7,9,13,14 | 1,4,6,8,9,11,12,13,14 | 1,13,14 | V |
| 14 | Information technology system, | 1,2,3,4,5,6,7,13,14 | 8,9,11,12,13,14,15 | 13,14 | V |
| 7 | Return policy leniency | 5,6,7,8,10,15 | 4,5,7,9,10,11,12,13,14,15 | 5,7,15 | VI |
| 9 | Management attention, | 1,2,3,4,5,6,7,8,9,10,14,15 | 9,11,12,13 | 9 | VI |
| 11 | Financial constraint, | 6,7,8,9,10,11,12,13,14 | 11,15 | 11 | VI |
| 12 | Reverse logistics personal resources, | 1,4,5,6,7,8,9,10,12,13,14 | 11,12,15 | 12 | VI |
| 15 | Company policy on reverse logistics | 1,3,4,5,6,7,8,11,12,14,15 | 7,9,11,15 | 7,11,15 | VII |

Figure 1. Interpretive structural model

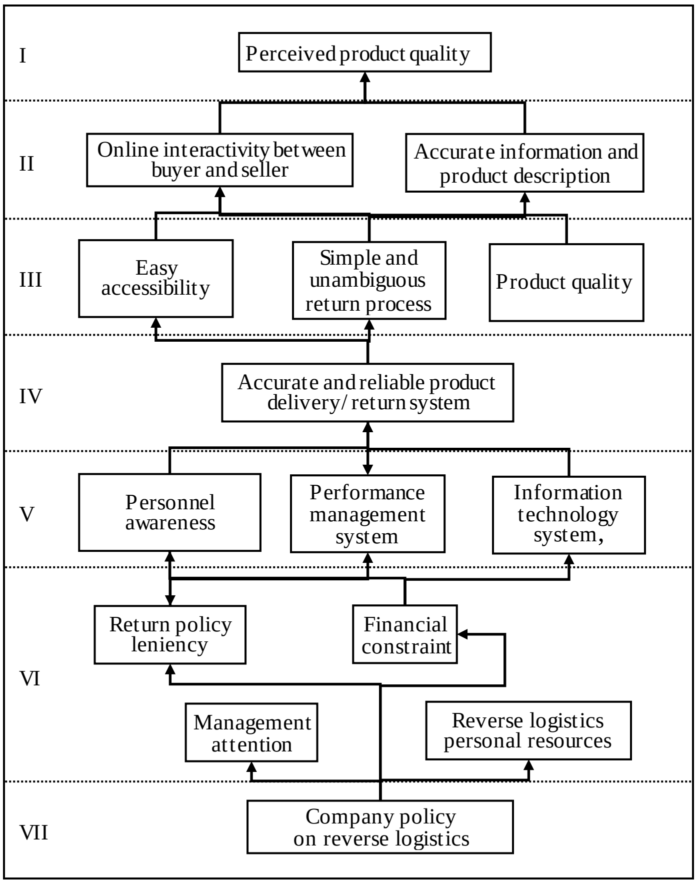
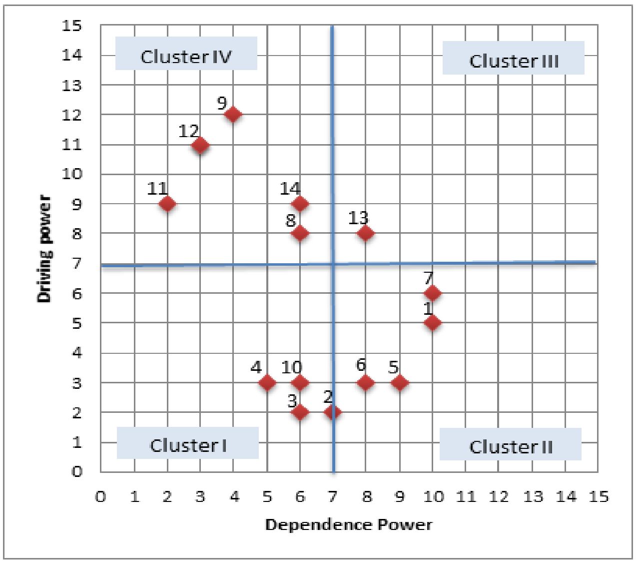



Table 5, shows reachability set and dependence set for each criterion derived from reachability matrix. Reachability set consists of the issue itself and other issues, which it influence and dependence set consists of the issue itself and other issues which may influence it. Intersection of these sets is derived for all the criteria, when reachability sets and the intersection sets are identical, it assigned as the top level in the ISM hierarchy. This procedure is continued until all levels are identified. The elements are arranged graphically in levels and links are drawn as the relationship. Diagraph is used to represent the elements and their interdependence in terms of nodes and edges to build the ISM models. The ISM model in Figure 2, shows that the most important element that enables successful of reverse logistics performance is company policy in reverse logistics as the base of ISM hierarchy, whereas consumer perceived product quality is the most dependent among other elements, and has been appeared on top of the hierarchy.

Figure 2 shows Driving – Dependence Power Diagram. The criteria are classified into four clusters, I: Autonomous, II: Dependent, III: Linkage and IV: Independent. Criteria grouped in the first cluster are relatively connected from the system. These benefits are primarily come at the top of the ISM model. Second cluster consist of dependent benefits that have strong dependence but weak driving power on other benefits. Third cluster has linkage benefits that have strong driving power and also strong dependence. Fourth cluster includes the independent benefits, which primarily lie at the bottom of the ISM model.

Figure 2. Driving Power – Dependence Power Diagram




## 5. DISCUSSION AND CONCLUSIONS

Performance management system, which lies in third cluster, is in need of a special attention and proactive involvement from the management, since this element has high driving power but it also dependent to other benefits. Improvement plan might be derived from third quadrant. E-retailers management may focus on developing their performance management system with clearer goal and measureable target. In this research, an ISM-based model has been developed to analyze the interactions among different criteria. The main objective of this research is to analyze the relationship among various criteria which will help e-retailers management, in order to improve their reverse logistics. This methodology helps to identify the hierarchy of elements for handling different criteria to improve e-retailers reverse logistics process. Furthermore, Hypothesis testing, structural equation modeling and larger case studies may be carried out to validate the ISM model.

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