Factors for Developing Resilient Backhauling Logistics System for Medium Scale Industries

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Abstract— *Logistic system are very complex in nature and a defusing field. The importance of good logistic system is growing tremendously due to its practical importance and robustness. So naturally it becomes an opportunity as well as an issue. There are so many challenges to logistic system. One of the issues that faces is Resiliency in logistic system. Resiliency in logistic sytems is considered as a way to reduce the severity and likelihood of logistic system disruptions. An effective logistic system makes industries competitive and profitable. India is a developing country and most of its industries are small and medium enterprises (SME). Achieving resiliency in logistic system is considered as a best way to reduce the severity and likelihood of logistic system disruption. In India major portion of the cargo is moved by road and train. The Medium Scale enterprises in particular are using road as their logistics medium. Many firms are adopting backhauling in distribution of products. In back hauling the trucks after delivering goods, returning to original destination in empty condition are being hired by another company and they are loading the vehicle with their product and shipped to the destination which will be near or on the way to the starting point of vehicle. This will save one fourth of expenditure in logistics. This thesis finds out the parameters which will cause disruption and aims to model a resilient backhauling logistic system for a medium scale industry under Indian scenario*

Keywords— *resilience, logistic system, backhauling*

Introduction

In developing countries most of its industries are small and medium enterprises (SME). In this paper India is taken for study because India is a fast developing country. . As per the government statistics almost 90% of industries are SME's and their contribution to the total export is 40%. Indian organizations have started collaboration with logistic partners to cope up with the increasing uncertainty of supply networks, globalization of business, proliferation of product variety and shortening of product life cycles. It has been observed that SMEs in general are not able to implement logistics management system (LSM) to its full extent, mainly because they are managed at arm's length by larger customers and have to follow the norms stipulated by the buyer. Studies reveal the lack of performance among SMEs after the introduction of logistic system management as compared with larger companies is because SMEs and large enterprises implement LSM differently, and apparently this difference in implementation is significantly associated with SMEs performance.

A highly integrated logistic network links producers and consumers through multiple transportation modes, including air and express delivery services, freight rail, maritime transport, and truck transport. To serve customers efficiently, multinational and domestic firms provide tailored logistics and transportation solutions that ensure coordinated goods movement from origin to end user through each logistic chain network segment

Logistics services includes inbound and outbound transportation management, fleet management, warehousing, materials handling, order fulfillment, logistics network design, inventory management, supply and demand planning, third-party logistics management, and other support services logistics services are involved at all levels in the planning and execution of the movement of goods

Industries having high potential impact on business performance face high logistic system risks due to its complexity. On analysis it is found that almost 85% of global logistic system had experienced minimum one significant disruption in a year. A number of internal and external forces contribute increase in logistic risks. Studies conducted to locate and find out the risks showed that the operational risks are major contributors. Nobody can predict the possibilities of disruption in supply chains because of its structural complexity. Achieving resiliency in logistic system is considered as a best way to reduce the severity and likelihood of supply chain disruption. Resilience will help to capture the differential and uneven ability of an entity to react, respond and cope with uncertain, disruptive, volatile and rapid change. Resilience has gained attention in countries and regions responding to an ever more diverse array of external shocks and transitions. A better option is to build sufficient resilience on logistics by closely identifying the connected parameters. A resilient logistic system can help an industry to overcome the various risks and to return suddenly from avoidable risk.

Capabilities for building resilient logistics system

The four capabilities to build resilience are visibility, control, flexibility and collaboration. Visibility is the capacity to track and monitor and even foresee the logistic events and patterns. This helps an organization to address the issues in logistic system before becoming a problem. Flexibility is the capability to response quickly to problems without much hike in operational cost. This minimizes the impact of a sudden shift or disruption. Collaboration with others helps to build trust based relationship. Control helps to ensure proper procedures and process which are following in the company by implementing robust policies, control mechanisms. After the serious research conducted in resilience, an initial frame work for a resilient logistic system has developed. They asserted that logistic resilience can be created through four key principles: 1) resilience can be built into a system in advance of a disruption (i.e. reengineering), 2) a high level of collaboration is required to identify and manage risks, 3) agility is essential to react quickly to unforeseen events and 4) the culture of risk management is a necessity. Characteristics such as agility, availability, efficiency, flexibility, redundancy, velocity and visibility were treated as secondary factors.

In India road has become the predominant mode of transportation of freight cargo. An estimation of the modes of movement of cargo highlights that In India nearly 61% of the cargo is moved by road, 30% by rail and rest by airway, pipelines and inland waterways. This is as compared to a 37% share of road in the USA and 22% in China. It is recognized that movement of long haul, bulk traffic by road is less efficient than by rail. In India road freight volumes have increased at a much higher rate than the growth of the road network over the last few years, creating structural issues of capacity and quality. Complex taxation and the use of different road permits/documents in different states impose additional constraints on the movement of freight by road. In the financial year 2009-2010, the total length of toll roads in India was only 8,502.48 kilometers, about 2% of national highways in the country, according to the TCI-IIMC joint study "Operational Efficiency of Freight by Road in India"

1.1. Backhauling in Logistics

One of the new trends in logistics is backhauling. By adapting backhauling a company can save 25% of expenditure in logistics. In backhauling a truck is loaded from a particular place of industry carry the goods to destination like warehouse, depot, or to the consumer. After unloading, the truck has to return empty. If a company utilize this empty truck for the distribution of its product to the original destination that is the vehicle's starting point, the company can save expenditure in logistics in addition to the savings in fuel, reduction in atmospheric pollution, wear and tear of vehicles etc. Many SMEs are adopting this type of logistics system across the world. In India also a lot of companies are employing this method

2. Literature review

Companies can develop resilience in three main ways; increasing redundancy, building flexibility and changing corporate culture. A resilient enterprise can be built by creating redundancies throughout the supply chain. The redundancy helps the firm to continue operation after a disruption sometimes it may be a temporary one and very expensive. When a company increases flexibility in supply chain it can withstand majority of disruptions and better respond to demand fluctuations. After a disruption those companies that recover quickly and even profitably from those that fault is corporate culture. For achieving this they have to communicate the employees continuously. They have to distribute the power to the teams and individuals to take necessary actions.(Yossi sheffi (2005), Building a resilient supply chain, Harward business review) . 2. Resiliency in supply chains is considered as a way to reduce the severity and likelihood of supply chain disruptions (Falasca et al. 2008, Boin et al. 2010). 3. The four pillars of a resilient supply chain are visibility, Flexibility, collaboration and control. (Supply chain resilience 2011, Business continuity institute). 4. Supply chain resilience can be created through four key principles. They are resilience can be built into a system in advance of a disruption , a high level of collaboration is required to identify and manage risks, agility is essential to react quickly to unforeseen events and the culture of risk management is necessity. Supply chain is of different scales for different organizations. This can be supported by the fact that the information has a multiplier role in every sector of an organization. Risks and vulnerabilities are the key concern of organization which is further boosted by the economic crisis and market uncertainties. Resilience is now becoming a new concept and it is different from traditional risk management. (Aleksandar Aleksic et al., 2011). 5. Supply chains face disruptions of various sortsof disruptions (Snyder et al., 2006) and such disruptions have a common phenomenon (Svensson, 2000) like natural disasters, industrial disputes, terrorism (Christpher and Peck, 2004). Dependence on a single supplier, supplier bankruptcy, war, and political instability (Wilson,2007) have all resulted in serious disruptions to supply chain activities. Recent events such as the fuel protests in 2000, foot and mouth disease in 2001 (Peck, 2005) and the hot summer in the UK in 2003, hurricanes Katrina and Rita (Snyder et al., 2006), September 11 terror attack (Sheffi and Rice, 2005) in the USA etc, have demonstrated that a disruption affecting an entity anywhere in the supply chain can have a direct effect on a businesses' ability to continue operations, get finished goods to market or provide critical services to customers (Jüttner et al., 2003). Snyder and Shen (2006) declare that supply chain disruptions can have significant costs (e.g. damage to facilities, inventory, electronic networks, and infrastructure) and subsequent losses due to downtime. Inventory costs due to obsolescence, markdowns and stock-outs can be significant (Christopher and Lee, 2004). Moreover, a company that experiences a supply chain disruption can expect to face significant declines in sales growth, stock returns, shareholder wealth, and customer goodwill (Snyder and Shen, 2006). Therefore, it is critical to account for disruptions during the design of supply chain

networks so that they perform well even after a disruption (Snyder et al., 2006). 6. Although supply chain risk is now firmly on the corporate agenda after a series of catastrophic natural disasters, it is not the only threat that executives and politicians are coming to terms with. Criminals, terrorists, security agencies and so-called hackers are increasingly targeting the information and communications technology (ICT) systems of large corporations and government agencies. The logistics and supply chain industry is finding itself increasingly in the line of fire. 7. Backhauling has become an attractive cost saving technique in logistics. The third party logistics providers should utilize this method for cost reduction.(Machigar Ongtang and Satama Sirivunnabood, 2014

3. Problem definition

India is a developing country and most of its industries are small and medium enterprises. SMEs in India face problems due to the lack of proper identification and utilization of logistics parameters and infrastructure. The medium scale industries use road as logistic medium.   The problem is to identify the parameters which will cause disruption and modeling a resilient logistic system for a medium scale industry under Indian scenario.

3.1. Objective

The method for building resilient logistic system had identified by many researchers. But there is no defined method for calculating the resilience of the logistic system of medium scale industries out of which some of the companies are using backhauling method. So first of all identifying the parameters for disruptions and then find resilience assessment for the system by modeling of a resilient backhauling logistic system for medium scale enterprises in India and thereby we can arrive a solution for developing countries as a whole.

3.2. Factors for disruptions in Indian logistics

The different types of modes for Logistics are Road, Rail, Air Water and Pipeline/cable. In India road has become the predominant mode of transportation of freight cargo.   The major advantages of roadways are cost effective, fast delivery, ideal for short distances and up to national level, ideal for transporting perishables, easy to monitor and locating goods, easy to communicate with driver and ideal for sending couriers.   Small and Medium scale Enterprises are particularly employing this mode. Different types of trucks are used for transporting cargos. They are categorized as mini trucks (small commercial vehicle gross vehicle weight less than 3.5 tones), light commercial vehicles (gross vehicle weight up to 7.5 tones), medium commercial vehicles (gross vehicle up to 7.5 to 16.2 tones), and heavy commercial vehicles (gross vehicle weight more than 16.2 tones). All the above vehicles are having or not having with GPS. So any disruption in this logistics system will seriously affect the performance of the industry. These may also face disruption due to many reasons. They are given in the table - I.

Table -I

Sl .No.	Factors for disruptions
1	Road condition and Traffic jams
2	Break down of vehicles
3	Goods susceptible to damage through careless driving,
4	Natural hazardous and extreme weather conditions.
5	Driving regulations
6	Geographical conditions
7	Administrative delay
8	Political situations
9	Lack of trust with operators.
10	Lack of availability of trucks
11	Financial crisis
12	Attitude of drivers
13	Energy disruptions and fuel price fluctuations
14	On road checking by police, checkpost and other departmental officials.
15	Terrorists attack
16	Road accidents

Inorder to find out the importance of factors listed in the table, a questionnaire was prepared and contacted various firms which are arranging trucks to various industries for back hauling logistic system.

3.3. Questionnaire.

The questionnaire was prepared to identify the parameters for disruptions in out-bound logistics system and for modeling a resilient backhaul logistics system. This consists of three categories. They are sales officials, service providers and operators of logistic system of an organization.   The questionnaires were supplied to five sales officials, four service providers and four operators of logistics for each organization. There are 27 questions are in the questionnaire. All are of five point scale. For analysis three companies were selected across from Kerala. Only a part of the questionnaire is shown below due to space limitation.

MODELLING OF RESILIENT BACKHAULING LOGISTICS FOR SMALL AND MEDIUM SCALE ENTERPRISES

This questionnaire is submitting before you as part of my M.Tech project /thesis work to collect valuable data regarding logistics system in your organization. The thesis is intended to

identify the parameters for disruptions in out-bound logistics system and for modeling a resilient backhaul logistics system

Kindly answer the following statements about the causes of disruptions in backhauling logistics which are relevant to your firm, will help to complete thesis.

STUDY OF OUT- BOUND LOGISTICS SYSTEM
A. SALES OFFICIALS

1. Whether Backhauling is used for out bound logistics in your firm.

☐ No ☐ sometimes ☐ frequently ☐ most frequently

☐ always

2. Number of backhauling logistics providers of your firm.
☐ 0 ☐ 1-2 ☐ 3-4 ☐ 5-6 ☐ 7-8 ☐ >8

3. Percentage of savings by using backhauling.
☐ 0 ☐ 1-25 ☐ 26-50 ☐ 51-75 ☐ 76-100

4. The regions where backhauling logistics is required.
☐ Inside state ☐ south India ☐ North India
☐ Eastern India ☐ Western India

5. Lead time delay in getting vehicle from service providers in days.
☐ 0 ☐ 1-2 ☐ 3-4 ☐ 5-6 ☐ 7-8

6. Due to any administrative lag is there any difficulty in getting vehicles from service providers.
☐ No ☐ very little ☐ little ☐ more ☐ much

7. The financial position of the company affects any delay in logistics system(non-payment of transportation cost in time)?
☐ Never ☐ sometimes ☐ frequently
☐ Most frequently ☐ always

8. Percentage of lead time delay in delivery of item
☐ 0 ☐ 1-25 ☐ 26-50 ☐ 51-75 ☐ 75-100

9. Percentage of additional amount demanded by the service provider for achieving resiliency
☐ 0 ☐ 1-25 ☐ 6-50 ☐ 51-75 ☐ 76-100

10. Percentages of goods delivered in damaged condition by the logistics service provider to customer.
☐ 0 ☐ 1-25 ☐ 26-50 ☐ 51-75 ☐ 76-100

4. Case study

India is a country where most of the industries are of SMEs. Three companies were selected from across Kerala. They are Western India Private Limited, Kannur(WIP), Kerala Agro Machineries Corporation, Athani, Ernakulam(KAMCO) and Kerala Automobiles Limited, Thiruvananthapuram. Western India Plywoods Limited, Kannur is located in a village known as Valapattonam in Kannur district. It is established in 1945. They are manufacturing hard boards, plywood, and allied products, Densified wood for electrical and structural purposes, furniture and furniture components, engineered wooden flooring, DAP moulding compound. They are distributing their 80% of the product throughout India and remaining abroad. Their main suppliers are Indian railways, Automobile industries, construction fields, individual parties etc. The product distribution is done through by the company itself and through by third party logistics service providers. In this company they have adopted backhauling system. For this purpose they entered collaboration with third party logistic service company (3PL). The 3PL will arrange trucks which

are going empty on return to carry the product of the company to their destination which is near or original starting point of the vehicle. This will saves costs, open new opportunities, increases the profit margin of a company due to the reduced cost, which ultimately reduce the price of the product and benefit for their customers. The company has regional sales centers at Thiruvananthapuram, Bangalore, Chennai, Vijayawada, Hyderabad, Mumbai, Ahmadabad and Kolkata. Even though majority of the logistics are done by backhauling method the company is facing disruptions due to the reasons mentioned in the table - II

Table -II

Sl.No.	Parameters for disruptions
1	Non availability of trucks
2	Fluctuation in fuel price
3	Road condition and Traffic jams
4	Road accidents
5	Breakdown of vehicle
6	Attitude of drivers
7	On road checking by police, check post and other departmental officials

The Kerala Automobiles Limited (KAL) is located at Aralummoodu, Thiruvananthapuram. It is a public sector organization owned by government of Kerala. They are manufacturing three wheelers. Now the volume of production is at a low pace that is 100 autorikshaws per month. This company uses backhauling logistics system for reducing transportation cost. Their main areas of distribution were Punjab, Haryana and Rajasthan. They have entered contract with two firms for the distribution of products. Questionnairs were supplied to the sales officials, service providers and operators, it is found that the company is also facing difficulties in meeting the lead time in distribution.. The reasons are shown in table – III.

Table- III

Sl.No.	Parameters for disruptions
1	Non availability of trucks
2	Fluctuation in fuel price
3	Goods susceptible to damage through careless driving.
4	Road accidents
5	Breakdown of vehicle
6	Attitude of drivers
7	On road checking by police, check post and other departmental officials
8.	Terrorists attack

The Kerala Agro Machineries Corporation (KAMCO) is a public sector company owned by government of Kerala, which is located at Athani in Ernakulam district. KAMCO was started to cater to the needs of small and marginal farmers. The company's main products are power tiller, tractor, power reaper etc. It has 50 numbers of dealers all over India. The company is also using backhauling logistics to reduce the transportation cost. After the survey conducted by using the questionnaire, it is found that this organization also facing similar difficulties.

Comparing the parameters which influence the disruption logistics for each company, the factors are more or less similar. The data obtained from questionnaire for each companies can be analyzed separately by using the tool Statistical Package for the Social Sciences(SPSS). This tool is very useful for the analysis of data. After analysis we will get the importance or weightage of factors which is causing the disruptions in the logistic system. From this we can make a frame work for becoming a resilient backhauling logistic system for each company.

5. Conclusion

Small and medium scale industries are increasingly affected by the vulnerabilities in logistic system management and particularly in backhauling logistics. It is established that by adopting backhauling one fourth of the expenditure in out-bound logistics can be saved. This has necessitated improvements of their resilience to the events which had identified not only to minimize the consequences but also to utilize effectively positive consequences. Here the factors for disruptions in backhauling logistics have identified. This is only the first phase of the work and the future work involves the actual analysis of data obtained from the questionnaire. Once the actual factors are found and analyzed then the next phase includes modeling of resilient logistics system for SMEs.

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