



Reliability Engineering for Logistics Management - a Quantitative Approach

Dr.D.Ghosh

Associate Professor, Department of Business Administration, Assam University, Silchar-788011

ABSTRACT

With the growth of Internet and ICT the tremendous growth of E Commerce in today's business cannot be undermine. The customers are expecting better and better quality of products and services from the E-retailers. The main concern of the today's E Commerce company's especially E retailers lies on the mapping of their Logistics Operations so as to render proper services at the right time, right place and right price. The logistics operations are focusing basically on the reliabilities of all the logistical parameters so as to ensure zero defects in their services. The main focus of the paper will be to identify the reliability components of the logistical operations and to suggest measures to ensure the reliability of the Logistics Operations.

KEYWORDS : Logistics, Reliability, ICT, E Commerce and E retailers.

I.INTRODUCTION: The Competition in the current business environment is becoming intense day by day. With the ever increasing the growth of Internet and ICT the businesses are getting support in their operations. Thus, the businesses are in a position to design their processes in an effective manner. The scenario in the E Commerce as well as E retailing is really exciting as these companies need to device their logistics operations in such a way so as to allow the products to reach to the targeted customers at right time, right place and in right price. The companies are designing basic as well as value added services of the logistics operations. There are sufficient growths in the third party logistics (3PL) as well as fourth party logistics (4PL) to deliver the process in efficient and effective manner.

Today's business operations need to accelerate their processes so as to satisfy their customers. The important component of every business is logistics and supply chain management. The activities under logistics include so many components like transportation, inventory management, warehouse, order processing and packaging. Each components of logistics need to align in such a way so that the objective of the business should be achieved. Due to the continuous innovation in the zone of Information and Communication Technology every function can be better integrated with ICT.

The logistics operations designed by the companies need to reliable. Thus, reliability engineering deals with the probability that the system will deliver its said performance under stated conditions. Thus, in logistics operations reliability engineering need to be ensured so as to deliver the services and products to the right place, right time, right time as well as in right quality.

II.NEED OF THE STUDY: Due to competition the companies are facing some problems in the zone of costs. Logistics functions are very important for successful business operations. Without logistics the business will not be able to compete in the market. The important components of logistics are transportation, inventory management and warehouse management. The operations managers need to know the cost associated with the business logistics. For successful business functions the managers need to minimize cost of every activity.

The cost in terms of transportation, warehouse, packaging, and inventory increased due to different factors such as fuel price, weight, volume, density and height of products. Companies need to maintain a delicate balance between of increased materials and transportation costs against the expectations of improved service levels by customers. To execute same-day-delivery e retailers need to take a cross functional approach which need an integration of thoughtful planning, IT investment and close coordination with 3PL-4PL.

The E Commerce companies as well as E retailing firms also the 3PL-4PL regularly map their Key Performance Indicators (KPI) of Logistics Operations so as to ensure better reliability in these operations.

III.REVIEW OF LITERATURE: The supply chain and logistics is very important wing of any operation. In case of many contingency situations

it is the supply chain that needs to deliver its best possible activities. Reliability of supply chain and logistics are needed in modern operations. The supply chain and logistics reliability are basically the probability of the chain delivering the stated activities with respect to time, place, price and quality (Thomas 2002: 61-67).

The work of Arvis, Raballand and Marteau of World Bank during 2007 highlighted the macroeconomic quantitative description of logistics costs by assessing the World Bank projects for Africa and Central Asia. The prime sources of logistical cost are not only the physical constraints but also the rents and flaws in transit systems.

ICT plays an important role in the operations of Logistics and Supply Chain. The tremendous opportunities laid down by RFID cannot be underestimated, thus ensures better reliability of the logistics operations through better visualizations of inventory, fleet and warehouse operations (Chow, Choy, Lee and Chan 2007: 221-234).

Uncertainty prevails in the transport operations in the logistics and supply chain functions. There are different types of risks also inherent due to those uncertainties (Rodrigues, Mohamed & Naim 2010: 45-64).

Logistics operations are very complex. Thus also very important component of this logistics operations are transportation. Delay in the area of transportation imposes high economic cost. Delay generally results from increased journey time, increased range of arrival time and schedule delay (Fowkes, Firmin, Tweddle and Whiteing 2010: 33-43).

The reliability in Logistics operations depends on several factors like fulfillment centers location-layout, distances from fulfillment centers to stores, replenishment time of the products in the fulfillment centers, fulfillment centers capability for supporting store demand, connectivity of the routes of transportation. Factors like labor disputes, bad weather, road conditions, traffic situations and terrorist threats impacts to a great extent on the system's reliability (Wang, Lu and Kyam 2006: 525-534).

The study of Svensson during 2002 mentioned the vulnerability, that result from the functional dependencies between firms' activities and resources in supply chain.

Managers need to know to deal with the problem of order allocation in the two-echelon logistics service supply chain during emergency situations. The work of Wei-Hua, Cai, Zheng-Xu and Yan in the year 2011 numerically analyzed the emergency order allocation mechanism which reflected the relationship between emergency coefficient, uncertainty and emergency cost. In the study they have used the LIN-GO 8.0 software for the calculation.

In the highly competitive scenario of time compression the technological effort becomes a key variable and a means of differentiation between third party logistics providers (Savage 2003: 236-253).

The companies need to design the logistics operations based on their product life cycle. The logistics components which have impact on the operations are logistics engineering, technical publications, personnel technical training, spare/ repair parts provisioning, maintainability, reliability, finance, test equipment and facilities (Brimer 1995: 8-11).

IV.OBJECTIVES OF THE STUDY:

- To know the importance of Logistics Operations in E retailing.
- To map the Key Logistics Performance Indicators and their reliability in the light of E-retailing.

V. RESEARCH QUESTIONS:

- What are the different key logistics performances Indicators?
- What the reliability of the said key logistics performance Indicators?

VI. SCOPE OF THE STUDY:

The study will pinpoint the logistics operations of the E retailing firms with all key logistics performance indicators.

VII. LIMITATION OF THE STUDY:

The present study only focused on E retailing firms. The other limitation of the study is the lack of availability of the first hand data.

VIII. RESEARCH METHODOLOGY AND MODEL DEVELOPMENT:

The type of research is exploratory in nature. The different sources of literature have been studied to find out the objectives of the study and to develop the model.

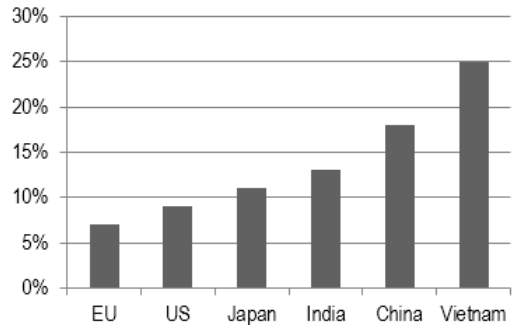
TABLE 1: E COMMERCE IN INDIA

Sections	2015	2016
Gross Merchandise Value (GMV)	\$8-\$10 billion	\$12-\$15 billion
Courier/Logistics	Rs.3500 crore	Rs. 6000 crore
Payments (use of payment gateways & fees for collecting COD)	Rs.1000 crore	Rs.2000 crore
Marketing and Ad Spends	Rs.6000 crore (40% digital)	Rs.10,000 crore (60% digital)
Packaging material	Rs.700 crore	Rs. 1200-1500 crore
Cash on delivery (% of total)	70%	50%
Number of Sellers online	2,50,000	5,00,000
No of online shoppers & Internet user base	50 million, 400 million	75 million, 470-485 million

Source: The Economic Times, 14 Jan, 2016, Page-14

From the above table it is clear that the Logistics contribution is increasing to Rs 6000 crore in 2016, also packaging materials are increasing to Rs 1200-1500 crore.

Figure 1. Total Logistics Cost as percentage of GDP (2009)



Source: KPMG

According to the study carried by the KPMG on logistics cost it is revealed that the logistics cost is very important parameter of the business. It is observed that during 2009 in India the total logistics cost was approximately 13% of the GDP. But in case of EU, US and Japan the logistics cost was considerably low.

TABLE 2: ACTIVITIES OF LOGISTICS SERVICE PROVIDERS

Logistics	Key Functions
Transportation	Shipping, Forwarding, (De) Consolidation, Contract Delivery, Freight Bill Payment / audit, Cross-Docking, Brokering.
Warehousing	Storage, Receiving, (Re-) Assembling, Return goods.
Inventory Management	Forecasting, Consulting
Order Processing	Order Entry/ Fulfillment, Consignee Management, Call Centre
Information System	EDI, Routing/Scheduling, Artificial Intelligence, Expert Systems, Bar Coding, RFID, Web Based connectivity, Tracking and Tracing
Value added activities	Design and Recycling of packaging, marking/ labelling, billing, call centre activities

Source: Sink 1996

From the above tables 1 & 2 and also from figure 1 it is clear that the logistics operations are very important in E retailing.

The Key Logistics Performance Indicators (KLPI) as indicated by Odette International Limited is as follows:

TABLE 3: KLPI AND MEASURES

KLPI	Point of Measure
Arrival Precision	Time
Pick Up Discrepancy Alert	Alert
No of Incidents	Security
Late Delivery Alert	Alert
Filling rate in transport equipment	Efficiency
Stock accuracy	Security

Source: Odette 2007

The above pointed measures of KLPI are very much important for the business to ensure the logistics reliability. The following formulations are needed for understanding the reliability of logistics operations.

- Arrival Precision: This KLPI is required to know the receiving and loading functions accuracy.

AP= (S1/S2) x 100

S1 is the total number of shipment arrivals within agreed time frame
S2 is the total number of shipment arrival

The LSP (Logistics Service Providers) must specify the AP for all type of shipments.

- Pickup Discrepancy Alert: The KLPI here need to operate for Pick up related to operations.

PDA= (A1/A2) x 100

A1 is the total number of alerts within the specified time
A2 is the total number of pick up discrepancies

Number of Incidents: Here the KLPI need to target the proper goods handling so that the chances of damages and missing are almost zero.

NI= (O1/O2) x 100

O1 is the total number of orders with anomalies.
O2 is the total number of orders.

Late Delivery Alert: The KLPI here need to check for delivery alert.

LDA= (SA1/SA2) x 100

SA1 is the total number of shipment alerts within agreed time.
SA2 is the total number of late shipment deliveries.
Filling Rate in transport equipment: This KLPI measures the efficiency in loading.

FRTE= (V1/V2) x 100

V1 is the total volume loaded on transport.
V2 is the total volume available on transport.

Stock Accuracy: This is used to see the reliability of the store operations.

SA= (SU1/SU2) x 100

SU1 is the Total stock units' discrepancy in inventory.
SU2 is the Total stock units estimated.

IX. CONCLUSION: The above mentioned and discussed KLPI are quite important for the companies so as to ensure the better reliability. After all it the reliability of the logistics operations that gives the total guarantee of better services. The main activities that E retailers need to devise are Enhance real time inventory management, optimize fulfillment systems, create a flexible workforce and develop robust logistics partnerships. All these typically depends on the reliability of logistics operations.

REFERENCES:

1. Arvis, J F, Raballand G and Marteau J F (2007), "The Cost of Being Landlocked: Logistics Cost and Supply Chain Reliability", World Bank Policy Research Working Paper No-4258.
2. Fowkes A.S, Firmin P.E, Tweddle G and Whiteing A E, (2004), "How highly does the freight transport industry value journey time reliability—and for what reasons?", International Journal of Logistics Research and Applications: A Leading Journal of Supply Chain Management, Volume 7, Issue 1, PP- 33-43.
3. Goran Svensson, (2002) "A conceptual framework of vulnerability in firms' inbound and outbound logistics flows", International Journal of Physical Distribution & Logistics Management, Vol. 32 Iss: 2, pp.110 – 134.
4. Harry K.H. Chow, K.L. Choy, W.B. Lee, Felix T.S. Chan, (2007) "Integration of web-based and RFID technology in visualizing logistics operations – a case study", Supply Chain Management: An International Journal, Vol. 12 Iss: 3, pp.221 – 234.
5. Liu Wei-hua, Xu Xue-cai, Ren Zheng-xu, Peng Yan, (2011) "An emergency order allocation model based on multi-provider in two-echelon logistics service supply chain", Supply Chain Management: An International Journal, Vol. 16 Iss: 6, pp.391 – 400.
6. Odette International Limited 2007 Report.
7. Roy C. Brimer, (1995) "Logistics networking", Logistics Information Management, Vol. 8 Iss: 4, pp.8 – 11.
8. Sink, H. L., Langley Jr., C. J., Gibson, B. J (1996), "Buyer observations of the US third-party logistics market", International Journal of Physical Distribution Logistics Management, Vol.26, No.3, pp. 38-46.
10. The Economic Times-What Next for E Commerce in India, 14 Jan, 2016, Page-14

11. Thierry Sauvage, (2003) "The relationship between technology and logistics third-party providers", International Journal of Physical Distribution & Logistics Management, Vol. 33 Iss: 3, pp.236 – 253.
12. Thomas, M.U (2002), "Supply Chain Reliability for Contingency Operations", Reliability and Maintainability Symposium 2002 Proceedings-Annual, IEEE, PP-61-67.
13. Vasco Sanchez-Rodrigues Andrew Potter Mohamed M. Naim, (2010) "Evaluating the causes of uncertainty in logistics operations", The International Journal of Logistics Management, Vol. 21 Iss: 1, pp.45 – 64.
14. Wang N, Lu J and Kyam P (2006), "Reliability Modeling in Spatially Distributed Logistics Systems", Reliability, IEEE Transactions, Vol 55, Issue 3, PP 525-534.