Chapter 15
Prioritizing Best Practices for Logistics Service Providers

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Abstract Due to globalization and fast growing e-commerce businesses, the scale of Logistics Service Providers (LSPs) in India is expected to increase. LSPs support their client organizations to provide a smooth and timely delivery of goods. LSPs provide flexibility in their processes to meet the dynamic requirements of their customers. In this chapter, there is an attempt to identify the best practices followed by Indian LSPs and to rank the identified best practices. The best practices have been categorized into four major categories, that is strategic, operational, technical, and societal, based on literature review and opinion of experts. Further, twenty best practices were identified as subcategories under above-defined categories. The experts were asked to rate the 20 factors as per their importance. Further, to rank the best practices, a fuzzy AHP approach was applied. Based on priority weights, different categories were ranked in decreasing order as Operational (0.45), Strategic (0.41), Technical (0.10), and Societal (0.03). It has been observed from the study that the top 4 most important factors among all the 20 factors are safe delivery of shipments, use of eco-friendly fleet, reduction in carbon emission, and timely delivery. The study is likely to assist organizations in familiarizing with the strengths and practices used by Indian LSPs so that they can set up their perceptions and expect for their fulfillment. The research is also expected to help unorganized and budding LSPs to recognize their weak factors, which require further improvement and can excel to fulfill the dynamic market needs.

Keywords Best practices · Fuzzy AHP approach · Logistics service providers · Service quality

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15.1 Introduction

Due to advancement in technology and significant developments in the Indian economy, the logistics sector is transforming to align with changing business requirements. There is a need to bring flexibility in logistics operations to meet the dynamic and fast-changing requirements (Ecer 2018). Logistics is considered as the backbone of an economy, and it contributes around 13% in GDP as against 7–8% in developed countries (Outlook India 2017). In the past few decades, the logistics sector has shown tremendous growth, and at present, it has reached to around the US$225 billion industry. The logistics sector is growing at very high speed to matchup with the increased rate of market demand. The role of flexibility in operations and adaptability to technology are also increased to a big extent (Alkhatib et al. 2015). It is expected to grow around 10–15% annually. The growth in the Indian economy is bringing lots of opportunity for logistics sector to grow in terms of increase in volume handling, large traffic volume, and an increase in network coverage. In India, LSPs use their blend of infrastructure, technology, and dedicated manpower to provide a smooth flow of goods starting from suppliers and ending up with final consumers. There is also an increased need for flexibility in LSPs operations, including transportation, warehousing, inventory handling, or final delivery to the customers (Shukla et al. 2010).

Despite a few weaknesses, the logistics sector is witnessing huge growth in retail, e-commerce, and manufacturing sectors. LSPs support their client organizations in satisfying their end customers with better service quality and committed shipments. Logistics Service Providers (LSPs) or 3PL provides various services, including transportation, freight forwarding, warehousing, container services, shipping services, express cargo delivery, value added services, etc. to manage all logistical activities in the entire supply chain smoothly. At present, organized logistics players are adopting the latest techniques and technologies to meet increased and dynamic logistics requirements. Many best practices are being followed by LSPs to bring transparency, enhance service quality, and improve collaboration and coordination among supply chain members.

These studies focus on the identification of best practices followed by Indian LSPs and rank them by their importance by fuzzy AHP. The purpose of this chapter is to emphasize the LSP's best practices and their support to smoothen up the entire supply chain. The flow of the chapter is as follows. The first section is an introduction which is followed by a literature review, which has been discussed in Sect. 15.2. The development of a model is discussed in Sect. 15.3. Further, the research methodology has been discussed in Sect. 15.4. Section 15.5 contains findings and concluding remarks of the study are discussed in Sect. 15.6.

15.2 Literature Review

In past studies, many researchers researched the logistics services and logistics service providers. Selviaridis and Spring (2007) developed a taxonomy of 3PL studies and reviewed around 114 refereed journals for the papers published from 1995 to 2005. Marasco (2008) selvdid depth analysis of same studies by exploring around 152 articles which are published in 33 international journals. Many researchers discussed the innovative practices adopted in logistics management and Busse and Wallenburg (2011) reviewed similar studies for the period of 2001–2009. Nowadays, outsourcing has become so common for organizations in almost all industry sectors which indicate the increased scope of logistics services providers and their respective logistics services.

In the current market scenario, Logistics services are not limited to transportation or warehousing whereas LSPs offers multidimensional logistics services in the form of one-stop solution (Kumar and Singh 2012). The commonly known logistics services, which are offered by LSPs are transportation, warehousing, fleet handling, order management, etc. (Sahay and Mohan 2006). The adoption and usage of information technology tools had also increased to make effective communication among all supply chain entities (Fasanghari et al. 2008; Gilaninia et al. 2011). The logistics providers are also adopting innovative and sustainable practices to cope up with changing market needs. Jayaram and Tan (2010) discussed supply chain integration, which is an obvious requirement for LSPs to conduct smooth operations across complex supply chains. The tougher competitive markets and declining margins made pressure on LSPs to be equipped with all updated resources and technology for providing better customer satisfaction. The adoption of best practices becomes the requirement for survival, growth, and continuity of business in the future (Tan et al. 2014; Huang et al. 2014). Logistics service providers have initiated and adopted innovative and sustainable best practices along with their inbuilt operations to provide flexibility to the customers (Shukla et al. 2010). Optimal utilization of fleet (Basligil et al. 2011), flexibility in fleet management, scheduling and services (Naim et al. 2010), value-added services (Soinio et al. 2012), vendor managed inventory, use of warehousing software (Doerr et al. 2006), use of GPS technology for tracking and tracing of shipments (Hillbrand and Schoech 2007), shortest and optimal route planning (Ulku and Bookbinber 2012), and quick complaint handling are found to be the most frequent logistics functions which are provided by LSPs in their bouquet of services. In past studies, many researchers also studied LSPs environmental consciousness and their inclination toward the adoption of green supply chain practices and reverse logistics, etc. Dey et al. 2011). In literature, the LSPs also showed their concern toward society by adopting rainwater harvesting, planting more trees, making use of solar energy, taking steps toward a reduction in carbon emission, etc. (Lieb and Lieb 2010; Govindan et al. 2012).

Due to increased globalization, LSPs are required to redefine their strategies to meet international standards and enhance the capability to reach globally (Kumar and Singh 2012). This increases the scope of LSPs to cover a wider market reach and

improve connectivity with other nations. In some countries, the outsourcing of logistics services is still in infancy phase, whereas in developed countries, LSPs handles most of the non-core activities to provide logistical support to the organizations (Tan et al. 2014). It has been observed from the past studies that more than 50% of organizations outsource shipment consolidation to Indian LSPs (Bhatnagar et al. 1999), whereas order fulfillment, carrier selection, and freight payment in Singapore are approximately 40% outsourced to LSPs. Kumar and Singh (2012) had identified that the logistics outsourcing practices are comparatively faster in Asia-Pacific Region and Western Europe than North America and Latin America.

Existing literature suggests that best practices followed by LSPs are driven more by top management. The new ideas, new policies, and innovation are usually initiated by the senior management of an organization and finally turned into applicable strategies. Hoek et al. (2008) suggested that the other peer departments must be internally aligned with supply chain partners to enhance efficiency and integration. Ellinger et al. (2008) examined the market orientation and had identified that the efforts and dedication of manpower directly affect the performance of logistics service providers. Network Planning and enhancement and network distribution management by a hub and spoke systems are important components of strategic planning (Zapfel and Wasner 2002). The management always prefers to audit all the processes to maintain control and transparency in the system. LSPs need to maintain the confidentiality of the entire customer data used in transactions, so top management gives high importance to this concern. As operational best practices, the prime focus of LSPs is to deliver safe shipments in committed time (Stank et al. 2003).

The best practices are broadly categorized into four categories strategic, operational, technical, and societal. The subcategories taken under each category is defined in Table 15.1 along with corresponding references.

15.3 Proposed Framework

The existing literature on best Practices has been reviewed. A model is proposed to understand the hierarchy of best practices usually followed by Indian LSPs (Fig. 15.1). Almost all well-established and well-known LSPs practice their operations in the best possible way to ensure successful fulfillment of all commitments made to the customer. At the strategic level, the top management of the organization is directly involved in taking major decisions related to manpower management, network planning and enhancement, audit, and control of all ongoing processes, maintaining data confidentiality and identifies new innovative and customized solutions to satisfy the customer needs an efficiently. At the operational level, the best practices adopted by LSPs are more focused toward the satisfactory end delivery of the services to the customer. Their preferences for delivering the best of the service quality are planning of safe shipments, timely and accurate delivery, optimizing resources efficiently, managing inventory, and efficient route planning. At the technical level, this is almost mandatory for LSPs to make use of latest software and tools to

Table 15.1 Literature review on best practices followed by LSPs

Best practices	Definition/meaning	References
Organizational		Ellinger et al. (2008), Hoek et al. (2008)
Manpower management	Managing human resources involved in all logistics operations	Aghazadeh (2003), Sahay and Mohan (2006), Hamdan and Rogers (2008), Wong and Karia (2010), Juga et al. (2010), Jayaram and Tan (2010), Tezuka (2011), Ecer (2018)
Network planning and enhancement	Planning for maintaining existing network and enhancing new dimensions as required for expansion of business	Zapfel and Wsaner (2002), Ellinger et al. (2008), Basligil et al. (2011), Gilaninia et al. (2011), Kayakutlu and Buyukozkan (2011), Soinio et al. (2012), Gunasekaran et al. (2016)
Audit and control	The process to cross-check the correctness of the functioning of all processes in the organization	Comyn-Wattiau and Akoka (1996); Gilmour (1999), Fernando et al. (2018)
Data confidentiality	Keeping all records and data transactions with appropriate security measures	Farmer (1988), Tweddle (2008), Jothimani and Sarmah (2014), Fernando et al. (2018)
Innovation and customized solutions	Trying out new ways to provide services along with serving customer needs in a tailor-made fashion	Farmer (1988), Ghobadian et al. (1994), Huo et al. (2008), Busse and Wallenburg (2011), Yeung et al. (2012)
Operational		Isik et al. (2018), Stank et al. (2003), Yeung et al. (2012)
Safe shipments	Ability to deliver products safely	Parasuraman et al. (1985), Vandamme and Leunis (1993), Ghobadian et al. (1994), Philip and Hazlett (2001), Mentzer et al. (2001), Stank et al. (2003), Markovic (2006), Ecer (2018)
Timely delivery	Ability to deliver goods on time	Parasuraman et al. (1988), Millen et al. (1999), Sahay and Mohan (2006), Huo et al. (2008), Busse and Wallenburg (2011), Kumar and Singh (2012), Ulku and Bookbinber (2012), Yeung et al. (2012), Augusto et al. (2019)

(continued)

Table 15.1 (continued)

Best practices	Definition/meaning	References
Resource optimization	Optimum use of all available limited resources to LSPs	Aghazadeh (2003), Sahay and Mohan (2006), Naim et al. (2010), Tezuka (2011), Forslund (2012), Isik et al. (2018)
Efficient route planning	Planning of route for efficient movement of the fleet	Zapfel and Wsaner (2002), Madaan and Wadhwa, (2007), Basligil et al. (2011), Ulku and Bookbinber (2012), Ravi (2014)
Inventory replenishment	Adopting various ways to refill the inventory of customer at the earliest	Waller et al. (1999), Swenseth and Godfrey (2002), Sahay and Mohan (2006), Hua et al. (2011), Augusto et al. (2019)
Technical		Wang and Elhag (2006), Lai et al. (2008), Forslund (2012)
Use of warehouse management software	Use of IT and software for warehouse management	Doerr et al. (2006), Ketikidis et al. (2008), Tiwari *i.* (2018)
Data handling and extraction	Managing data handling and extraction of data through data mining tools	Evangelista et al. (2013), Kumar and Kumar (2014), Fernando et al. (2018)
Tracking and tracing of shipments	Using GPS technology to track and trace the exact location of transit shipment	Hillbrand and Schoech (2007), Shamsuzzoha, and Helo (2011), Sakun (2011), Kumar and Kumar (2014)
Use of the internet and (Electronic Data Interchange) EDI Systems	Access to the internet and adoption of EDI systems for increasing transparency of processes	Jharkharia and Shankar (2005), Fasanghari et al. (2008), Tezuka (2011), Wong and Karia (2010), Gilaninia et al. (2011), Evangelista et al. (2013), Tiwari et al. (2018)
Barcoding and RFID systems	Techniques which help in tracking the product or items	Musa and Dabo (2016), Doerr et al. (2006), Gaukler & Seifert (2007), Ketikidis et al. (2008)
Societal		Gruchmann et al. (2018), Centobelli et al. (2017), Mani et al. (2016)
Use of eco-friendly fleet	Use of more green and environment-friendly fleet to reduce the pollution level in an environment	Dey et al. (2011), Lieb and Lieb (2010), Colicchia et al. (2013), Anni-Kaisa et al. (2018)

(continued)

Table 15.1 (continued)

Best practices	Definition/meaning	References
Use of renewable energy sources	Use of those sources which can naturally replenish	Naim et al. (2010), Tezuka (2011), Ulku and Bookbinber (2012), Mani et al. (2016)
Use of reusable and recyclable packaging	Repeated usage of packaging either in the same form or another form as recycled one	Sahay and Mohan (2006), Lieb and Lieb (2010), Dey et al. 2011, Govindan et al. (2012), Anni-Kaisa et al. (2018)
Reduction in carbon emission	Step to reduce carbon emission in the environment by modifying transport and facility usage	Kim et al. (2009), Hua et al., (2011), Elhedhli and Merrick (2012), Anni-Kaisa et al. (2018)
Initiatives toward CSR	Organizational activities for society and environment as a part of corporate social responsibility	Colicchia et al. (2013), Juntunen et al. (2015), Centobelli et al. (2017), Gruchmann et al. (2018)

Source Singh and Sharma (2015)

keep updated their customers with basic requirements of tracing the exact position of goods, managing warehouses, data mining, etc. The best practices followed by LSPs to make their systems technically robust are the use of warehouse management systems software, use of barcoding and RFID technology, use of GSM-GPS technology, and Internet and EDI systems to make their system transparent and convenient. At the societal level, most of the LSPs are contributing toward Corporate Social Responsibility (CSR) activities by adopting major usage of renewable resources, eco-friendly fleet, and recyclable packaging materials. Moreover, they are also giving importance to the use of solar panels, tree plantation, and rainwater harvesting, especially at their warehouses and open areas.

15.4 Research Methodology

In literature, there are various methods available for ranking best practices of LSPs. The most common method used by researchers is Multiple Criteria Decision-Making (MCDM) techniques. These techniques give the opportunity to a researcher to deal with unstructured problems with multiple goals simultaneously. This reason accelerates the usage of these techniques (Lee and Eom 1990). In MCDM techniques, many mathematical techniques like Analytic Hierarchy Process (AHP), TOPSIS, Data Envelopment Analysis (DEA), etc. have been developed (Tyagi et al. 2015). Most of the approaches worked on the preferences and weights given by decision maker to various alternatives available to them. In this chapter, the identified best practices are ranked by using one of the effective tools of MCDM, that is, fuzzy AHP.

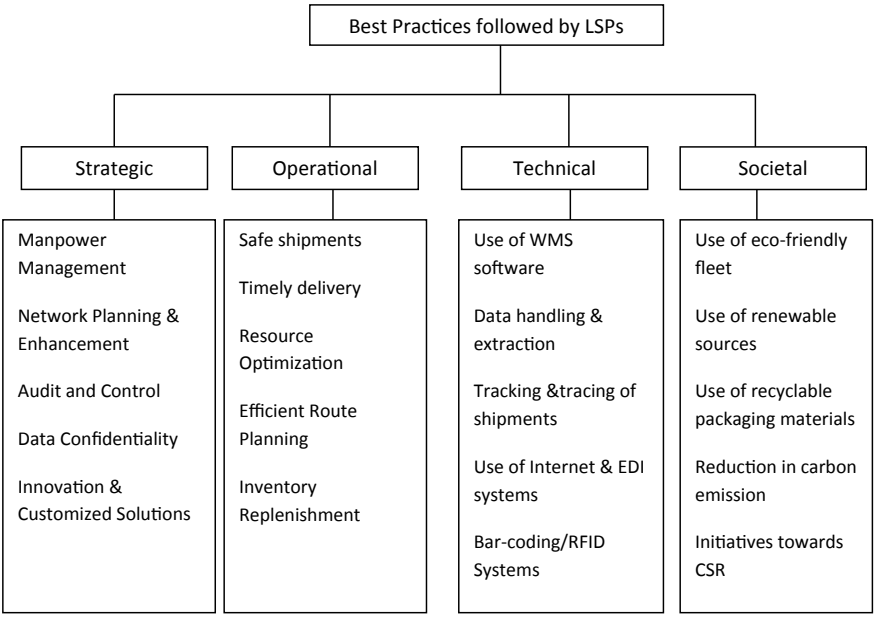

Fig. 15.1 Proposed model for best practices followed by LSPs

15.4.1 Fuzzy Analytic Hierarchy Process

AHP gives better results when we deal with exact and ordinary data, but fuzzy AHP is considered to be more appropriate to capture uncertainties associated with the data. The advantage of fuzzy AHP over AHP is to capture uncertain, imprecise judgment of experts in pair-wise comparison, which can be useful in dealing complexities with a 3PL selection. Proposed hierarchical framework (Fig. 15.1) will be used for applying fuzzy AHP. Linguistics scales for defining the weight of each factor is given in Table 15.2.

Let A = {a1, a2… an} be an object set and B = {b1, b2… bm} be a goal set.

Table 15.2 Factor importance rating as linguistic variable

Linguistic variable	Triangular fuzzy numbers
Equally significant	(1, 1, 1)
Weakly significant	(2/3, 1, 3/2)
Fairly significant	(3/2, 2, 5/2)
Strongly significant	(5/2, 3, 7/2)
Absolutely significant	(7/2, 4, 9/2)

In 1992. Chang explored extent analysis which stated that each object is taken and each goal y_i, is set respectively. Therefore, the extent analysis values for each object have been evaluated and are discussed as follows:

$$X_{y_i}^1, X_{y_i}^2, \ldots, X_y^m, i = 1, 2, \ldots, n, \tag{15.1}$$

where all the $X_{y_i}^j$ ($j = 1, 2, \ldots m$) are triangular fuzzy numbers represented by (u, v, w) where u, v, and w is the smallest, almost certainly, and largest possible numbers.

According to Chang (1996), the following are the steps of the fuzzy AHP:

Step 1: The value of a fuzzy synthetic extent concerning the *i*th object is defined as

$$X_i = \sum_{j=1}^{m} X_{y_i}^j \otimes \left[\sum_{i=1}^{n} \sum_{j=1}^{m} X_{y_i}^j \right]^{-1} \tag{15.2}$$

Now, apply the fuzzy addition operation of extent analysis values for a particular matrix such that

$$\sum_{j=i}^{m} X_{y_i}^j = \left(\sum_{j=1}^{m} u_j, \sum_{j=1}^{m} v_j, \sum_{j=1}^{m} w_j \right) \tag{15.3}$$

Now, apply the fuzzy addition operation of $X_{y_i}^j$ ($j = 1, 2, \ldots m$) values such that

$$\sum_{i=1}^{n} \sum_{j=1}^{m} X_{y_i}^j = \left(\sum_{i=1}^{n} u_i, \sum_{i=1}^{n} v_i, \sum_{i=1}^{n} w_i \right) \tag{15.4}$$

In Eq. (15.2), the vector is inversed and computed as

$$\left[\sum_{i=1}^{n} \sum_{j=1}^{m} X_{yi}^j \right]^{-1} = \left(\frac{1}{\sum_{i=1}^{n} wi}, \frac{1}{\sum_{i=1}^{n} vi}, \frac{1}{\sum_{i=1}^{n} ui} \right) \tag{15.5}$$

Step 2: Find $X_2 = (u_2, v_2, w_2) \geq (u_1, v_1, w_1)$ and then computed as

$$V(X2 \geq X1) = sup_{p \geq q}[\min(\mu_{X1}(p), \mu_{X2}(q)] \tag{15.6}$$

and can also be written as follows:

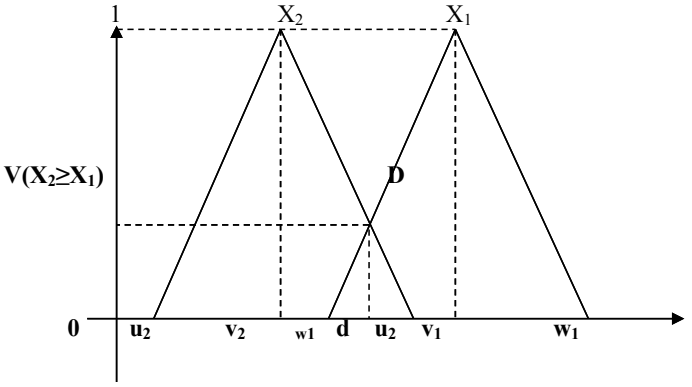

Fig. 15.2 The interaction between triangular fuzzy numbers, X_1 and X_2

$$V\ (X_2 \geq X_1) = \text{hgt}\ (X1 \cap X2) = \mu_{X2}(d) = \begin{cases} 1, & if\, v_2 \geq v_1, \\ 0, & if\, u_1 \geq w_2, \\ \frac{u_1 - w_2}{(v_2 - w_2) - (v_1 - u_1)} & otherwise, \end{cases} \tag{15.7}$$

where d is the ordinate of the highest intersection point D as shown in Fig. 15.2.

The values of $V(X_2 \geq X_1)$ and $V(X_1 \geq X_2)$ are compared.

Step 3: For a convex fuzzy number to be greater than k, convex fuzzy numbers X_i (i = 1, 2,…, k) can be defined as

$$V(X \geq X_1, X_2, \ldots, X_k) = V[(X \geq X_1)\ and\ (X \geq X_2)\ and \ldots and\ (X \geq X_k)]$$

$$\begin{aligned} V(X \geq X_1, X_2, \ldots, X_k) &= V[(X \geq X_1)\ and\ (X \geq X_2)\ and \ldots and\ (X \geq X_k)] \\ &= \min V(X \geq X_i), i = 1, 2, 3, \ldots, k \end{aligned} \tag{15.8}$$

Assume that,

$$d'(P_i) = \min V(S \geq S_k) \tag{15.9}$$

for, k = 1, 2, …, n and k ≠ 1.

Now the weight vector can be computed as,

$$W' = \{d'(P_1), d'(P_2), \ldots, d'(P_n)\}^T, \tag{15.10}$$

where Pi (i = 1, 2, 3…, n) are n elements.

Step 4: The normalized weight vectors by the method of normalization are given as

$$W' = \{d(P_1), d(P_2), \ldots, d(P_n)\}^T,$$

where "W" is a non-fuzzy number

Step 5: Combine the inputs of all experts by using a geometric average and then interpret the final output.

15.5 Findings of the Study

LSPs best practices are prioritized by using fuzzy AHP approach. Two experts have been chosen on the basis of their work experience with the logistics sector. The experts gave their inputs on various best practices adopted by LSPs. Expert-1 is senior operation manager in leading Logistics Company with experience of more than ten years. Expert-2 is supply chain head in well known Indian logistics company with 15 years of experience. The experts are working with well-established Indian logistics companies, and they provide their insights on the best practices followed by Indian logistics service providers in general.

The pair-wise comparison of all factors at each hierarchical level has been done on the basis of linguistics scale of Table 15.2. By using Eqs. 15.1–15.2, the pair-wise comparison matrices of all major and minor criteria in the form of a matrix are shown in Table 15.3. The final individual and global weights are evaluated by using Eqs. (15.3–15.10) by applying fuzzy AHP method and is shown in Table 15.4.

Results show that priority weight differs for all criteria. Based on priority weights, different categories can be ranked in descending order as Operational (0.45), Strategic (0.41), Technical (0.10), and Societal (0.03). The most important best practices are followed under the operational category. Under the operations category, safe shipments (0.44) and timely delivery (0.28) are two important sub-factors that are basically inbuilt operational practices required to serve customers. Resource Optimization (0.26) is also an important concern area where LSPs try to optimize their limited resources. After operational, the second priority should be given to Strategic. At the strategic level, the major sub-factor is Network Planning and Enhancement with priority weight of 0.31 followed by manpower management (0.28) and audit and control (0.23) as shown in Table 15.4. In today's market conditions, logistics service providers are extensively working toward the enhancement of network from domestic to global and simultaneously, emphasizing on manpower management to train them as per increasing market requirements. The weight for data confidentiality is 0.18, which shows that top management gives high importance to the security and safety of customer's data. Innovation and customized solutions (0.005) has less weight as compared as to other sub-factors. It reflects that LSPs give little importance to innovation rather than serving customers in a usual way.

In Technical, use of the internet and EDI (0.27) and use of WMS (0.26) are the two important sub-factors required for smooth communication between different supply chain partners. Common softwares like Electronic Data Interchange (EDI) and Warehouse Management software (WMS) brings transparency and reduces inventory

Table 15.3 Pair-wise comparison matrix of the major criteria and sub-criteria

a: Pair-wise comparison matrix of the major criteria

	Strategic	Operational	Technical	Societal
Strategic	(1, 1, 1)	(1.5, 2, 2.5)	(1.5, 2, 2.5)	(0.667, 1, 1.5)
Strategic	(0.4, 0.5, 0.667)	(1, 1, 1)	(2.5, 3, 3.5)	(1.5, 2, 2.5)
Strategic	(0.286, 0.334, 0.4)	(0.286, 0.334, 0.4)	(1, 1, 1)	(1.5, 2, 2.5)
Strategic	(0.667, 1, 1.5)	(0.4, 0.5, 0.667)	(0.4, 0.5, 0.667)	(1, 1, 1)

The weight vector is computed as $W_{BP} = (0.41, 0.45, 0.10, 0.03)^T$

b: Pair-wise comparison matrix of sub-factors—strategic

	Manpower management	Network plan and enhancement	Audit and control	Data confi-dentiality	Innovation and customized sol
Manpower management	(1, 1, 1)	(1, 1, 1)	(0.667, 1, 1.5)	(0.667, 1, 1.5)	(2.5, 3, 3.5)
Network plan and enhancement	(1, 1, 1)	(1, 1, 1)	(1.5, 2, 2.5)	(1.5, 2, 2.5)	(1.5, 2, 2.5)
Audit and control	(0.667, 1, 1.5)	(0.4, 0.5, 0.667)	(1, 1, 1)	(0.667, 1, 1.5)	(1.5, 2, 2.5)
Data confi-dentiality	(0.667, 1, 1.5)	(0.667, 1, 1.5)	(0.667, 1, 1.5)	(1, 1, 1)	(0.667, 1, 1.5)
Innovation and customized sol	(0.286, 0.334, 0.4)	(0.4, 0.5, 0.667)	(0.4, 0.5, 0.667)	(0.667, 1, 1.5)	(1, 1, 1)

The weight vector is computed as $Ws = (0.28, 0.31, 0.23, 0.18, 0.01)^T$

c: Pair-wise comparison matrix of sub-factors—operational

	Timely delivery	Safe shipments	Resource optimization	Effective route planning	Inventory replenish-ment
Timely delivery	(1, 1, 1)	(1, 1, 1)	(1.5, 2, 2.5)	(0.667, 1, 1.5)	(2.5, 3, 3.5)
Safe shipments	(1, 1, 1)	(1, 1, 1)	(3.5, 4, 4.5)	(1.5, 2, 2.5)	(3.5, 4, 4.5)
Resource optimization	(0.4, 0.5, 0.667)	(0.223, 0.25, 0.286)	(1, 1, 1)	(3.5, 4, 4.5)	(0.667, 1, 1.5)
Effective route planning	(0.667, 1, 1.5)	(0.4, 0.5, 0.667)	(0.223, 0.25, 0.286)	(1, 1, 1)	(3.5, 4, 4.5)
Inventory replenish-ment	(0.286, 0.334, 0, 4)	(0.223, 0.25, 0.286)	(0.667, 1, 1.5)	(0.223, 0.25, 0.286)	(1, 1, 1)

The weight vector is computed as $W_O = (0.28, 0.44, 0.26, 0.02, 0)^T$

(continued)

Table 15.3 (continued)

d: Pair-wise comparison matrix of sub-factors—technical					
	Use of WMS Software	Data handling and extraction	Tracking and tracing	Use of internet and EDI	Barcoding and RFID systems
Use of WMS software	(1, 1, 1)	(0.667, 1, 1.5)	(1.5, 2, 2.5)	(0.667, 1, 1.5)	(1.5, 2, 2.5)
Data handling and extraction	(0.667, 1, 1.5)	(1, 1, 1)	(0.667, 1, 1.5)	(2.5, 3, 3.5)	(1, 1, 1)
Tracking and tracing	(0.4, 0.5, 0.667)	(0.667, 1, 1.5)	(1, 1, 1)	(0.667, 1, 1.5)	(2.5, 3, 3.5)
Use of internet and EDI	(0.667, 1, 1.5)	(0.286, 0.334, 0.4)	(0.667, 1, 1.5)	(1, 1, 1)	(3.5, 4, 4.5)
Barcoding and RFID systems	(0.4, 0.5, 0.667)	(1, 1, 1)	(0.286, 0.334, 0.4)	(0.224, 0.25, 0.286)	(1, 1, 1)
The weight vector is computed as $W_T = (0.26, 0.25, 0.22, 0.27, 0)^T$					

e: Pair-wise comparison matrix of sub-factors—societal					
	Use of eco-friendly fleet	Use of renewable energy resources	Use of reusable and recyclable packaging	Reduction in carbon emission	Initiatives toward CSR
Use of eco-friendly fleet	(1, 1, 1)	(2.5, 3, 3.5)	(1, 1, 1)	(3.5, 4, 4.5)	(0.286, 0.34, 0.4)
Use of renewable energy resources	(0.286, 0.34, 0.4)	(1, 1, 1)	(1, 1, 1)	(3.5, 4, 4.5)	(0.4, 0.5, 0.667)
Use of reusable and recyclable packaging	(1, 1, 1)	(1, 1, 1)	(1, 1, 1)	(3.5, 4, 4.5)	(0.4, 0.5, 0.667)
Reduction in carbon emission	(0.223, 0.25, 0.286)	(0.223, 0.25, 0.286)	(0.223, 0.25, 0.286)	(1, 1, 1)	(0.286, 0.34, 0.4)
Initiatives toward CSR	(2.5, 3, 3.5)	(1.5, 2, 2.5)	(1.5, 2, 2.5)	(2.5, 3, 3.5)	(1, 1, 1)
The weight vector is computed as $W_{C4} = (0.51, 0.05, 0.43)^T$					

Table 15.4 Global weights of the main and sub-factors for selection of best LSP

S. no.	Factors	Individual wt.	Global wt.
1	Strategic	**0.41**	**0.41**
	• Manpower management	0.28	0.116
	• Network planning and enhancement	0.31	0.127
	• Audit and control	0.23	0.095
	• Data confidentiality	0.18	0.072
	• Innovation and customized solutions	0.01	0.005
2	Operational	**0.45**	**0.45**
	• Timely delivery	0.28	0.125
	• Safe shipments	0.44	0.202
	• Resource optimization	0.26	0.116
	• Effective route planning	0.02	0.011
	• Inventory replenishment	0.00	0.00
3	Technical	**0.10**	**0.10**
	• Use of WMS software	0.26	0.027
	• Data handling and extraction	0.25	0.026
	• Tracking and tracing of shipments	0.22	0.023
	• Use of the internet and EDI	0.27	0.028
	• Barcoding and RFID systems	0.00	0.00
4	Societal	**0.03**	**0.13**
	• Use of eco-friendly fleet	0.44	0.014
	• Use of renewable resources	0.06	0.002
	• Use of recyclable packaging material	0.07	0.002
	• Initiatives toward CSR	0.00	0.000
	• Reduction in carbon emission	0.44	0.014

integration in the entire supply chain. These findings have emphasized the increasing importance of communication by logistics providers to remain competitive in dynamic market conditions. Also, to serve across boundaries specifically in the era of e-commerce, competency of logistics provider can act as a competitive advantage to the firm. Data handling and extraction (0.25) followed by tracking and tracing of shipments (0.22) are also required sub-factors of a technical category. It helps in providing all essential informations related to data and exact positioning of the shipments to the customers.

Societal is the fourth important category. In this category, use of eco-friendly fleet (0.44) and reduction in carbon emission (0.44) is found to be the most important sub-

factor of societal. Further, the use of reusable and recyclable packaging (0.07) and the use of renewable energy sources (0.06) are the next important sub-factors of societal. These results clearly show that LSPs have started contributing toward society but not at a very large scale. LSPs are adopting best practices to serve customers in the best possible manner but still in the learning phase.

15.6 Conclusion

Logistics service providers are contributing hugely in the successful execution of all processes of organizations. At the same time, they are also trying to give the best of their services to fulfill their customer expectations. The best practices adopted by Indian LSPs are categorized into strategic, operational, technical, and societal on the basis of literature review and expert opinion. Further, twenty best practices were identified as subcategories under above-defined categories. The experts rated these sub-factors by their importance and further prioritized by using fuzzy AHP methodology. The main factors are ranked as Operational (0.45), Strategic (0.41), Technical, (0.10) and Societal (0.03). Safe shipments are the most important obvious best practice that is needed to be strictly followed by LSPs. Although LSPs focus comparatively less on societal factors, still use of eco-friendly fleet is found as one of the important best practices followed by LSPs. The importance of network planning an enhancement reflects the need for an increase in the existing distribution network and to serve more customers. Timely delivery and manpower management are two prioritized best practices where LSPs need to give more emphasis to be more successful. Delivering shipments on time and managing manpower to deliver best of the services are vital requirements of LSPs to make customer satisfied. Flexibility in processes is also a need of the hour to become compatible with customers' changing requirements.

Innovations and customized solutions, effective route planning, inventory replenishment, barcoding, and initiatives toward CSR activities are still in the infancy stage. Large logistics players have initiated these practices but small players are in planning state and if implemented, not at a very big scale. These best practices can further be implemented to bring improvement to the services of LSPs. The research can help client organizations to understand the processes and practices adopted by Indian LSPs closely and can assist them in making an appropriate selection of LSPs as per their requirement. The study will also enable unorganized and budding LSPs to identify the factors for improvement and can excel in satisfying the dynamic market needs.

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