

STUDY ON SERVICE QUALITY ISSUES IN CONTEXT TO LOGISTICS SERVICE PROVIDERS IN INDIA

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The matter presented in this thesis has not been submitted in part or fully to any other University or Institute for the award of any degree.

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CERTIFICATE

This is to certify that the thesis entitled “**Study on Service Quality Issues in Context to Logistics Service Providers in India**”, being submitted by Ms. Anchal Gupta to the Delhi Technological University for the award of the degree of Doctor of Philosophy (Ph. D.), is a record of bonafide research work carried by her. She has worked under our guidance and supervision and fulfilled the requirements for the submission of the thesis, which has attained the standard required for Ph.D. degree of the Institute. The results presented in this thesis have not been submitted elsewhere for the award of any degree or diploma.

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ABSTRACT

Logistics Service Providers (LSPs) provides outsourcing of logistics operations by giving the benefits of reduced cost, timely delivery and increased efficiency of supply chain. In past studies, some of the authors worked on the service quality issues of logistics service providers but the studies on service quality models developed for measuring customer satisfaction from Indian logistics service providers perspectives are very limited. Therefore, three objectives of this research have been developed on the basis of research gaps identified from literature review. The first objective is to analyze the best practices followed and challenges for Indian logistics service providers. The second is to develop a framework for the selection of best LSP based on service quality. The third and final objective is to identify the service quality dimensions and development of service quality framework for Indian logistics service providers.

To achieve the objectives of the study, literature has been reviewed in the areas such as: Logistics service providers: definitions, processes, best practices and challenges faced by them , service quality models: definitions, dimensions and measurement models, identification of constructs and items for the development of proposed framework for measuring logistics service quality.

In this study, different methods have been used to meet the objectives of the research. To achieve objective 1, the best practices of logistics service providers are explored and analyzed by using case study method. Three Indian case companies have been considered to understand the best practices followed by LSPs. The challenges faced

by LSPs are retrieved from literature review and expert opinion and then analyzed by using TISM approach. For objective 2, a framework for the selection of best LSP is proposed and analyzed by using Multi-criteria decision-making tools. For achieving objective 3, a conceptual framework is proposed. The data is collected from the employees of various organizations who are dealing from logistics service providers. Responses are sought about their satisfaction from logistics services on Likert scale. The data is collected and then analyzed for testing hypothesis by using Structural Equation Modeling.

The finding of case study method has provided various insights about the current assets, processes and best practices of Indian LSPs. The findings revealed that Indian LSPs are well equipped with resources but government attention and consideration as an industry is still missing. It has also been observed that the LSPs are now taking steps towards sustainability, environment and society. By using Fuzzy AHP, it has been observed that Competence (0.27), Communication (0.25), Commitment (0.20), Coordination & Collaboration (0.14) and Creativity & Customization (0.13) are major selection criteria for LSPs. It shows that customers give more importance to competence followed by communication and commitment while selecting their service provider. Fuzzy TOPSIS was used to find out the final rankings of best LSPs for the study. The results show that the PQR Ltd. is considered to be best LSP followed by XYZ Ltd., and ABC Ltd.

Findings of proposed logistics service quality model by using Structural equation modelling revealed that constructs such as operational quality, resource quality, information quality, personnel contact quality, and customization and innovation quality greatly influences customer satisfaction. It was found that all the constructs

were supported at the $p < 0.05$ significance level. It was also found that the constructs operational quality, resource quality, information quality, personnel contact quality, and customization and innovation quality were not having a significant impact on customer loyalty. Results of hypotheses testing are also supporting the mediating effect of customer satisfaction.

The significant contributions and research implications for both LSPs and customer organizations can be retrieved from the research work. LSPs can also understand their service quality evaluation parameters and can improve on lacking areas for more satisfaction of their customers. After understanding and adopting the LSQ model, the organizations can define their clear expectations to the LSPs. Recommendations along with limitations and future scope for study has been also made. The research work will help LSPs, customer organizations, academicians, and researchers by understanding, adopting and implementing the learning based on outcomes retrieved in the study.

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LIST OF ABBREVIATIONS

3PLs:	Third Party Logistics Providers
AHP:	Analytical Hierarchy Process
AMOS:	Analysis of a Moment Structures
ASV:	Average Shared Variance
AVE:	Average Variances Extracted
CC:	Closeness Coefficient
CFA:	Confirmatory Factor Analysis
CFI:	Comparative Fit Index
CIQ:	Customization and Innovation Quality
CL:	Customer Loyalty
CR:	Composite Reliability
CS:	Customer Satisfaction
CSF:	Critical Success Factors
CSR:	Corporate Social Responsibility
DEA:	Data Envelopment Analysis
DF:	Degrees of Freedom
DFC:	Dedicated Freight Corridors
EDI:	Electronic Data Interchange
EFA:	Exploratory Factor Analysis
FIFO:	First In First Out
FMCG:	Fast Moving Consumer Goods
FNIS:	Fuzzy Negative Ideal Solution
FOV:	Freight on Value

FPIS: Fuzzy Positive Ideal Solution

GDP: Gross Domestic Product

GPS: Global Positioning System

GSCM: Green Supply Chain Management

GST: Goods and Service Tax

ICD: Inland Container Depot

ICT: Information and Communication Technology

IQ: Information Quality

ISM: Interpretive Structural Modeling

IT: Information Technology

LCD: Liquid Crystal Display

LED: Light Emitting Diode

LIFO: Last IN First OUT

LPI: Logistics Performance Index

LSPs: Logistics Service Providers

LSQ: Logistics Service Quality

LTL: Less than truckload

MCDM: Multi-Criteria Decision Making

MIS: Management Information Systems

MSV: Maximum Shared Variance

NFI: Normed Fit Index

ODC: Over Dimensional Cargo

OQ: Operational Quality

PAF: Principal Axis Factoring

PCA: Principal Component Analysis

PCQ: Personnel Contact Quality

PDSP: Physical distribution Service Price

PDSQ: Physical Distribution Service Quality

RFID: Radio Frequency Identification

RMSEA: Root Mean Square of Error Approximation

RQ: Resources Quality

SAP: Systems, Applications, Products in Data Processing

SCI: Supply Chain Integration

SEM: Structural Equation Modeling

SERVQUAL: Service Quality Model

SPDC: Spare Parts Distribution Centers

SPSS: Statistical Package for the Social Sciences

SSIM: Structural Self Interaction Matrix

SWOT: Strengths, Weakness, Opportunities, and Threats

TFI: Tucker Lewis Index

TFN: Triangular Fuzzy Numbers

TISM: Total Interpretive Structural Modeling

TOPSIS: Technique for Order Preference by Similarity to Ideal Solution

TPL: Third Party Logistics

TQM: Total Quality Management

VMI: Vendor Managed Inventory

WIMS: Warehouse-Information-Management-System

WMS: Warehouse Management Software

Chapter 1

Introduction

1.1 Research Background

In fast developing world economy, all firms prefer to work together in an integrated manner in order to make efficient utilization of common resources of supply chain management. The supply chain management is responsible for conducting smooth flow of information and materials by integrating all partners, starting from supplier and ending up to final consumer. Usually, the 30-40 per cent share of the final cost of product is due to the logistics (Saripalle, 2018). So, this requires efficient management of all supply chain partners for smooth functioning of the entire system. It is very important that all partners of the supply chain are linked and integrated with each other to provide safe and assured delivery of goods on promised time and cost. Outsourcing of logistics operations can become a key to survival and growth for organizations in current competitive market conditions. Outsourcing of logistics operations can assist organizations to focus more on their core competencies and to respond faster to the dynamic market demands with competitive prices. Non-core activities like transportation, warehousing, value added services, documentation, order fulfillment, etc. are being outsourced by organizations in order to remain focused to their core areas (Jhawar and Garg, 2018). Logistics Service Providers (LSPs) give logistics solutions to the organizations by reducing their cost, providing better service quality, providing timely delivery and increased efficiency of supply chain. Logistics is considered as “backbone of the economy” and contributes as an important element for country’s future growth. Over past few decades, logistics sector in India has grown steadily and at present has become industry of worth US \$160 billion (Economic Survey, 2018).

India spent around 13 per cent of its GDP on logistics in 2018 which is comparatively higher than 8-9 per cent of developed countries (Malhotra and Mishra, 2019). Logistics Performance Index (LPI) has been used to benchmark and rank the countries on the basis of their logistics service quality, infrastructure, tracking and tracing ability, etc. by the World Bank. In 2018, LPI provided comparative ranking for 160 countries across the world. India has been ranked 44th in 2018 with LPI score of 3.18. Ranking has got decreased as compared to 35th in 2016 with LPI score of 3.42 (The World Bank, Logistics Performance Index, 2018).

The organizations outsource their logistics activities to LSPs with an expectation of better outcome in terms of more satisfied customers, enhanced customer loyalty and increased profitability. The service quality has direct effect on suppliers, customers and employees and also impacts the performance of client organizations. Therefore, LSPs are required to understand the expectations of their customers and must try to understand what their clients perceive about them and evaluate their service quality. There is a need of LSPs to have deep understanding on specific logistics requirements of client organizations and to identify or analyze the critical parameters which directly influence their customers' satisfaction and further customer loyalty.

1.2 Logistics Sector in India

Logistics can be considered as the key driver of the economy growth on which all commercial sectors depend for effective flow of their goods. In India, logistics industry is evolving rapidly and currently, having a worth of US \$160 billion with 13 per cent of its GDP. The evolution of logistics sector in India had begun in early 1970s when only suppliers and shopkeepers directly replenished their needs. By 1990's, organizations started outsourcing of transportation activities for movement of goods through warehouses only. During 1990-2000, the operations at port became more efficient and structured. Business functions started integrating to achieve the

common goal of effective supply chain management. From 2000 to 2010, Inland Container Depot (ICD) operations had emerged due to growth in trade volumes and regulations, rise in outsourcing of logistics services and addition of more value added services. In past few years, digitalization, communication and automation have increased to a big extent which results in increased transparency among all supply chain partners and integrating them for efficient supply chain management. But despite the fact that logistics sector accounting for 13 per cent of Indian GDP, the sector is not still recognized as an industry. This sector is highly unorganized. Lack of government support affects the development, adoption and implementation of policy frameworks in Indian logistics sector. This may be the main reason for not considering current logistics business as an industry.

The logistics sector is interplay of infrastructure, technology and trained manpower. In developing countries like India, infrastructural bottlenecks are one of the major concern areas to be improved on priority. The pathetic road conditions, inadequate roads, air and sea port capacities, poor connectivity, heavy congestion, traffic, and issues at check posts and tolls, etc. are a few to name (Mitra, 2006; Mitra, 2013). Among all the modes of transport, road is the most common mode used for freight transportation and constitutes around 60 per cent of the total freight traffic. Further, railways account for about 32 per cent which is followed by coastal shipping about 7 per cent, and air constitutes less than 1 per cent (IBEF, 2014). High investments and low margin due to untimely payment system by Indian shippers slow down the pace of logistics service providers. Moreover, the government policies and inspection strategies are not up to the mark and can be considered as one of the important hurdles in the success story of LSPs (Rajesh et al., 2011). Although the Government has initiated many steps in this direction but still the current capacities of LSPs are not synchronized with expected industry requirements.

The logistics sector in India is expected to witness continuous growth due to increase in retail, ecommerce and manufacturing sectors. Moreover, domestic and global consumption is rapidly increasing which opens many new opportunities for LSPs. It is expected that the logistics industry will reach to US \$215 billion industry by 2020 (Economic Survey, 2018).

1.3 Logistics Service Providers

The other popular names of Logistics Service Providers (LSPs) are “third party logistics providers (3PLs)” or “logistics outsourcing” or “contract logistics”. Marasco (2008) highlighted the importance of services over outsourcing or subcontracting. LSPs support organizations in both, direct and indirect ways and assist in maintaining seamless flow of goods across the entire supply chain. LSPs serve their customers with blend of dedicated fleet, warehouses, robust distribution network, trained manpower and advanced IT tools.

The LSPs provide various functions like inbound and outbound transportation, warehousing, fleet management, bulk procurement, freight movement, distribution optimization, value added services, etc. to provide competitive advantage to the client organizations. Now, logistics providers are just not performing simple supply chain operations but also play a very significant role in supply chain integration by facilitating collaboration among all supply chain partners (Kumar et al., 2012). Mostly all manufacturing sectors like automobile, electronics, cement, pharmaceuticals, processed foods, oil & gas and FMCG apart from agriculture need multimodal transport services to serve wide customer base with limited production base. Most of the firms are dependent on logistics providers for their warehousing activities, wide geographical coverage, developed IT solutions and strong network. The information about Indian LSPs, and the different market segments and industries catered by them can be retrieved from Centre for Monitoring Indian Economy (CMIE) Prowess Database.

The logistics service providers are differentiated on the basis of industry verticals, targeted market and product differentiation. In India, TCI, CONCOR, AFL Logistics, All Cargo Logistics, Gati, ABC India, Agarwal Packers and Movers Ltd, Safexpress Ltd, Om logistics, etc. are the major logistics service providers. Foreign organizations also look for opportunities to enter in Indian logistics sector by carefully observing the dynamics of Indian market. Huge market size along with low competition at lower price majorly attracts foreign players towards logistics sector of the country. For instance, in 2009, a French global shipping company entered into India in air segment. DHL (popularly known as Blue Dart) and TNT etc. are the multinational organizations which are currently dealing in Indian markets. The logistics providers in India have captured different industries by providing customized solutions to their customers. As for instance, Om logistics, well-recognized LSP from 1980s, has their core competence in serving automobile and electronics sector. Similarly, Blue Dart is known for their competence in providing courier and Over Dimensional Cargo (ODC) services in air mode (they have their fleet of own crafts). Likewise, retail sector distribution is efficiently managed by Safe Express and Gati – well known brands in logistics sector (Market Indian Logistics Report, Edelweiss, 2018).

LSPs play an important role in enhancing performance of supply chain and have significant impact on organization profitability. Nowadays, the concern of LSPs towards sustainability has also increased due to limitations of resources. In global competitive environment, organizations are adopting sustainable measures along with conventional measures to evaluate LSPs performance. Adoption of sustainable practices by LSPs can help in making proper use of available natural, social and economic resources for long lasting businesses. LSPs have also started taking initiatives like carbon emission reduction, reduction in fuel consumption, use of

solar panels, plantation of trees, use of reusable or recyclable products, etc. in order to preserve natural resources for long term business continuity. The selection of LSPs is done on various criteria decided by the shipper and performance is always evaluated to decide upon the continuity of business and to acknowledge the fulfillment of promised expectations. While selecting a LSP for their non-core activities, organizations usually give more importance to criteria like logistics cost, service quality, compatibility with user, consignment tracking capability, total revenue, geographical coverage, information systems, and on-time delivery, etc. (Kumar et al., 2012). Organizations are also interested in evaluating performance of logistics providers to ensure efficient and value added contribution for betterment.

1.4 Service Quality

Quality can be explained as “degree of satisfaction of an individual gained from the service experienced” or “those characteristics of product or service that meets the exact consumer needs and then provide customer satisfaction”. Companies which serve their customers with high quality goods or services generally had high proportion of market share, increased profitability and higher turnover as compared to those companies which are dealing with low quality of goods or services (Ghobadian, 1994). In recent studies, service quality and customer satisfaction are more broadly considered as synonym terms but theoretically, these terms are distinct and implies that better service quality results in more customer satisfaction. Service quality can be considered as an important element to measure business performance. Organizations focus on improvement of service quality for more customer satisfaction. Customer satisfaction directly affects the customer loyalty. The improved level of service quality will result in reduction in cost as well as increase in profits simultaneously. Service Quality can be explained as “the customers satisfaction from the service experienced and the way through which service has been

conveyed". Many researchers have already established the association among service quality, business performance, customer satisfaction, and customer loyalty in literature (Seth et al., 2006). So, this association motivates and provides opportunities to practitioners and researchers towards concepts of service quality and its applicability in various industries. Nowadays, the LSPs are focusing on attributes which are important and considered by customer while evaluating service quality of them. LSPs also wanted to know about the key drivers which affect their level of service quality and interested to explore the issues or barriers which can create obstacles in their path to success.

In past studies, many authors have discussed about the definitions, dimensions, models and measurement methods of service quality. The concepts and definitions of service quality have been greatly influenced by the service quality model (SERVQUAL) given by Parshuraman et al. (1985, 1988, 1993). In literature, a few service quality models have been created for generic purpose and a few other service quality models pertains to particular requirements of different industries. Ladhari et al. (2008) have explored more than 30 service quality models which are designed to meet the particular requirements of industry. The different scales were considered for different countries as discussed by many authors in past studies. In previous studies, the service quality models have been developed for wide variety of industries such as health sector, restaurants, banking, sports, higher education, and telecommunication, etc. Some models had also showed variation in nature and number of dimensions considered for the study. Majority of these studies have explored quality issues related to many service industries but less or marginal work was done in direction of logistics services, provided by LSPs. Logistics service providers as in the business of providing services, are needed to be explored specifically in Indian context by understanding the various service quality issues they undergo while serving their clients.

1.5 Service Quality Issues of Logistics Service Providers

The organizations take services from logistics providers with a clear-cut objective of achieving excellence in serving customers or transporting the accurate product to the correct customer at the committed moment. As a general mindset, the firms hand over full responsibility to logistics service providers to look after each and every logistical activities including transportation and warehousing on their behalf. Usually, the organizations clearly mentioned their selection criteria of LSPs and future expectations from them. Aghazadeh (2003) provided an optimal solution for selecting a logistics service provider into simple five step procedures. The organizations have indicated their interest in evaluating LSPs performance for future business continuity. On the other hand, at the same time it is very crucial for service providers to perform extraordinary on customer expectations to survive in the intense competitive world.

In current business environment, LSPs are expected to provide accurate, flexible, speedy and timely delivery of goods as order qualifiers whereas use of advanced technologies and sustainable practices can be classified as order winners. Inadequate infrastructure, less availability of skilled manpower and less adoption of technology are the major hurdles in the path of LSPs to provide desired level of service quality to the customers.

The service quality of LSPs is affected by both interior and exterior factors. The interior factors which affect the services are the processes and systems followed by LSPs. The best practices followed by LSPs indicate the level of excellence in their operations and justify their betterment from their competitors. In the same way, the challenges faced by LSPs internally as well as externally can affect the quality of services. The best practices and challenges of LSPs not only affect the service quality to be delivered to the end customers but also affect the selection of

LSPs by their client organizations. The selection of LSPs also depends on the service quality provided by them and how much they are capable of meeting customer expectations. The reasons which affect external service quality issues can be delay in delivery of goods, interchangeability and damage of goods, reach and accessibility, etc. (Farmer, 1988; Mentzer et al., 2001; Huo et al., 2008; Juga et al., 2010; Yeung et al., 2012). The services provided by 3PLs have been evaluated at various dimensions but service quality dimensions have not been considered in past studies. Therefore, there is a need to understand the expectations of customers from LSPs and modify the processes internally as well as externally to deliver the desired service quality to them.

1.6 Motivation for the Research

Organizations outsource their logistic functions to LSPs with pre-decided agreement on service quality. Therefore, every service provider is bound to deliver quality services as a prerequisite for survival. There is vast literature available on service quality, logistics service providers, service performance, and customer satisfaction but in isolation. In literature, the service quality in supplier-buyer relationships is also studied by many authors but giving less importance to third party logistics relationships. Although some authors worked in this area but the studies on service quality models developed particularly for measuring customer satisfaction from logistics service provider perspectives, are very limited. Although logistics outsourcing is an important area but very limited studies are available in this field specifically in developing countries like India. The rising markets of e-retail, e-commerce and the Government initiative of “MAKE IN INDIA” concept will provide wide opportunities for LSPs to grow and expand their businesses. There is a good scope to understand the processes, best practices and challenges faced by LSPs. There is an ample opportunity to study the issues related to service quality of Indian LSPs,

giving services to various segments of industries. There is wide scope to identify critical service quality dimensions of logistics service providers on which customers evaluate their services. This has motivated the researcher to develop a framework for measuring service quality and their impact on customer satisfaction and customer loyalty.

1.7 Research Questions

It was observed that the service quality issues of Indian LSPs were less studied. It provides great opportunity to explore and extend research in this area. Detailed literature review and gaps identification have been done in Chapter 2 by researcher. The research questions to be addressed through this study are:

Q1. What are the assets and processes of Indian LSPs?

Q2. What are the best practices followed and challenges faced by Indian LSPs?

Q3. What are the parameters considered by client organizations while selecting the best logistics service providers for them?

Q4. What are the service quality dimensions of Indian LSPs which affect their customer satisfaction and customer loyalty?

1.8 Research Objectives

The following research objectives are developed for the study based on research questions:

1. To analyze the best practices followed and challenges for Indian logistics service providers.
2. To develop a framework for the selection of the suitable LSP based on service quality.
3. To identify the service quality dimensions and development of service quality framework for Indian logistics service providers.

1.9 Methodology of Research

Detailed research methodology is given in Chapter 3. However, different methods to achieve the objectives of the study are summarized here. To achieve objective 1, the best practices of logistics service providers are explored and analyzed by using case study method. Three case companies have been considered to understand the best practices followed by LSPs. The challenges faced by LSPs are retrieved from literature review and expert opinion and then analyzed by using Total Interpretive Structural Modeling (TISM) approach. For objective 2, a framework for the selection of best LSP is proposed and analyzed by using Multi-Criteria Decision Making (MCDM) tools. For achieving objective 3, a conceptual framework is proposed. The data is collected from the employees of various organizations who are dealing with logistics service providers. Responses are sought about their satisfaction from logistics services on Likert scale. The data is collected and then analyzed for testing hypothesis by using Structural Equation Modeling (SEM).

1.10 Significance of the Study

The present research work is expected to be useful for logistics service providers and the organizations which take services from LSPs. The significance of research is as follows.

- It is expected that the upcoming time will be booming period for logistics service providers as the Government of India has recently launched “Make in India” concept which will provide wide opportunity to expand their businesses for serving the nation.
- The upcoming opportunities in retail online and e-commerce businesses will enhance business scope of LSPs and can enrich their service capabilities to meet the market expectations.

- Logistics providers can develop strategies to improve their performance by understanding their strengths and weaknesses and can become globally competitive.
- Organizations which take services from LSPs can better understand about the performance parameters they consider while evaluating their service providers and the same parameters can help in selection of LSPs in future.
- Logistics service providers can also understand the parameters on which generally their services are evaluated and they can improve upon lacking areas for better satisfaction of their customers.

1.11 Structure of the Thesis

The thesis is organized into nine chapters. The brief explanation of all chapters is discussed below.

Chapter 1- “Introduction” deals with the outline of the research work and mentions about the Indian logistics sector and logistics service providers. It presents the various logistics services provided and their selection and evaluation on the basis of their service quality. Researcher elaborates the motivation of the research and to select the service quality issues of Indian LSPs for research work in this chapter. The research objectives are developed from research questions and the significance of study is also discussed. The structure of the thesis along with brief details of chapters is also mentioned.

Chapter 2- “Literature Review” is based on the past studies in the field of logistics service providers and service quality. Definitions, concepts and models are explained in this chapter. It also emphasizes on the detailed review of literature for identification of critical success factors, best practices and challenges faced by Indian LSPs. A review of literature for identification of service quality dimensions and constructs is also comprehensively done for

proposed framework development. A review of literature assisted in finding the research gaps and provided scope for the extension of present study.

Chapter 3- “Research Design” explains the step by step procedure pursued for the present study. After the research gap analysis, research objectives were established. To achieve these objectives, different methodologies and tools were used. This chapter discusses various methodologies like case study method, TISM, Fuzzy AHP, Fuzzy TOPSIS and sensitivity analysis which are used for the development and evaluation of the various frameworks. This chapter also discusses about the descriptive analysis, framework validation and hypotheses testing by Structural Equation Modeling (SEM).

Chapter 4- “Best Practices Followed by Indian LSPs” deals with the best practices followed by Indian LSPs to offer quality services to their customers. To understand the best practices of Indian LSPs, case study method is used. Three case organizations have been selected for the study based on their origin, annual turnover and manpower strength. In this chapter, the assets, processes and best practices along with SWOT analysis of all the three case organizations have been discussed in detail.

Chapter 5- “Challenges Faced by Indian Logistics Service Providers” deals with the hurdles faced by Indian LSPs while delivering quality services to their customers. In this chapter, the structural linkages between the shortlisted challenges have been reviewed and the prioritization of challenges is done using Total Interpretive Structural Modeling (TISM) approach. The driving power and dependence power is also found for these challenges. The categorization of these challenges into four categories by MICMAC analysis has been discussed.

Chapter 6- “Selection of Logistics Service Provider Based on Service Quality” deals with the selection of best logistics service provider on the basis of their service quality among all available alternatives. In this chapter, a 5C’s framework is proposed to select the best LSP on the basis of its service quality. The framework is validated by means of a real case illustration. The Multi-Criteria Decision Making tools (MCDM) tools like Fuzzy AHP and Fuzzy TOPSIS are used for selecting the best LSP out of all available alternatives. To check the robustness of the proposed framework, sensitivity analysis has been applied.

Chapter 7- “Development of Theoretical Logistics Service Quality (LSQ) Framework and Research Hypotheses” deals with the development of theoretical framework for measuring customer satisfaction from logistics service quality in Indian context. All the constructs and corresponding items of the proposed framework have been elaborated in Chapter 2. The constructs considered for the framework have been initially taken from literature review and then examined by industry experts by looking at their relevance in Indian context. The scale development for theoretical framework is discussed in detail.

Chapter 8- “Data Analysis and Hypotheses Testing” discusses about the validation of theoretically proposed Logistics Service Quality framework (LSQ framework) through statistical analysis. In this chapter, the examination and compilation of quantitative data which is collected through survey method is analyzed and the outcomes related to validity of the proposed model are interpreted and discussed. The next step is to check and validate the structural relationships of the service quality attributes with latent variables by using SEM. Further, the mediating effect among service quality dimensions, customer satisfaction and customer loyalty is also assessed.

Chapter 9- “Conclusions and Future Directions” discusses about the learnings of the research and the synthesis of the entire research work. Additionally, the significant contributions and implications of the research work for the managers, organizations, researchers and academicians are also discussed. The limitations along with future scope of the research are also mentioned. Few recommendations for the logistics service providers are brought out in the research work.

1.12 Concluding Remarks

In this chapter, the background of the research has been discussed. The logistics sector including logistics service providers and their service quality issues have been introduced in detail. The motivation for research is discussed to explain the relevance and importance of the study. The research questions are framed from the study and research objectives thus developed on the basis of questions framed. The different methodologies used for study are also summarized briefly. The structure of the thesis along with brief descriptions of nine chapters has been also mentioned. In the next chapter, a literature review on different aspects of the study has been undertaken and presented in a comprehensive manner.

Chapter 2

Literature Review

2.1 Logistics Service Providers: An Introduction

Since last four decades, numerous researches are done on Logistics Service Providers (LSPs) and logistics services provided by them. At present, the field is continuously growing and various authors are contributing in different ways. Selviaridis and Spring (2007) offered a classification of studies on logistics service providers and identified opportunities for further study in this area by exploring extensive literature review of 114 research papers which are published from 1990 to 2005. Marasco (2008) did an in-depth literature analysis on logistics service providers by analyzing 33 international journals which are published from 1989 to 2006. From 2001 to 2009, Busse and Wallenburg (2011) contributed significantly towards study on innovation practices in field of logistics. Generally, authors referred outsourcing as giving some part of business to third party for the benefit of cost reduction and improved customer services. Many authors referred “logistics service providers” with various names like “logistics outsourcing” (Knemeyer et al., 2003; Jaafar and Rafiq, 2005), “TPL” (Maloni and Carter, 2006), “third party logistics (3PL)” (Sahay and Mohan, 2006; Selviaridis and Spring, 2007; Gotzamani et al., 2010), “LSPs” (Fabbe-Costes et al., 2008). Nowadays, third party logistics (3PLs) have become very important

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1. *Part of this chapter has been published as “Prioritizing Best Practices for Logistics Service Providers”, Transforming Organizations through Flexible Systems Management, (pp. 257-275). Springer, Singapore, 2020.
 2. *Part of this chapter has been published as “Prioritizing Critical Success Factors for Sustainable Service Quality Management by Logistics Service Providers”, Vision, 22(3), 295-305, 2018.

component of logistics sector. Fulconis et al. (2006) argued that LSPs can be referred as 4PLs when they work as consultants or assist organizations in framing and managing supply chains.

Various definitions on LSPs are mentioned by various authors in literature. According to Lieb (1992), it is traditionally defined as “the external companies which perform logistics functions for the organizations which they used to do by themselves” whereas Delfmann et al. (2002) defined LSPs as “the external organizations which carry out logistics functions on behalf of the other organizations”. As per researcher understanding, LSP is just not only handling day to day logistical transactions but simultaneously, responsible for effective supply chain integration and increased supply chain profitability. In other words, LSPs can be defined as “those who manage the flow of materials and information to fulfill the organization’s needs”. Marasco (2008) conceptualized the dyadic relationship between buyers or sellers of the goods and logistics service providers in a supply chain whereas Bask (2001) represented relationship of LSPs with seller and buyer in a triadic form of relationship as shown in Figure 2.1.

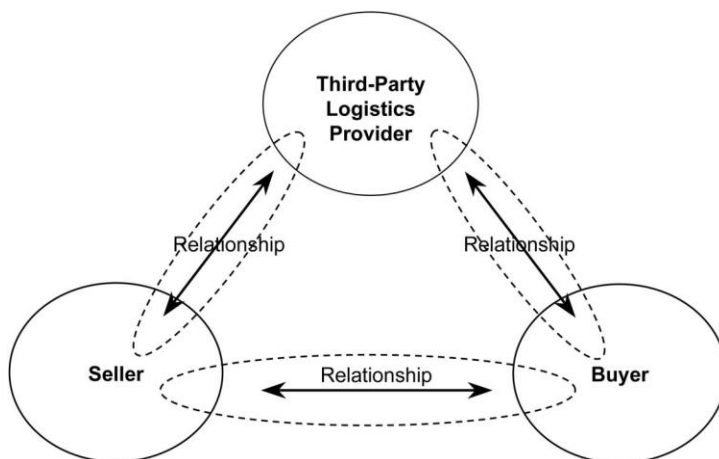


Figure 2.1: Triadic Relationship of Seller, Buyer and Third Party Logistics Provider

Source: Bask (2001)

Tezuka (2011) highlighted LSPs as integrated, contract, and consulting service providers. Different authors discussed about the LSPs processes and their services based on different industry segments they served. According to Hertz et al. (2003), LSPs serve multiple roles as service developers, customer developers and customer adapters altogether. LSPs which have their own assets for smooth functioning are generally known as “asset type” whereas LSPs with adequate resources to function their processes, are known as “non- asset type” (Tezuka, 2011).

2.2 Services Provided by Logistics Service Providers

In today’s dynamic market conditions, LSPs provide multiple services either to serve individual or multiple customers (Sheffi, 1990; Rabinovich et al., 1999; Kumar and Singh, 2012). In past times, the organizations commonly outsourced for logistics activities like transportation, warehousing and fleet management (Sahay and Mohan, 2006). Gilaninia et al. (2011) and Fasanghari et al. (2008) highlighted the importance of information technology in effective coordination across the distribution channel. Supply chain integration is also considered as a basic tool for enhancing effectiveness and profitability of LSPs, as discussed by many authors (Jayaram and Tan, 2010; Huang et al., 2014). Competitive environment and decreasing margins are big hurdles in the growth story of LSPs (Tan et. al., 2014). Most frequent outsourced functions are value added services (Soinio et al., 2012), optimal delivery time (Ulku and Bookbinber, 2012), flexibility in service (Naim et. al, 2010) and network optimization (Basligil et al., 2011). Many studies exist in literature on contemporary logistics practices like innovation management (Busse and Wallenburg, 2011), green supply chain, and reverse logistics, etc. (Govindan et al., 2012).

The increased use of Information Technology (IT) makes logistics operations handling easy which results in improved efficiency of LSPs. Various authors worked on importance of IT tools

and techniques for integration of supply chain, information sharing, inventory management and to improve overall effectiveness of supply chain practices. Evangelista et al. (2013) highlighted the innovation process for small and medium sized LSPs by using ICT and highlighted on impact of technology adoption and information integration on LSPs performance as per their level of adoption and usage. Wong et al. (2015) established the relationship between the importance of IT enabled collaborative decision making and improvement in customer service performance. In the present scenario, digitalization and automation of logistics activities are increased to a big extent due to high use of information technology and customized software for supply chain integration and inventory management.

The increase in use of LSPs services has changed the relationships between shippers and LSPs. Supply Chain Integration (SCI) is required as a significant part for increasing effectiveness and profitability of LSPs, as mentioned by many authors (Jayaram and Tan, 2010; Huang et al., 2014). Daugherty et al. (1996) discussed the execution of integrated logistics concept in US firms and observed that the internal and external integration among supply chain partners are important and helps in enhancing supply chain efficiency. Jung et al. (2008) proposed a decentralized framework for distribution planning between the manufacturer and 3PL in order to maximize their profits in the supply chain and minimization of information sharing among them. Fabbe-Costes et al. (2008) analyzed 48 articles in detail published in nine reputed journals for discussing the association between inter organizational supply chain coordination and client's performance. They made a systematic content analysis and identified few LSPs which can be viewed as enablers (used as "tools" by shippers) and potential (proactive SCI improvers). Jayaram and Tan (2010) proposed that there are significant differences in the organization's performance when they are using LSPs or to when they are not. Their research also supported

that the information integration and relationship building are positively correlated with organization performance. Huang et al. (2014) found inconsistency in results on relationship between SCI and performance in literature. So, they proposed a model to reexamine the supplier customer association under demand uncertainties and then evidenced that SCI shows positive impact on the supplier's performance by empirically tested methods.

Globalization has become a major reason for companies to revamp their processes, build up goods to meet international market requirements and enhance capability to reach globally (Kumar and Singh, 2012). This requirement gives full opportunity to logistics providers to come up with wide market reach and better connectivity with other nations. Many developed nations are currently in stage of well-established logistics providers handling all non-core activities whereas a few are still at initial stage (Tan et. al, 2014). Bhatnagar et al. (1999) have analyzed that more than 50 per cent of firms outsource shipment consolidation to logistics providers whereas around 40 per cent outsourced order fulfillment, carrier selection and freight payment in Singapore. Logistics outsourcing practices are comparatively slower in North America and Latin America as compared to Asia-Pacific Region and Western Europe (Kumar and Singh, 2012). In Hong Kong, transportation along with storage contributes around 10 percent of GDP while transport and storage industry contributes around 9 per cent of entire employment whereas in China, 3PL is still at initial stage (Huo et al., 2008). China requires reengineering of their operations and revisiting their competitive strategies to face increased uncertainties and to meet the needs of global customers in complex competitive environment (Wang et al., 2010).

There is also a need of adoption of sustainable practices by logistics service providers in order to conserve limited available resources and to encourage green initiatives. Mitra and Datta (2013) studied the implementation of green logistics in manufacturing organizations in India and

established that GSCM practices adoption are still in infancy phase and regulatory framework is also lacking in terms of promoting environmental sustainability. Marchet et al. (2014) explored immense research on sustainability and ecological factors in logistics and also proposed directions for future research. Luthra et al. (2015) further recognized the critical success factors for implementing green practices and optimization of resources for future use in Indian organizations. Govindan et al. (2012) highlighted the importance of reverse logistics for its benefits of decreased resource investment levels, reduction in storage and distribution costs.

Due to high fragmentation in Indian logistics sector, the market is flooded with many small and large logistics service providers. Usually, firms select LSPs based on volume of shipments, level of service quality desired, urgency and cost associated with particular consignment. The firms behave very critically while selecting logistics provider for sharing their responsibilities as their brand image is going to be represented by them. The organizations have clearly defined criteria for selection and future expectations from the service provider. The organizations evaluate LSPs performance from time to time for business continuity (Kayakutlu and Buyukozkan, 2011). While making selection of LSPs, least cost is not the only criteria. Organizations also consider service quality, flexibility, innovation, and increase in profits and improvement in customer satisfaction. Kumar and Singh (2012) found that LSPs performance can be evaluated by using two main criteria – cost and service quality. Singh and Sharma (2014) identified that assets and processes of service providers are the main factors which affect the selection and performance of LSPs. Wong and Karia (2010) mentioned that all LSPs tries to acquire physical, human, information, knowledge and relational resources to utilize firm capabilities in efficient manner. LSPs have been acquiring and then bundling them together in various specific ways to create inimitable and firm- specific capabilities. Efendigil et al. (2008) and Senthil et al. (2014) applied

Multi-criteria Decision making (MCDM) approaches for selection and assessment of reverse logistics contractor in order to support increased requirements of green practices. Many mathematical models and techniques have been discussed in literature to support selection, efficiency analysis and performance measurement of LSPs (Hamdan and Rogers, 2008; Kayakutlu and Buyukozkan, 2011; Kumar and Singh, 2012; Rajesh et al., 2012; Huang et al., 2014; Marcoa et al., 2014). MCDM tools like Analytical Hierarchy Process (AHP), Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), Interpretive Structural Modeling (ISM), Total Interpretive Structural Modeling (TISM), Fuzzy AHP and Fuzzy TOPSIS, etc. are used by various authors to prioritize or rank the factors which are important for the choosing the best LSP out of all alternatives (Bottani and Rizzi , 2006; Liu and Wang, 2009; Percin, 2009; Kumar and Singh, 2012; Suyabatmaz et al., 2014). Data Envelopment Analysis (DEA), a linear programming technique is also used by many authors to measure the logistics service provider efficiency (Hamdan and Rogers, 2008). Rajesh et al. (2012) proposed the strategies for various functions of LSPs on basis of all four perspectives of the balanced scorecard.

2.3 Methodology of Literature Review

Marying (2007) suggested a step by step procedure to do systematic review of literature and to define clear research design. The research methodology will initiate from material collection, followed by descriptive analysis and evaluation of collected material. The steps followed are mentioned in detail below:

2.3.1 Material Collection

Material collection is the initial step of review process. The material is collected from various sources like research papers from reputed journals, articles from journals and books and related past reports. In the first stage, the pair of keywords “Logistics service providers” or “Service

quality” and “Literature review of logistics service providers” are used as keywords to search out in the relevant research articles. These keywords were searched in “Google-scholar search engine” and “Scopus” and also sorted on the basis of relevance of the study context. After reading and analyzing the collected material, the literature review was continued by searching more about logistics service provider’s characteristics which were affecting their service quality. Further, the literature search was attributed to keywords like “Best practices followed by LSPs”, “Challenges faced by LSPs”. Then, at second stage, the concept of “Service quality”, “Service quality models”, “Service quality dimensions” and “Service quality issues of Indian logistics service providers” were explored in research articles. Generally, the research articles collected for the study had been taken from reputed journals. The journals of Elsevier, Springer, Emerald, Wiley, and Taylor and Francis were preferred for collecting study material. Most of the research papers, collected from above explained sources were taken for consideration in this study.

2.3.2 Descriptive Analysis

In the present study, the articles sourced from more than fifty journals to understand the available literature. The articles which have been considered for study are published in reputed journals such as International Journal of Physical Distribution and Logistics Management, International Journal of Production Economies, Benchmarking: An International Journal, Journal of Cleaner Production, International Journal of Production Research, Supply Chain Management- An International Journal, The International Journal of Logistics Management, etc.

2.3.3 Category Selection

The category of the research work is chosen to study the service quality issues of Indian LSPs. The service quality issues of LSPs which affect the customer satisfaction and loyalty are discussed in the present research work. The framework followed for the literature review is

shown in Figure 2.2. So, the main categories of the literature review undertaken can be listed as follows:

- Service quality definitions and service quality models.
- Characteristics of logistics service providers which affect the service quality provided by them in terms of critical success factors, best practices followed by them and the challenges faced by them during the delivery of services.
- Service quality dimensions and constructs to develop the proposed framework for logistics service quality in Indian context.

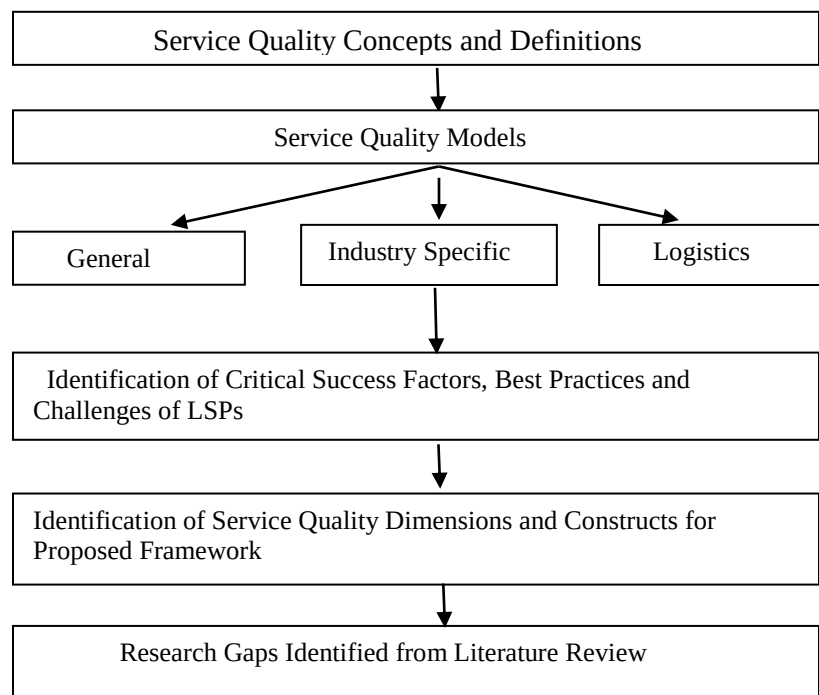


Figure 2.2 Framework of Literature Review

2.4 Service Quality Definitions, Models and Measurement

Service quality definitions and measurement models are available in plenty as researched by many authors in past studies. In general, the studies have indicated the details of various components of service quality, factors which affect the performance of service provider and the

quality dimensions which make their services successful with an obvious objective of more customer satisfaction, increased profitability and better business performance.

Several researchers have explored service quality issue with different viewpoint and with varied approaches (Seth et al., 2005). Few studies have covered framework development whereas some ended up with empirical outcomes (Teas, 1993). Seth et al. (2005) compared around 19 existing service quality models which were published in reputed journals from 1984 to 2003 and acknowledged relation among them. Similarly, Ladhari (2008) identified the key concepts and empirical issues related to service quality models applied for dealing industry specific issues. These models were also differentiated with most widely applicable SERVQUAL model given by Parasuraman et al. (1985).

2.4.1 General Service Quality Models

Gronroos (1984) discussed that perceived service quality can be achieved only when firm matches service expectation with service perception. He identified three dimensions (“Technical quality”, “Functional quality” and “Image”) of service quality required to achieve customer satisfaction. “Gap Model” was introduced by Parasuraman et al. (1985) by defining gap as differences between consumer’s expectation and consumer’s perceptions. They developed ten dimensions (“Tangibles”, “Reliability”, “Responsiveness”, “Communication”, “Credibility”, “Security”, “Competence”, “Understanding/knowing customers”, “Courtesy” and “Access”) of service quality for evaluation from consumer perspective. This model was further revised and named as SERVQUAL instrument for computing consumers perceptions from service quality by reducing number of dimensions from ten to five (Table 2.1) (Parasuraman et al., 1988, 1993). They had developed a 22-item instrument in the form of common statements to measure

consumers' expectations and perceptions by corresponding four to five items to a single dimension.

Table 2.1: SERVQUAL Dimensions

Dimensions	Definitions	Items in Scale (22 items)
Reliability	Ability to deliver accurately on committed time	4
Assurance	Ability and knowledge of personnel and confidence of customers on them	5
Tangibles	Outlook of physical facilities and equipments including personnel	4
Empathy	Customization and individual attention to customers	5
Responsiveness	Helping out customers and providing quick services	4

The SERVQUAL model was applied by many researchers with its basic five dimensions in the areas of government departments, hotels, restaurants, telecommunication, retail sector and information systems, etc. (Kontogeorgos et al., 2014). At the same time, this model has been criticized by many researchers mainly for the reasons of neglecting main quality dimensions like cost and accessibility and measuring service quality in terms of gap where customers rarely respond in terms of P - E gap. Despite this widespread criticism, SERVQUAL is considered as most commonly measurement tool used for evaluating service quality.

Lehtinen and Lehtinen (1982) created a service quality model based on three constructs that are, “Interactive”, “Physical” and “Corporate Quality”. Haywood Farmer (1988) introduced a service quality model based on three attributes- “Physical facilities and processes”; “People’s behavior” and “Professional judgment”. LeBlanc and Nguyen (1988) had given five dimensions which

include “Degree of customer satisfaction”, “Internal organization”, “Physical environment and instruments supporting service producing system”, “Corporate image” and “Personnel customer satisfaction” to measure service quality. Brogowicz et al. (1990) established a service quality framework which includes three constructs namely “Company image”, “External influences” and “Traditional marketing”. Parasuraman et al. (1991) had refined and reassessed the SERVQUAL model by testing it empirically. Cronin and Taylor (1992) investigated relationship of service quality with customer satisfaction and realized that evaluations based on perceptions can better measure the service quality. They conceptualized and framed “Performance only” model called SERVPERF without taking consumers’ expectations into consideration. Mattsson (1992) argued on the belief of taking expectations as a standard whereas standards can depend on many other factors like experience based, ideal, minimum tolerable and desirable, etc. and developed a value-based service quality model for measuring customer satisfaction.

Babacus and Boller (1992) developed a model by taking service quality as one-dimensional construct and then empirically tested the proposed model. Generally, the quality models given by various authors are conceptual and theoretical in nature. Teas (1993) proposed empirical based service quality model for measurement of expectations and presented the Normed Quality and Evaluated Performance (EP) model. In 1993, O’ Hara and Frodey proposed a service quality model for manufacturing but they have not defined constructs and variables properly and no mathematical validation has been done.

With advancement in field of information technology, Furey (1991) highlighted the importance of IT which increases convenience and maintaining records for better service quality. Ghobadian (1994) in United Kingdom discussed not only the service quality model but also, what ideally the service quality model should do. He proposed to identify the “Sources of quality”, “Discover the

quality problems”, “Understand the cause of quality problems” and then suggest best course of action to improve the service quality of model. Berkley and Gupta (1994) introduced a service quality model which linked the IT strategy of the firm with the services to improve customer satisfaction and increasing customer effectiveness in the long-run. Johnston (1995) suggested the 18 determinants of service quality as satisfied and dissatisfied customers in his study. Harte and Dale (1995) have almost taken the SERVQUAL model with addition of one dimension “fees” to it. Asubonteng et al. (1996) and Buttle (1996) had critically reviewed the SERVQUAL model and confirmed the reliability and validity of SERVQUAL measures.

Dabholkar (1996) addressed technology based self-service options by proposing two alternative models of service quality. Oliver’s model (1999) was modified to highlight the effect of desires, desires congruency, perceived performance, expectations, expectations disconfirmation on overall service quality which result into overall satisfaction. Llosa et al. (1998) conducted an experiential research work of service quality dimensionality in which the results suggested to club all the three constructs, reliability, responsiveness and assurance into one as the correlation among them was found to be very high. Zhu et al. (2002) presented a model to relate traditional service dimensions with IT based service options which helped in cost reduction and creation of value added services for customers.

There is rich literature available on service quality issues. Several authors have suggested different frameworks - theoretical and empirical for serving different segments and fields. Philip and Hazlett (2001) proposed a PCP model in pyramid structure which will consist of three main attributes– “Pivotal (Outputs)”, “Core”, “Peripheral (Inputs)”. Oh (1999) proposed an integrative model to deal with post purchase decisions which combines service quality, customer value and customer satisfaction concepts altogether. The revised model of Dabholkar et al. (2000)

highlighted service quality issues in terms of antecedents, consequences and mediators. They observed that the service quality acting as mediator between antecedents (components) and customer satisfaction along with behavioral intentions. Imrie et al. (2002) have also developed a service quality model in Asian context with addition of four dimensions (Generosity, Politeness, Courtesy and Sincerity) in place of “Empathy”.

Frost and Kumar (2000) framed an industry specific service quality framework for internal customers as well as internal suppliers for measuring their service quality whereas Charles and Kumar (2014) presented a framework for measuring service quality by DEA (Data Envelopment Analysis). Various authors have used a variety of measurement tools like Taguchi’s Quality function, AHP, SEM, DEA, SAP-LAP framework and many other statistical methods to evaluate empirical results of service quality models (Seth et al., 2006; Charles and Kumar, 2014). Santos (2003) thought of upgrading service quality models according to the needs of recent e-commerce businesses. They introduced a basic framework for e-service quality where feedback from customers is more important than traditional services. Stiakakis and Georgiadis (2009) proposed an e-service quality model where the same constructs and dimensions of SERVQUAL model were referred but the number of items within a construct have been revised and validated. The concepts of service quality, service performance and customer loyalty were discussed in business-to-consumer contexts to satisfy the customer by delivering best class services (Chumpitaz and Paparoidamis, 2007).

Buttle (1996) highlighted the variation in number of service quality dimensions taken for various industries while developing service quality models. As for instance, SERVQUAL model had five dimensions whereas Gronroos (1984) identified only three dimensions. The variation in number of dimensions from two to thirteen has also observed in literature, considered for different

frameworks by different authors. Several authors have related the concepts of service quality, service performance, customer satisfaction and customer retention/loyalty (Mentzer et al., 1999; Juga et al., 2010). Three dimensions-operational, relational and cost performances are used to measure service performance as defined by Stank et al. (2003). They also extended the studies to understand the impact on market share of LSPs after identifying critical quality dimensions and their impact on customer satisfaction and customer loyalty.

2.4.2 Industry Specific Service Quality Models

Although a vast literature is available on general service quality models but these models sometimes do not fit to meet the industry specific issues of service quality. Some authors applied same five dimensions given in SERVQUAL model for catering needs of specific industries whereas several authors modified quality dimensions to measure service quality of a particular sector. Wide criticism of SERVQUAL model also becomes an important reason for researchers to look forward to some alternative ways of measuring service quality (Buttle, 1996). Carman (1990) felt simple adaptation of SERVQUAL model is not sufficient for computing industry related service quality issues and he developed a model by including 13 additional items to SERVQUAL instrument which make adequate revisions for dealing with different service contexts. Various service industries like retail banks, career centers, higher education, medical services, dental services, hotels and restaurants, etc. considered service quality and customer satisfaction as a prime area of concern (Stevens, 1995; Tomes and Ng, 1995; Sower et al., 2001). The measurement scales developed by many countries like Australia, Canada, Korea, Greek, Hongkong, Spain and US, etc. varied as per their requirement and convenience of data collection and analysis (Ladhari, 2008).

Knuston et al. (1990) proposed a service quality model for lodging industry which had same five dimensions as SERVQUAL model but included 26 items in place of traditional 22 items whereas Getty and Getty revised the same model but with only perception scores. A service quality model for hospitality sector was addressed by Saleh and Rehan (1991) in Canada by developing two separate measureable scales for hotel guests (32 items) and management staff (33 items). Bouman and Vander Wiele (1992) proposed a service quality model with three constructs (“Customer kindness (19)”, “Tangibles (13)” and “Faith (8)”) for car service industry. Vandamme and Leunis (1993) explored a model for health care sector by taking feedback from patients on six dimensions (“Tangibles”, “Medical Responsiveness”, “Assurance I”, “Assurance II”, “Nursing staff”, “Personal beliefs”, and “Values”).

Service quality models were also introduced to evaluate service quality for restaurant industry by revising Parasuraman’s SERVQUAL model with 29 items and taking only customers’ expectations into account. In USA, Dabholkar et al. (1996) developed a model to cater retail sector by understanding consumers’ perceptions only on five quality dimensions like physical aspects, reliability, personal interaction, problem solving and policy. Sweeney et al. (1997) proposed six constructs, that is, “Functional service quality”, “Technical service quality”, “Product quality”, “Relative price”, “Value” and “Willingness to buy” for measuring service quality of retail. Souteriou and Stavrinides (2000) developed an internal service quality DEA framework for a bank branch. A service quality model for health sector was proposed by White and Galbraith 2000 by adding more dimensions to the existing SERVQUAL model.

Every organization is striving for excellence in their services to improve and retain their customer. Likewise, travel agent industry in Hongkong developed a service quality model to enhance footfalls to their business of tourism (Lam and Zhang, 1999). Khan (2003) developed a

service quality model for ecotourism with five dimensions same as SERVQUAL and sixth dimension “ecotangibles” is also considered with 29 items. Some authors have chosen a very rare area to identify gaps between consumers’ expectations and consumers’ perceptions. As for example, Engelland et al. (2000) developed service quality model for career service centers on college campuses by making little revisions in existing gap model. Few authors made addition and deletion to the number of dimensions as per their needs to represent a particular sector. In USA, Cook and Thompson (2001) considered four dimensions with 34 items and only perception scores and developed a service quality model for library sciences. Janda et al. (2002) revised five dimensions to measure service quality of internet retail.

In literature, it was clearly seen that different authors have defined different measurable dimensions even for same service industry. As for instance, Broderick and Vachirapornpuk (2002) developed and tested a service quality model for internet banking based on five key elements which are related to “Expectations of customers”, “Representation and goodwill of service organizations”, “Actual service taken by customer” and “Customer involvement”. Sureshchandar et al. (2002) addressed service quality issues for banking in India with five dimensions whereas Buttle (1996) discussed same issues in banking in UK with different four dimensions. Many authors worked for quality improvement of services in banks with different frameworks (Jabnoun and Khalifa, 2005; Karatepe et al., 2005)

Service quality models were proposed to deal with the service issues of consulting services by adding two new dimensions (process and education) to the existing four dimensions (assurance, responsiveness, reliability, empathy) of SERVQUAL model (Yoon and Suh, 2004). Parasuraman et al. (2005) developed a new model after great success of SERVQUAL instrument for e-services related service quality issues. Complex issues that come across while dealing with

outsourcing relationships and their quality of services were accessed by several authors in various ways. Service quality of Malaysian banks was measured through DEA technique by collecting data through survey from 688 customers (Charles and Kumar, 2014). Kontogeorgos et al. (2014) developed a service quality model on the line of SERVQUAL model for measuring quality of the Greek Ministry of agriculture resulting in three dimensional structures instead of five dimensions of SERVQUAL instrument.

2.4.3 Relevance of Service Quality Models for Logistics Providers

As evident from above mentioned literature, we can understand the detailed availability of literature on service quality models and measurement frameworks in both options- general as well as industry specific areas. In this section, only those service quality models would be highlighted which were specifically applied to the areas of supply chain, logistics and specifically logistics service providers. Although some authors worked in this area but the studies on service quality models developed for particularly measuring customer satisfaction from logistics service provider services is very limited. There is wide opportunity to identify critical service quality dimensions which affect customer satisfaction and then develop a framework which exactly meets the customer requirements.

The area of supply chain was studied by various authors in parts- physical distribution, purchase, supply chain performance (Beinstock et al., 1997) and logistics (Mentzer et al., 1999, 2001) but as an integrated complete supply chain from supplier to consumer was firstly focused on by Seth et al. (2006). They highlighted the importance of service quality models in supply chain and developed a model based on gap analysis. They considered bi-directional gaps between supplier and firm, firm and distributor and distributor and customer. Seth et al. (2006) further revised their model by adding one more component i.e. third party logistics into their existing

framework. Here, they also devised techniques like quality loss function, DEA to measure service quality for various dimensions.

In literature, many studies have been conducted to monitor the progress of their service provider through empirical analysis but logistics service quality along with customer satisfaction and customer retention is not deeply explored so far. But in India, generally studies related to this area focused on comparative analysis of third party logistics providers or to measure performance of third party logistics by using various mathematical tools. Mentzer et al. (1999, 2001) explored service quality concept for LSPs by considering nine logistic quality dimensions related to order processing (“Personnel contact quality”, “Order release quantities”, “Information quality”, “Ordering procedures”, “Order accuracy”, “Order condition”, “Order quality”, “Order discrepancy handling”, and “Timeliness”). Rafiq and Jaffar (2007) also proposed a service quality model to measure customer perception of logistics service quality of 3PL service providers with the same dimensions as Mentzer (1999). Stock and Lambert (1992) considered 13 constructs for developing a world class logistics service quality for four industry sectors (furniture, plastics resins, imaging products and video tapes). Franceschini and Rafele (2000) developed service quality model for logistics by taking 8 indicators and then tuned up them with SERVQUAL model. He further condensed eight indicators to three logistics quality dimensions- “Tangible components”, “Ways of fulfillment” and “Information actions”. Lai et al. (2002) proposed a service quality model for transport logistics for evaluating supply chain performance by introducing three dimensions and 26 items. Stank et al. (2003) evaluated the relationships between logistics service performance, customer satisfaction, customer loyalty and market share in United States. Several authors proved the association between service performance and

customer loyalty and treated this as an important area of interest in business to business service contexts (Juntunen et al., 2015).

Many authors did not consider cost as a service quality dimension for study but Stank et al. (2003) included cost as a measurable parameter and found that the role of cost performance is comparatively insignificant while evaluating the impact of service quality on loyalty. Sometimes, it is difficult to assess outsourcing performance, particularly when dealing with complex structure of third party. Beinstock et al. (2008) expanded the logistics service quality model by incorporating Technology Acceptance Model (TAM) into it. Saura et al. (2008) proposed a service quality model for logistics services in Spain by establishing structural relationship of service quality dimensions with satisfaction and loyalty whereas in China. Tian et al. (2008) developed a service quality model to establish association between 3PL and customer organizations by considering trust as an important parameter for study. Lin and Ho (2008) conducted an empirical study on adoption of green innovations by logistics service providers. Kim and Han (2011) developed and validated a reliable scale for measuring environmental logistics practices. Huang et al. (2009) studied about the service quality of logistics while delivering orders of online retail purchasing in Taiwan and developed a model with 7 constructs and 15 items. In Finland, Juga et al. (2010) investigated the impact of logistics service quality attributes on shipper satisfaction and subsequently on customer loyalty. They developed a theoretical model by identifying critical logistics service dimensions and then studied its impact on customer satisfaction and loyalty.

Kersten and Koch (2010) discussed three dimensions (“Potential quality”, “Process quality” and “Outcome quality”) with 13 items and found the impact of these attributes on service quality and growth of LSPs in future. Wong and Karia (2010) developed a theoretical framework by

identifying strategic logistics resources for explaining the competitive advantage of LSPs by using the Resource Based View (RBV) approach. Rao et al. (2011) proposed an e-LSQ model with four constructs and ten items. In the proposed model, Physical Distribution Service Quality (PDSQ) and Physical Distribution Service Price (PDSP) measured the logistics service quality and their impact on the customer satisfaction from online purchases and customer retention by using SEM. Thai (2013) suggested and empirically validated a Singapore based logistics service quality model with seven dimensions (“Personal contact quality”, “Information Quality”, “Order handling quality”, “Physical distribution service quality”, “Corporate image”, “Timeliness” and “Social responsibility”) and 32 items. The relationship among service quality, satisfaction, loyalty and brand equity of LSPs had been established in form of conceptual model by Grant et al. (2014). Roslan et al. (2015) have applied SERVQUAL model to develop Malaysian logistics service quality model. Gulc (2017) followed theoretical approach and suggested models and methods for measuring service quality of LSPs in courier services.

In order to survive and sustain with growing customer expectations, the LSPs are required to continuously improve the quality of services provided. Although every logistics service provider is bound to fulfill basic service quality requirements to qualify customer orders but to win customer orders, LSPs can identify specific critical success factors. Critical Success Factors (CSFs) are the most important factors of LSPs which are responsible for providing the best quality services in order to be successful and to be sustainable in future. These factors will help LSPs in understanding the expectations of customers and in defining the milestones to be achieved. The critical factors of LSPs which are responsible for providing quality services to end customers are described in detail as under.

2.5 Identification of CSFs for Sustainable Service Quality of LSPs

Various critical factors for sustainable service quality of LSPs are enlisted in the literature. Many CSFs were identified by several researchers in past studies and below listed twelve CSFs were identified as most important from literature review and discussion with experts from various industries (Figure 2.3). These factors are further discussed in following section.

Committed Management and Workforce

Top management plays very important role in strategy planning and developing a long term vision for survival and growth. Top management commitment and support helps in making effective utilization of all available resources to provide sustainable service quality (Luthra et al., 2015). A sincere and committed effort is required by management for not only achieving their daily targets but also continuously improve their operating standards, performance and customer satisfaction (Bottani and Rizzi, 2006). It helps to motivate the skilled and committed workforce which works for 24 by 7 with dedication to deliver all consignments on time without any failure. Consistent employee training and participation is also essential for upgrading their knowledge and better understanding of organization's strategic direction and goals (Singh and Sharma, 2015).

Understanding and Analysis of Customer Needs

The logistics provider must undergo deep market analysis and must have clear understanding of their target customers and their expectations from them. They should always bridge the gap between customer expectations and actual services provided for measuring customer satisfaction (Stainer, 1997).

Deep market analysis can help LSPs to frame their strategies and policies to serve customers in an effective and efficient manner. There is a need to provide quick, timely and flexible services in order to fulfill dynamic market requirements. So, LSPs need to adopt these requirements and update themselves in terms of infrastructure, resources and technology (Percin, 2009).

Benchmarking with Global Standards

In the era of globalization, LSPs are expected to compete with global benchmarks and standards to ensure quality services. Continuous improvements, high technological usage, mitigating errors, quality information flow, eliminating wastage, optimizing costs and environment conservation are important factors on global benchmarks (Lu and Yang, 2010). LSPs require upgrading their resources and assets to provide world class excellence in services (Bagchi et al., 2005).

Managing Assets and Infrastructure

Effective Asset management and their utilization is the prime concern for any LSP. Assets are the resources which assist LSPs to fulfill their customer orders in best possible manner. Optimum use of all assets, resources and infrastructure can support logistics providers in effective utilization of their inputs and in improving their outputs simultaneously (Daughterty et al., 1996; Jothimani and Sarmah, 2014). The target of sustainable service quality can be achieved only with availability of all required and latest assets and infrastructure. The Government is also taking consistent steps in the direction of improvement of infrastructure in India by initiating many infra projects like Dedicated Freight Corridors, Golden Quadrilateral, North-south and East-west transport Corridors, and Inland Waterways transport, etc. (Rajasekar et al., 2014).

Network and Resource Planning

Network and resource management is one of the important factors for defining the service quality of any logistics service provider (Daugherty et al., 1996). Wide geographical coverage and decentralized supply chain framework of logistics providers help organizations in expanding their businesses within and outside country (Jung et al., 2008). Resources of logistics providers can be clearly expressed by their skilled manpower, their trucks and fleet, their numerous warehouses, IT support and innovative sustainable practices (Bottani and Rizzi, 2006; Naim et al., 2010). LSPs understand the importance of available resources and make resource allocation and utilization in best possible manner.

Service Quality and Reliability

Service Quality becomes the basic necessity for the organizations to become successful. The level of services delivered by LSPs will be the deciding factor for their business continuity and opportunities for future business (Kumar and Singh, 2012; Senthil et al., 2014). Due to dynamic market conditions, LSPs not only need to deliver satisfactory quality services but to sustain, also need to upgrade their services with innovative solutions. Performance of logistics providers can be improved by delivering correct product to the correct place at the committed time in desired form with proper packaging and a huge element with all required documents to the right customer (Franchesini and Rafele, 2000; Jothimani and Sarmah, 2014).

IT Applications and Information Sharing

Increased use of Information and Communication Technology (ICT) in logistics innovation process enhances optimal utilization of available resources and capabilities of tracking the consignments (Jharkharia and Shankar, 2005; Singh, 2012; Evangelista et al., 2013). Logistics

providers can share all relevant information frequently with all supply chain partners by connecting them with common platform like Electronic Data Interchange (EDI). Advancement in IT tools simplifies the major activities like inventory handling, communication among all supply partners, forward and reverse supply chain, and resource optimization (Boon, 2011, Kumar and Singh, 2012; Agrawal et al., 2015)

Managing Inventory Integration

Organization keep inventory at multiple stages (spare parts, work in process and final goods) which accounts for more than 85 per cent of the working capital and hence counts in the final product cost. Logistics service providers help Original Equipment Manufacturers (OEMs) in managing their inventories by the way of integrating inventories in the cycle and by offering solutions of sequential and schedule supplies, warehousing, sourcing and just in time solutions (Stank et al., 2003; Singh, 2012). Efficiency of LSPs in managing inventory integration is an identification function towards service quality of LSPs and is recognized as critical success factor in LSPs performance.

Cost Optimization

LSPs contribute towards cost optimization by managing inventory integration as described above. Further, outsourcing of logistics function by OEMs to LSPs help them in containing their distribution costs in the wide geographic spread. Outsourcing of manpower and labor activities is a trending outsourcing function which helps OEMs keep their manpower cost variable with all compliances followed and hence is the definite function towards cost optimization (Juga et al., 2010; Jothimani and Sarmah, 2014). Outsourcing warehousing needs assist OEMs in focusing on their core competencies of their production and ensures no or minimal inventory areas in the production units.

Integrated Logistics Management

Collaboration among all supply chain partners assists in smoothing of logistics operations. Nowadays, the organizations are integrating with other organizations, both horizontally and vertically as a green initiative and contributing towards environment and society (Agrawal et al., 2015). Technology and EDI are important tools that help for managing integration of forward and reverse logistics. Various authors proposed many frameworks for supply chain integration and emphasized on many benefits like risk sharing, sharing of resources, reduction in inventory and smoothen up the entire supply among all stakeholders (Ellinger et al., 1997; Campbell and Sankaran, 2005; Jayaram and Tan, 2010).

Use of Reusable and Recyclable Packaging and Pallets

Reusable packaging materials are made of durable materials and designed for extending life of packaging or pallets. The pallets can be reused or recycled for multiple trips. LSPs use reusable or returnable packaging or pallets which are usually made of superior quality plastic, steel, wood or polypropylene sheets. In automobile sector, recyclable racks are used for shipping engines and fenders etc. (Izogo and Ogba, 2015). For identification of reusable shipping containers, technologies like Bar-code labels and Radio Frequency Identification Devices (RFID) are also used. LSPs prefer to make use of recyclable bins in order to reduce cost and for environmental benefits (Luthra et al., 2015).

Use of Renewable Energy Sources

As Government of India already passed laws for organizations to share some part of their profits as CSR activities so it becomes very essential for LSPs also to contribute for environment and society (Liu and Wang, 2009). Many green practices are already initiated by LSPs towards

environment protection and sustainability in form of usage of solar panels for power generation against heat emitting electric ones, trees plantation at their facilities, using alternate fuels for reducing carbon emission, implementing green supply chain management for sustainability, reverse logistics implementation, etc. for resource optimization (Luthra et al., 2015).

The above mentioned critical success factors are summarized in a framework is shown in Figure 2.3.

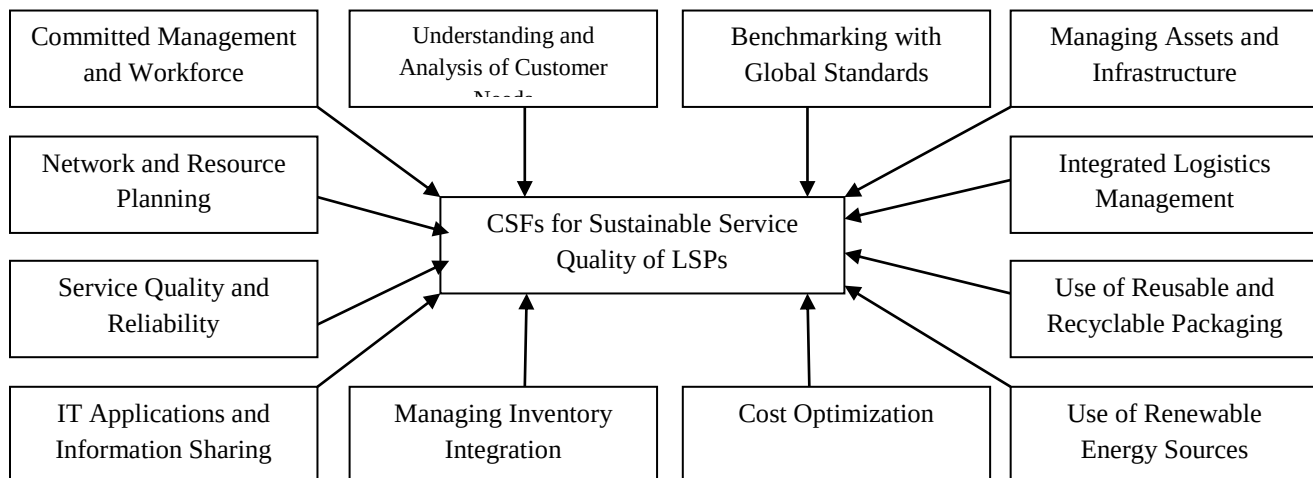


Figure 2.3: Identified CSFs for Service Quality Management of LSPs

2.6 Best Practices Followed by LSPs

Existing literature suggests that best practices followed by LSPs are promoted by top management. The new ideas, new policies and innovation are usually initiated by 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 improve the efficiency of the entire process. Ellinger et al. (2007) suggested that the market orientation and development practices followed by manpower also influence the performance of logistics service providers. Network Planning and enhancing the existing network, network distribution management by hub and spoke systems are the important components of strategic

planning (Zapfel and Wasner, 2002). The management always prefers to audit all the processes to maintain control and transparency in system. LSPs need to maintain confidentiality of the entire customer data used in transactions so top management gives high importance to this concern. The best practices followed by LSPs are listed from literature and summarized in Table 2.2.

Table 2.2: Best Practices Followed by LSPs

S.No	Best Practices Followed by LSPs	Description	Source
I	Resource Optimization (Facility, Fleet and Manpower)	Optimum use of all available limited resources to LSPs	Forslund (2012); Tezuka (2011); Jayaram and Tan (2010); Naim et al. (2010); Aghazadeh (2003)
II	Advanced IT Support	Making use of latest and advanced available technology	Evangelista et al. (2013); Gilaninia et al. (2011); Sakun (2011); Tezuka, (2011); Wong and Karia (2010); Fasanghari et al. (2008); Jharkharia et al. (2005)
III	Network Enhancement and Optimization	Planning of maintaining existing network and enhancing new dimensions as required for expansion of business	Gunasekaran et al. (2016); Soinio et al. (2012); Basligil et al. (2011); Kayakutlu and Buyukozkan (2011); Ellinger et al., (2008); Zapfel and Wasner (2002)
IV	Customer Relationship Management	Maintaining and managing relationship with customers	Huang et al. (2014); Tezuka (2011); Jayaram and Tan (2010); Wong and Karia (2010); Hertz and Alfredson (2003)
V	Warehousing and Value Added Activities	Providing warehouse processes and value added services like kitting, labeling etc. to the	Tan et al. (2014); Soinio et al. (2012); Basligil et al. (2011); Hamdan et al. (2008);

		customers	Aghazadeh (2003)
VI	Flexibility in Service	Providing flexible logistics services to end users	Huang et al. (2014); Kumar and Singh (2012); Soinio et al. (2012); Naim et al. (2010); Millen et al. (1999)
VII	One Stop Solution	Providing all integrated logistics solution at one point	Marasco (2008); Singh et al. (2012)
VIII	Customized Costing	Provide flexible costing on the basis of quantity and weight.	Sahay and Mohan (2006); Boyson et al. (1999)
IX	Shipment Planning (Routing & Allocation)	Allocation and final routing plan of each individual shipment along with ready alternate plan	Ulku and Bookbinder (2012); Basligil et al. (2011); Ellinger et al. (2008); Zapfel and Wasner (2002)
X	Track and Tracing Ability	Ability to track and trace the shipment with its exact location and time to reach to the destination	Tezuka(2011)
XI	Handling Environmental Uncertainty	Providing smooth services irrespective of environmental disruptions and uncertainties	Huang et al. (2014); Ulku and Bookbinber (2012); Tezuka (2011); Naim et al. (2010)
XII	Product Returns (Reverse Logistics)	Managing the return of product either in the form of used or empty bin	Agrawal et al. (2015); Govindan et al. (2012)
XIII	Audit and Control	Process to cross check the correctness of the functioning of all processes in the organisation	Gilmour (1999); Comyn-Wattiau and Akoka (1996)
XIV	Data Confidentiality	Keeping all records and data transactions with appropriate security measures	Jothimani and Sarmah (2014); Tweddle (2008); Farmer (1988)
XV	Innovation & Customized Solutions	Trying out new ways to provide services along with serving customer needs in tailor-made fashion	Yeung et al. (2012); Busse and Wallenburg (2011); Huo et al. (2008); Ghobadian et al. (1994); Farmer (1988)

XVI	Use of Warehouse Management Software	Usage of IT and software for warehouse management	Ketikidis et al. (2008); Doerr et al. (2006)
XVII	Data handling and Extraction	Managing data handling and extraction of data through data mining tools	Evangelista et al. (2013); Kumar and Kumar (2014)
XVIII	Tracking and Tracing of Shipments	Using GPS technology to track and trace the exact location of pipeline shipment	Kumar and Kumar (2014); Shamsuzzoha and Helo (2011); Hillbrand and Schoech (2007)
XVIX	Use of Electronic Data Interchange (EDI) Systems	Access to internet and adoption of EDI systems for increasing transparency of processes	Evangelista et al. (2013); Sakun (2011); Tezuka (2011); Wong and Karia (2010); Fasanghari et al. (2008); Jharkharia et al. (2005)
XX	Bar-Coding & RFID Systems	Techniques which helps in tracking the product or items	Ketikidis et al. (2008); Doerr et al. (2006); Gaukler and Seifert (2007)
XXI	Use of Eco-friendly Fleet	Usage of more green and environment friendly fleet to reduce the pollution level in environment	Colicchia et al. (2013); Lieb and Lieb (2010); Dey et al. (2011)
XXII	Use of renewable energy sources	Usage of those sources which can be naturally replenish	Huang et al. (2014); Ulku and Bookbinber (2012); Tezuka (2011); Naim et al. (2010)
XXIII	Use of Reusable and Recyclable Packaging	Repeated usage of packaging either in same form or another form as recycled one	Dey et al. (2011); Lieb and Lieb (2010); Sahay and Mohan (2006)
XXIV	Reduction in Carbon Emission	Step to reduce carbon emission in environment by modifying transport and facility usage	Elhedhli and Merrick (2012); Kim et al. (2011); Hua et al. (2011)
XXV	Initiatives Towards CSR	Organizations activities for society and environment as a part of corporate social responsibility	Juntunen et al. (2014); Colicchia et al. (2013); Lieb and Lieb (2010)

After identifying the best practices from literature review, there is need to understand the best practices followed by top Indian logistics service providers. This enables to understand the actual

service quality issues and best practices of Indian LSPs. The best practices followed by Indian LSPs are studied through case studies and discussed in Chapter 4.

2.7 Identification of Challenges Faced by Indian LSPs

Ten challenges are identified from past studies and after discussions with experts and mentioned in detail in Chapter 6. The brief details of challenges are given in Table 2.3.

Table 2.3: Challenges Faced by Indian Logistics Service Providers

S.No.	Challenges Faced by LSPs	Description	References
I	Infrastructural Bottlenecks	Dismal road conditions, poor connectivity, high toll rates, corruption on highways and hinterlands, inadequate air and seaport capacities	Venkatesh et al. (2017); Mitra (2013); Sanyal (2006)
II	Lack of Efficient Technical Systems	Less adoption of available advanced technical systems	Luisa et al., (2013); Sauvage, (2003)
III	Cost Implications	Huge investment in resources and shortage of adequate working capital for LSPs	Mitra (2013); More and Basu (2013); Govindan et al. (2012)
IV	Inefficient Inspection Strategies	Lack of rigid guidelines and inspection policies	Mitra (2013); Rajesh et al. (2011)
V	Fragmented and Unorganized Sector	Interplay of small and large LSPs due to undefined eligibility criteria	Ding et al. (2012); Mitra (2006)
VI	Conventional Ways of Operations	Slow adoption of automation due to unavailability and cost	Sharma et al. (2011); Mitra, (2006)
VII	Lack of Government Support Policies	Missing Government stringent strategies for LSPs which results in non-recognition of logistics sector	Govindan et al. (2012); Luthra et al. (2011)

VIII	Lack of Appropriate Performance Metrics	No performance standards or benchmarks have been defined by Indian government	Mitra (2013); Rajesh et al. (2011)
IX	Shortages of Trained Workforce	Few of the universities offers courses and specialized trainings on logistics management	Abdulrahman et al. (2014); Govindan et al. (2012); Thai et al. (2011)
X.	Less Awareness Towards Sustainability Measures	Low concern towards adoption of sustainable logistics operations	Abbasi and Nilsson (2016); Mitra (2013); Colicchia et al. (2013)

2.8 Dimensions of Service Quality and Their Relevance to Logistics Service Providers

Service quality dimensions are those constructs or parameters on which organizations will rate LSPs performance. So, in other words we can say that the measurable quality dimensions are those drivers which will ensure quality in logistics services.

LSPs can also improve on these parameters to provide excellence in their services and can increase their profitability and market share. From past studies, various dimensions of service quality related to services provided by logistics service providers were identified. It has been already noticed from the literature review that various service quality models explored various frameworks with different number and nature of dimensions in their studies. Here, the service quality dimensions relevant to the Indian logistics sector will be taken into consideration from literature review and expert opinion.

Promised Delivery Without Failure- This is a basic necessity of LSPs which impacts customer satisfaction directly. Additionally, this is found to be relevant measurable factor of service

quality in Indian context also. In literature, several authors coined this term along with term “Reliability” where reliability implies the same meaning by stating that “ability to deliver the committed service without failure”. In past studies, Parasuraman et al. (1985, 1988) stated that the firm must honor its promise. Franceschini and Rafele (2000) measured promised delivery of goods by calculating the number of orders delivered to the required orders by a certain period of time. This concept was referred by many authors to define service quality of service providers (Dabholkar et al., 2000; Davis and Mentzer, 2006; Juga et al., 2010; Jothimani and Sarmah, 2014).

Right Product to the Right Place- It is very important for LSPs to serve customers with right delivery at right time at desired location to survive and grow in such a competitive environment. Parashuraman (1985) emphasized on the right delivery of goods by the firm at the first time. Mentzer et al. (1999, 2001) also suggested assurance in terms of right delivery at the decided location on committed time and taken as service quality dimension in their framework. Several authors mentioned this service quality parameter in their corresponding studies (Franceschini et al., 2000; Mentzer et al., 2001; Stank et al., 2003; Yeung et al., 2012);

Prompt Services- This implies giving quick service to the customers. There is huge need to serve customers with their demands in minimum time. This makes prompt service as an important aspect of service quality delivered by LSPs. Various authors considered this parameter to measure service quality in their respective studies (Parasuraman et al., 1985; Farmer, 1988; Ghobadian, 1994; Philip and Hazlett, 2001; Yeung et al., 2012; Jothimani and Sarmah, 2014)

Delivery of Goods Without Loss or Damage- This parameter assures safe delivery of goods at the destination. The LSPs have to fulfill the basic requirement of delivering goods in right condition. Parasuraman et al. (1985) had taken “Assurance” as a service quality dimension of

SERVQUAL model. Mentzer et al. (2001) had considered “Order condition” as service quality dimension out of nine dimensions of their LSQ model. This implies the condition of orders in terms of damage. Several authors have used this concept for measuring service quality assurance (Vandamme et al., 1993; Stank et al., 2003; Markovic, 2006; Thai, 2008; Huang et al., 2009).

Timely Delivery- It refers to the delivery of shipments on promised time by LSPs. For logistics service provider, timely delivery is one of the mandatory requirements to satisfy customer with their services. Mentzer et al. (1999, 2001) referred “timeliness” as one of their service quality dimension which implies arrival of the order at customer location when promised. It means reducing the lead time and delivering the goods in earliest possible time (Rafiq and Jafaar, 2007). Juga et al. (2010) termed as “schedule” which implies ability to keep schedule. Many authors considered this parameter for measuring service quality of service provider (Farmer, 1988; Huang et al., 2009; Yeung et al., 2012). In our study, this parameter is also included.

Sufficient Temporary or Permanent Storage Capacity- The availability of storage capacity also affects the service quality level of LSPs. This parameter refers to the ability of LSP to handle volume business of customers. Juga et al. (2010) considered “Capacity” as operational service quality attribute in their respective study. Although this parameter is not considered frequently by many authors but few of the authors have taken this parameter into study (Farmer, 1988; Frankel, 1993). In Indian context, our experts found it important, so, this parameter has included in our study.

Effective Handling of Trade Documents- This relates to handling of documents related to trade transactions of customers. Documentation is also found to be an important concern of customers and considered this as an important parameter for measuring service quality (Lai et al., 2008).

Adequate Inventory Controls- Inventory management is crucial process which is managed by LSPs for their customers. LSPs are usually accountable for the stock of goods they keep and used for replenishment (Dooley, 2005).

Availability of Fleet and Physical Facility- It refers to the availability of adequate number of fleet and physical infrastructure in terms of warehouses/ distribution centers to the LSPs to provide smooth functioning of logistics operations to the customers. Yeo et al. (2015) have considered this parameter for measuring the service quality of Korean container ports. Thai (2008) discussed not only about the availability of fleet and facility but also considered the condition of available resources. Farmer (1988) also mentioned the size, location, layout and reliability of the physical resources. Many authors have considered this aspect for evaluating the service quality of LSPs (Parasuraman et al., 1985; Knuston et al., 1990; Murphy et al., 1992; Ghobadian, 1994; Philip and Hazlett, 2001; Hamdan et al., 2008).

Availability of Adequate Workforce- This implies that LSPs should be equipped with adequate number of skilled personnel to deliver quality services to the end customers (Hamdan and Rogers, 2008). In India, most of the logistics operations are done in conventional way which promotes the requirement of trained and dedicated workforce. Juga et al. (2010) had also suggested the importance of manpower in delivering quality logistics services

Financial Stability- It refers to the fact that LSPs should be financially stable in order to make necessary investments and capable of taking unavoidable risks (Jothimani and Sarmah, 2014). The customers also look for financial capability of LSPs while selecting them and take this attribute as important factor which affects LSPs service quality (Stank et al., 2003; Huo et al., 2008; Yeung et al., 2012; Juntunen et al., 2014)

Geographical Reach and Network Coverage- This implies the area coverage by LSPs across Pan India and other global locations. The presence of LSPs at various locations will also affect the service quality of their services (Wong and Karia, 2010). So, several authors also considered this as an important aspect for measuring service quality of LSPs (Kayakutlu et al., 2011).

Fleet and Physical Facility are Modern and Always Function Properly- This implies the working condition of available resources should be appropriate and must be enough to meet the desired output. Availability of resources is one of the important concern areas whereas proper functioning of available resources is mandatory for smooth operations (Thai et al., 2008). Therefore, many authors covered this aspect also for computing service quality of logistics service provider (Yeo et al., 2015).

Adequate, Maintained and Updated Information Technology (IT) Infrastructure- This refers to the adoption and usage of updated and advanced IT technologies and software. In the era of e-businesses, this becomes an important requirement in logistics and supply chain field to get connected with all the channel partners of the supply chain and get updated with all the online transactions (Doerr et al., 2006; Hamdan et al., 2008; Ketikidis et al., 2008; Juga et al., 2010)

Manages Reverse Logistics- This means managing logistics in reverse direction that is, delivering goods from customer to supplier. The common reasons for reverse logistics are damaged goods, replaceable goods, unsold items, and empty pallets, etc. (Agrawal et al., 2015). There is huge need of managing reverse logistics by LSPs in order to be in tuned with customer requirements as per market dynamic changes. (Sahay and Mohan, 2006; Govindan et al., 2012)

Availability of Physical Equipment like Pallets, Trolleys, Forklifts, etc.- This implies that LSPs must be equipped with physical equipment, required for smooth functioning of all transportation

and warehousing operations (Yeo et al., 2015). Availability of physical equipment plays an important role in delivering quality services to end consumers.

Information Communication to Customers- This refers to the quality of information communicated to the end customers. Information quality can be measured in terms of frequency and quality of content provided (Janda et al., 2002). Communication broadly explains to inform and update customers with all shipping movements from time to time. The information delivered should be complete (includes all required and desired content), timely (communication on right and exact time), accurate (error-free information sharing), adequate (sufficient information for operations) and credible (trustable and portable information) to the customers (Parasuraman et al., 1985; Farmer, 1988; Ghobadian, 1994; Mentzer et al., 2001)

Tracking and Tracing of Shipments- This implies the usage of GPS technology to track and trace the exact position of the shipments (Kumar and Kumar, 2014). This feature becomes an important parameter for selection of LSPs and customers get updated about each movement of their shipments (Hillbrand and Schoech, 2007; Shamsuzzoha and Helo, 2011; Tezuka, 2011).

Application of IT and EDI in Customer Service- It implies the usage of online applications and Electronic Data Interchange (EDI) systems to bring more transparency in system (Sakun, 2011; Evangelista et al., 2013). All the intermediaries and channel partners will be well connected through real time applications and get updated with each and every individual transaction at any stage (Jharkharia et al., 2005; Fasanghari et al., 2008; Wong and Karia, 2010; Gilaninia et al., 2011; Tezuka, 2011).

Builds Mutual Relationship and Trust- It is very important for LSPs to build strong association with their customers for survival and future business. Both parties work on mutual understanding

and customers have strong belief on the service quality of LSPs for managing their outsourced operations (Gronroos, 1984).

Shows Consistency in Services- This refers to the symmetry in deliverables and overall performance. LSPs are bounded to deliver consistent services to their end customers to establish long-term association with them (Huo et al., 2008). Promised deliveries at desired location at right time with perfect combination of customization and innovation make this attribute as an important requirement to deliver quality services (Parashuraman et al., 1985).

Shows Positive Attitude While Dealings- This means the behavioral aspect of LSPs when dealing with customers. Attitude of LSPs represent the concern towards handling of customers problems and positive attitude will definitely wins the customers trust (Gronroos, 1984; Farmer, 1988)

Tries out New Ideas Frequently- This implies the frequent trial of new and innovative ideas to provide services to their customers (Busse and Wallenburg, 2011). LSPs have to make changes in their pattern of service delivery to meet the specific requirement of their customers (Farmer, 1988; Huo et al., 2008)

Maintains Confidentiality in All Operations- This refers to the ability of LSPS to secure sensitive information from competitors (Jothimani and Sarmah, 2014). Customers feel risk in sharing their sensitive data with LSPs due to their privacy and security reasons but if LSPs maintain the desired level of confidentiality in all operations then customers get motivated to outsource (Farmer, 1988; Tweddle, 2008).

Makes an Effort to Understand my Situation- This implies the ability to understand other problem as own issue and take appropriate steps to resolve (Parasuraman et al., 1988; Philip and Hazlett, 2001). In current market scenario, there is urgency of delivering goods otherwise one

has to pay high penalties. So, dependency on LSPs for timely delivery can be better handled by taking the equal concern from LSPs on the shipments (Saleh and Ryan, 1991).

Maintains Courteous Behavior While Dealing- This means showing polite behavior to the customers and providing comfort zone to them. This behavioral aspect also counts as important aspect to measure service quality delivered (Parasuraman et al., 1985; Ghobadian, 1994).

Easily Accessible When Needed- This refers to the availability of personnel at LSPs workstation to deal with issues and problems of customers quickly (Juga et al., 2010). The customers feel happy if their problems are timely acknowledged and resolved on priority. The easy access to LSPs becomes a qualifying criterion for defining good service quality (Gronroos, 1984; Parasuraman et al., 1985; Ghobadian, 1994; Janda et al., 2002).

Handles Queries and Complaints Effectively- This means effective handling of complaints and queries of customers. The customers feel more satisfied if their complaints are handled quickly and effectively (Mentzer et al., 1999, 2001). To ensure better quality of services, queries and complaints should be handled on priority (Farmer, 1988).

Product Knowledge and Experience of Logistics Service Provider is Adequate- This refers to the knowledge level and experience of the personnel of LSPs dealing with customers (Mentzer et al., 2001). Their behavioral aspects, knowledge about all processes and their experience will affect the customer satisfaction from quality services of LSPs (Vandamme and Leunis, 1993; Dabholkar et al., 1996; Juga et al., 2010).

Shows Creativity in Its Methods of Operations- It can be defined as ability to fulfill unexpected and unusual consumer needs (Yeung et al., 2012). LSPs show creativity in operations in order to provide customized and innovative solutions to end consumers (Busse and Wallenburg, 2011).

Seeks out New Ways to Do Things- It refers to trying out different ways to do existing things in innovative manner (Kumar and Singh, 2012; Huang et al., 2014). Innovation is the need of an hour and can impact the better service delivery of goods (Millen et al., 1999; Naim et al., 2010; Soinio et al., 2012).

First To Initiate with New Services- It means to initiate new services to cater the specific needs of the customers. Customers encourage LSPs to customize and innovative services as per requirement.

Shows Concern towards Environment- It implies the concern of LSPs towards sustainability (Ulku and Bookbinber, 2012; Colicchia et al., 2013). Nowadays, LSPs initiate some activities for the welfare of environment and society (Lieb and Lieb, 2010; Naim et al., 2010; Tezuka, 2011; Huang et al., 2014).

Serving Specific Needs- It refers to the fulfillment of specific need of the customers. LSP offers customized services to serve their specific and unique needs (Parasuraman et al., 1985; Ghobadian, 1994; Stank et al., 2003; Yeung et al., 2012).

Accommodates my Changing and Urgent Requirements- It means the flexibility of LSPs in serving customers with their changing and urgent needs (Huo et al., 2008; Jothimani and Sarmah, 2014). In today's dynamic markets, LSPs need to serve customers with their flexible requirements. This also becomes an important reason for satisfaction of customers from LSPs services (Gronroos, 1984; Farmer, 1988; Dabholkar et al., 2000; Franceschini et al., 2000).

2.8.1 Customer Satisfaction

Many authors have related service quality and customers satisfaction as synonymous but theoretically, both are distinct concepts and delivery of quality services will increase customer

satisfaction from services (Olsen, 2002; Sureshchandar et al., 2002; Saura et al., 2008). Customer Satisfaction can be defined as the quality of services provided to the customers which is sufficient enough to meet their expectations. The prime goal of any organization is to satisfy customers with their resources, processes and services.

The customer satisfaction level from logistics can be measured on various parameters. The consumer's satisfaction depends on both, internal and external environmental factors. Singh and Sharma (2015) discussed about the integration of assets and processes which affect the overall performance of LSPs and impact the customer satisfaction as well. Many authors considered performance measures to ensure customer satisfaction whereas some have defined and focused on internal factors of LSPs to deliver satisfactory services to consumers (Mentzer et al., 1999; Huo et al., 2008). In literature, many authors developed the relationship between performance parameters and customer satisfaction (Daugherty et al., 1996; Stank et al., 2003).

This study deals with service quality issues of LSPs where it becomes important to understand the customer expectations from LSPs and meet them for better customer satisfaction. Numerous findings strongly support that the improvements done in logistics service quality by LSPs results in increasing customer satisfaction (Innis and LaLonde, 1994; Daugherty et al., 1996). Mentzer et al. (2000) discussed the nine constructs for defining service quality dimensions of LSPs and their impact on satisfaction. Tian et al. (2008) found that LSPs play an important role in improving customer trust on outsourcing of logistics services in China but many researchers considered satisfaction under trust construct. Juga et al. (2010) also established the relationship among logistics services in Finland with customer satisfaction and then subsequently with customer loyalty. Huang et al. (2009) conducted similar studies in Taiwan. In service quality research, some studies measured satisfaction as a construct with one – item scale (Olsen, 2002;

Huang et al., 2009; Juga et al., 2010) whereas on a contrary, many of the studies have satisfaction as a construct with atleast three items (Mentzer et al., 2001; Chu and Wang, 2012; Yeo et al., 2015). Chu and Wang (2012) conducted similar studies and established the relationships between of logistics performance with customer satisfaction. Thai (2008) developed a theoretical service quality model for maritime transport and studied their impact on customer satisfaction.

Customer satisfaction is measured by various authors in many different forms. Several authors measured customer satisfaction from service quality delivered to them. In this study, customers also show satisfaction on various attributes of LSPs like their resources, availability of fleet, manpower, processes, management and overall service quality. Infact, customers feel delighted with their relationships with their service providers when they are satisfied from services. The parameters used in this study for measuring customer satisfaction are as follows.

Satisfaction from Processes of LSPs- Customers outsource their logistics operations like transportation, warehousing and other value-added services etc. to LSPs to get benefits of cost reduction and improved quality. It is obvious that customers will feel more satisfied if they receive these services as per their desires (Yeo et al., 2015). This makes this component as an important factor to measure customer satisfaction from logistics services.

Satisfaction from Fleet, Facilities or Physical Infrastructure of LSPs- LSPs requires adequate and proper functioning resources to serve the customer demands on time (Chu and Wang, 2012). If the availability and conditions of resources are not appropriate, then LSPs would not be able to deliver promised consignments as per customer needs. Therefore, customer satisfaction from fleet, facilities and physical infrastructure becomes a necessary factor to satisfy customers with overall service quality (Mentzer et al., 1999; Yeo et al., 2015).

Satisfaction from Management and Employees Of LSPs- The involvement of top management in devising strategies for the smooth functioning of all processes will result in more customer satisfaction (Mentzer et al., 1999; Stank et al., 2003; Yeo et al., 2015). The dedication of manpower towards work and their positive attitude towards customer queries provides a healthy platform for customers. These attributes become an important reason for satisfying customers from logistics outsourcing.

Satisfaction from Overall Service Quality of LSPs- This implies the feedback on the entire association of LSPs with customers and it also affect the future continuity of business (Tian et al., 2008). The satisfaction from overall service quality means satisfying customers on each and every aspect of logistics activities by delivering quality services as per their expectations (Juga et al., 2010; Chu and Wang, 2012). This must be included essentially while measuring customer's satisfaction from LSPs services.

Customer Delighted Relationships with LSPs- Satisfaction of customers also reflects in their pleasant relationships with their service providers (Stank et al., 2003; Saura et al., 2008). Satisfied customers prefer to maintain long-term business continuity with same LSPs (Tian et al., 2008). This has to be considered as important attribute for measuring customer satisfaction from service quality of LSPs.

2.8.2 Customer Loyalty

As Oliver, 1999 states the loyalty as “a customer commitment to re-purchase the same product or service frequently and consistently in future”. Loyalty is usually measured in terms of repurchasing the same product, increase sales from other products and recommend the service providers to other business partners. Several authors have discussed the concept of loyalty in logistics (Saura et al., 2008; Ramanathan, 2010; Bouzaabia et al., 2013). Three order fulfillment

factors viz “Accessibility”, “Timely delivery” and “Trouble-free return policies” are found to be significant in influencing loyalty of customer by Heim and Sinha (2001). Past studies showed that LSPs capabilities affect the firm performance directly which becomes the main reason for loyalty of customers (Esper et al., 2007; Cho et al., 2008).

Bloemer et al. (1998) established the association between service quality and service loyalty. They have taken “Purchase intentions”, “Word of mouth”, “Value for money” and “Complaining actions” as four attributes to define service loyalty from four different service industries and developed an empirical validated scale for service quality and service loyalty relationships. Hsu et al. (2010) investigated the relationship between service quality of home delivery processes and loyalty of their customers with special emphasis on loss aversion. Many authors proved the link between service quality and customer loyalty with mediating effect of customer satisfaction (Caruana, 2002, Saura et al., 2008). Usually, customer loyalty in logistics sector is measured in terms of continuity of business with same service provider, outsource more activities, recommend to other business partners or shows commitment towards the service provider. In this study, the parameters considered to define the customer loyalty for logistics service providers are discussed below.

Committed to LSPs- The customers show commitment towards the logistics service providers and keep positive attitude for future dealings. The commitment of customer indicates loyalty of customer towards the same service provider. Stank et al. (2003) also considered the same parameter for measuring customer loyalty for logistics services.

Outsource More Activities to LSPs- The loyal customers generally explore more business opportunities with same service providers and expand the scope of business with them. The expansion of business may be due to adding up more outsourced activities or increasing the

scope of existing ones. This parameter is considered by many authors in measuring customer loyalty in different industry verticals (Tian et al., 2008; Juga et al., 2010).

Recommendation of LSPs to Other Organizations- The loyal customers recommend their logistics service providers to other organizations and their business partners. Recommendation from customers automatically signifies the fulfillment of their desires from the logistics services. This parameter suggested by various authors (Stank et al., 2003; Tian et al., 2008; Juga et al., 2010) which we have also considered for our study.

Continuation with Same LSPs- The continuity of outsourcing of logistics services with same service provider as long as possible. Any organization will take decision of continuity of business with same service provider only if they feel delighted from the services. Tian et al., (2008) and Juga et al., (2010) suggested this to be an important parameter to measure customer loyalty.

2.8.3 Relationship between Customer Satisfaction and Loyalty

The literature suggested a strong link between customer satisfaction and loyalty (Stank et al., 2003; Juga et al., 2010). The satisfied customers usually preferred to repeat the same service provider with expectation of same level of services as they had experienced in the past (Stank et al., 2003). The consumer loyalty can also be measured in terms of enhancement of businesses with current service providers by increasing the scope of services with them (Juga et al., 2010). Good feedback about service quality of LSPs is a significant indication of increase in future sales and shows customer loyalty towards LSPs (Grant et al., 2014).

Saura et al. (2008) analyzed the relationships between service quality, satisfaction and loyalty long with their usage of Information and Communication Technology (ICT) by using empirical

analysis. Huang et al. (2009) established the relationship among the Logistics Service Quality (LSQ), customer satisfaction and loyalty. Bouzaabia et al. (2013) explored logistics service quality as relational LSQ and Operation LSQ with data set of two countries like Romania and Tunisia. They found various results related to impact of relational LSQ and operational LSQ on customer satisfaction and customer loyalty.

In literature, many authors found the mediating effect of customer satisfaction between service quality attributes and customer loyalty. Caruana (2002) concluded that the customer satisfaction acting as a mediator between service quality and customer satisfaction after empirical analysis. Getty and Thompson (1995) identified the similar relationships between service quality, customer satisfaction and recommending behavior of consumers especially for lodging industry. Gittell (2002) found that the achievement of customer satisfaction and customer loyalty is highly dependent on the relationships between service providers and customers. Most of the studies supported the fact that “satisfied customers are proved to be loyal customers” (Gittell, 2002; Saura et al., 2008). In this study, the parameters are clubbed in different constructs on the basis of vast literature review and inputs from industry experts and then their relationship with customer satisfaction and customer loyalty are also empirically tested. In next section, the constructs identified from literature review have been discussed.

2.9 Identification of Constructs for Measuring Logistics Service Quality

In this research work, Logistics Service Quality (LSQ) framework is proposed. From vast review of past studies and deliberations with experts, the constructs have been listed and selected on the basis of relevance in Indian context. The constructs or variables which define the service quality dimensions of Indian LSPs and have impact on customer satisfaction and loyalty have been included in the study. Basically, the seven constructs have been developed by clubbing up

identified service quality dimensions (discussed in previous section) to measure the service quality provided by logistics service providers. The constructs of the proposed framework with their literature review is discussed in Table 2.4. In the proposed framework, seven constructs have been considered based on discussion with experts. These are “Operational Quality”, “Resource Quality”, “Information Quality”, “Personnel Contact Quality”, “Customization and Innovation Quality”, “Customer Satisfaction” and “Customer Loyalty”. The constructs which consists of service quality dimensions as items which are actually stated as statements in the questionnaire and later, tested and validated by using SEM. The corresponding statements or measureable items to each construct of proposed model will be discussed in detail later in Chapter 7.

Table 2.4: Constructs for Proposed Framework

Construct for Proposed Framework	Description	Corresponding References
Operational Quality	Refers to the capability of LSPs to deliver promised services without failure, on right place, on scheduled time, gives prompt services with sufficient capacity and inventory.	Bouzaabia et al. (2013); Thai (2013); Juga and Juntunen (2010); Juntunen et al. (2010); Davis (2006)
Resources Quality	Refers to the availability of adequate fleet, infrastructure, and skilled manpower, functioning of resources, financial stability and network coverage.	Yeo et al. (2015); Wong and Karia (2010); Thai (2008); Tongzon (2002); Ugboma et al. (2004); Murphy et al. (1989, 1993)

Information Quality	Refers to the adequate, maintained and updated IT resources and provides accurate, timely and adequate information	Thai (2013); Huang (2009); Saura et al. (2008); Tian et al. (2008); Rafiq and Jaffar, (2007); Mentzer et al. (1999, 2001)
Personnel Contact Quality	Refers to the positive attitude, courteous behavior and complaint handling of the contact personnel of LSP	Wong et al. (2015); Juga et al. (2010); Saura et al. (2008); Rafiq and Jaffar (2007); Mentzer et al. (1999, 2001)
Customization and Innovation Quality	Refers to fulfillment of specific and changing needs of the individual customers and tries out new ways to initiate things	Hu (2016); Bellingkrodt (2015); Coehlo and Henseler (2012); Flint (2005), Panayides (2005), Victorino (2005); Lacobucci, et al. (1995)
Customer Satisfaction	Refers to the satisfaction of customers from fleet, infrastructure, manpower, management and overall logistics service quality	Yeo et al. (2015); Grant et al. (2014); Rao et al. (2011); Juga et al. (2010); Juntunen et al. (2010); Huang et al. (2009); Saura et al. (2008); Tian et al. (2008); Mentzer et al. (2001); Stank et al. (2003)
Customer Loyalty	Refers to the customer retention to the same LSP in form of continuing business, outsourcing more activities and recommendation to others	Grant et al. (2014); Rao et al. (2011); Juga et al. (2010); Juntunen et al. (2010); ; Huang et al. (2009); Saura et al. (2008); Tian et al. (2008); Stank et al. (2003)

2.10 Research Gaps Analysis

In past studies, many researchers explained the concept of service quality models and logistics service providers separately. Few authors combined both concepts and developed different frameworks either on same dimensions retrieved from most common SERVQUAL model or defined their own measurable quality dimensions as per their requirement of study. But there are very limited studies which highlighted the relationship among logistics service quality, customer satisfaction and customer loyalty. Being LSPs, in the business of providing logistics services, it is very crucial to understand customer expectations and retain their customers for long term profitability. There is wide opportunity to conceptualize logistics service quality construct which act as measurable parameters by organizations when they evaluate the performance of LSPs. A service quality model can be developed to investigate how perceived logistics service quality influences customers' satisfaction and customer loyalty in third party logistics outsourcing, particularly in Indian context.

In this study, logistics service quality framework is proposed which will evaluate the impact of logistics service quality on customer satisfaction and customer loyalty. A comparative analysis of existing few service quality models has been done to understand the need of study and the gaps in literature and shown in tabular form in Table 2.5.

Table 2.5: A Comparative Analysis among Service Quality Models

S.No	Model	Author	Dimensions	Scale used	Details of Model	Scope and Applicability of Model	Limitations/Weakness	Gap identified
I	Gap Model (SERVQUAL Instrument) Generic Type	Parasuraman, Zeithaml and Berry (1985, 1988, 1993)	5-dimensions (22 items): Reliability(4), Responsiveness (4), Assurance(5), Tangibles(4), and Empathy(5)	Based on both expectations and perceptions $SQ = \sum_{j=1}^k (P_{ij} - E_{ij})$ SQ=Overall service quality K= the number of attributes P _{ij} = performance perception of component i w.r.t component j. E _{ij} =Service quality expectation for component j w.r.t	Developed SERVQUAL instrument with similar 22 items for understanding customers expectation and perceptions	Health sector, Banking, Hotels, and Restaurants, Ministry, Information systems, Library services etc.	The dimensions considered in model shows bad fit when CFA was applied with 5 factors. The concept of gap score has been questioned in literature with a reason that it was difficult for consumer to respond for both perception and expectation of service simultaneously	Cost was not considered as service quality construct, Empirically weak, The model is widely accepted but concept of gap is questioned/criticized by many authors

				component i.				
II	Performance Only Model (SERVPERF) Generic Type	Cronin and Taylor (1992)	5 –dimensions (22 items): Reliability(4), Responsiveness(4), Assurance(5), Tangibles(4), and Empathy(5)	Service quality can also be measured on the basis of perceptions only. $SQ = \sum_{j=1}^k P_{ij}$ SQ=Overall service quality K= the number of attributes Pij= performance perception of component i w.r.t component j.	Use same SERVQUAL model with 22 items but with performance only statements.	Banking, Pest control, Dry cleaning, Fast food industry	Cost is not taken into consideration, Problems with some empirical results.	Cost was not considered as service quality construct Problems with empirical result for customer satisfaction construct
III	Logistics Service Quality Model Industry Specific Type	Mentzer et al. (1999, 2001)	9- Dimensions (25 items) Information Quality(2), Ordering procedures(2), Ordering Release Quantities(3), Timeliness(3), Order	Perception only	Developed a logistic service quality (LSQ) framework based on constructs related to order placement and order receipt	Logistics services (USA)	Dimensions taken into consideration for modeling are more inclined to order delivery processes, Customer loyalty is not taken into consideration	Infrastructure and Cost was not considered as service quality construct, Mostly dimensi

			Accuracy(3), Order Quality(3), Order Condition(3), Order Discrepancy Handling(3), Personnel contact quality		activities and study their impact on satisfaction level of consumers.			ons are related to order delivery process which does not cover all aspects of logistics services , Limited up to customer satisfaction
IV	Logistics Service Performance Model Industry Specific Type	Stank et al 2003)	Three Performance Parameters: Relational Performance (3), Operational Performance (3), Cost Performance (2)	Perception only	This research examined the relationships of logistics service performance, customer satisfaction ,customer loyalty and market share	Logistics services provided by 3PL (U.S.)	Limited number of dimensions was considered for developing the framework. The results related to market share may not be valid and can be subjective(found market share of total North American Third Party Logistics Industry)	Three dimensions taken for study is limited, more aspects of logistics services can be added. In this model the results for market share may be not valid and can be subjecti

								ve.
V	Logistics Service Quality: A New Way to Loyalty Industry Specific Type	Saura et al. (2008)	6 constructs and 14 items Personnel Quality, Information Quality, Order quality(6), Timeliness (4), Satisfaction(2), Loyalty(2)	Perception only	This framework explored the relationship among service quality, customer satisfaction and loyalty from the perspective of ICT.	Logistics services, Spain	Tangibles like infrastructure , network etc. are not added in the study.	Infrastructure , operational quality and cost are not considered as one of the service quality construct Major emphasis of the study with the perspective of Information and Communication Technology
VI	Service Quality and its Relation to Satisfaction and Loyalty in Logistics Outsourcing Relationships	Juga et al. (2010)	5 constructs and 13 items Operational Service Quality (3), Personal Service Quality(3), Technical Service Quality (3), Satisfaction(1), Loyalty(3)	Perception only	This model evaluates the perceived service quality which influences both a shipper's satisfaction and subsequent loyalty in outsourcing relationships.	Logistics services, Finland	Limited constructs have been considered for measuring service quality. The number of items within a construct is also not sufficient.	There is scope of expanding empirical analysis to test and validate the results of the proposed framework.

2.10.1 Major Gaps Identified from Existing Service Quality Models in Literature

Major gaps identified from literature review are as below:

1. The most popular **SERVQUAL model** given by Parshuraman et al. (1985, 1988, 1993). They defined 5 dimensions scale for evaluating service quality. The dimensions considered in model shows bad fit when CFA was applied with 5. It works on concept of “**gap**” which is variation of consumer’s expectations and perceptions from service. The concept of gap score has been questioned in literature with a reason that it was difficult for consumer to respond for both perception and expectation of service simultaneously.
2. The **SERVPERF model** considered customer perception only for measuring service quality (Cronin and Taylor, 1992). It does not consider cost as a construct and deals with only perception. There were also some problems with empirical results for customer satisfaction construct.
3. **Mentzer et al. (1999, 2001)** proposed an industry specific service quality model, particularly for logistics service providers in USA. He defined nine dimensions but mostly dimensions are inclined towards order delivery processes which do not cover all aspects of logistics services. Moreover, he did not consider financial stability as any of the service quality construct or measurable item. His research work is limited up to customer satisfaction.
4. **Stank et al. (2003)** proposed a service quality model for the services provided by logistics providers in US. He has taken only three dimensions as performance parameters for developing his framework. He extended his work from customer satisfaction to customer loyalty and also found market share in his studies. But in reality it is difficult to find market share only on the

basis of logistics provider's feedback and the results obtained from survey for market share in studies may be not valid and can be subjective.

5. **Saura et al. (2008)** explained a logistics service quality model for Spain. The authors considered three constructs along with customer satisfaction and loyalty. The main emphasis of their research work is on measuring information, personnel and order quality with inclusion of Information Technology but the important constructs like tangibles and operational quality etc were missed out. The addition of these missed parameters in the study can enhance the scope and purpose of the research.

6. **Juga et al. (2010)** explored the perceived service quality model on logistics outsourcing relationships in Finland. In this study, three constructs (operational, personnel and technical service quality) along with customer satisfaction and loyalty were considered. But, the number of items for measuring each construct is very limited and after applying Confirmatory Factor Analysis (CFA), it was further reduced. Therefore, it calls for further empirical validation of results.

2.10.2 Expected Contributions of Research Work

1. The research on logistics service providers in past studies is mostly done in other countries. Therefore, there is requirement to understand and analyze the best practices and challenges of LSPs in Indian context. This part of study is very essential to get familiarize with actual operations of LSPs in Indian scenario.

2. As most studies are done in U.S.A and other countries they are not relevant in Indian context due to different infrastructural and environmental conditions of our country. There is huge need

to develop a model to understand the parameters which impacts service quality of Indian LSPs and which also affect the customer satisfaction and customer loyalty.

3. Mostly existing models in literature have not considered infrastructure as their element for study. In our proposed framework, the infrastructure will be considered as one of the important parameter to evaluate LSPs service quality.

4. There is a need to find out relevant and reliable constructs to measure the different parts of service quality in logistics outsourcing. In our proposed framework, from vast literature review, the number of service quality dimensions will be considered which will cover almost all aspects of services provided by logistics providers.

5. The selection of appropriate LSP is also an important component of concern. In this study, a framework is also proposed to select a best logistics service provider among all available alternatives.

2.11 Concluding Remarks

In this chapter, the in-depth literature review for the study has been done. The framework followed for literature review has been mentioned. First of all, service quality definitions and measurement models including general and industry specific models have been studied in detail. Further, identification of critical success factors, best practices followed and challenges faced by LSPs have been done based on past studies as well as expert opinion. The service quality dimensions and constructs for proposed framework has been listed from in-depth review of literature for proposed framework. The research gaps are also by comparing few existing service quality models. The learnings from identified research gaps assisted in framing research

objectives for this study. In next chapter, the research methodology followed for research objectives have been discussed in detail.

CHAPTER 3

Research Design

3.1 Introduction

In this chapter, the research design and methodology of the study has been discussed. The research objectives are developed from research gap analysis, discussed in Chapter 2. Different approaches have been adopted for the present study by considering the research objectives as the prime components of the research. The use of multiple methods as per their suitability can help to overcome the shortcomings of one method over another. The mixed method approach is used to enhance the robustness of research outcomes as the data has been taken from varied sources (Bryman, 2007; Abowitz and Toole, 2009). The same approach is followed by various authors while analyzing the data related to supply chain and logistics (Kotzab et al., 2006; Seuring and Muller, 2008; Seuring, 2011; Dubey et al., 2015). The case study method and empirical analysis along with decision making mathematical models for developing and analyzing the framework have been used. The objective of best practices has been dealt with by the case study method. Multi-Criteria Decision Making Methods (MCDM) are utilized to deal with challenges faced by LSPs and selection of best LSP. Structural Equation Modeling (SEM) has been applied to analyze the data collected through survey and to validate the proposed framework.

3.2 Research Objectives of the Study

The research objectives have been developed on the basis of research gaps identified in Chapter 2. These are as follows.

1. To analyze the best practices followed and challenges for Indian logistics service providers.
2. To develop a framework for the selection of suitable 3PL based on service quality.
3. To identify the service quality dimensions and development of service quality framework for Indian logistics service providers.

The objectives are not directly linked to each other but theoretically, these follow a logical sequence. As most of the past studies has been conducted in other countries, it is important to get familiarize with processes followed by Indian LSPs. Therefore, the very first objective is to get familiarize with an Indian LSPs practices and try to understand the current system of LSPs. While developing understanding about functions of LSPs through personal visits, a problem of selection of suitable LSPs by customers has been identified. The selection criteria for LSPs are not fixed and this issue is of major concern. Therefore, a 5Cs framework has been developed for selecting the best LSP based on service quality to achieve the second objective of the study. Even though, the development of framework has been done on the basis of Indian industry experts, its applicability has found to be limited. In the third objective, various service quality dimensions from vast literature have been identified. The data has been collected from the customers who are working in different industry verticals through structured questionnaire and further empirical analysis has been done to generalize the results of framework in a larger context. The first two objectives have been met using an exploratory approach and for meeting the third objective, the results are empirically analyzed and validated.

A research framework has been developed to achieve these objectives as shown in Figure 3.1. Different methods have been used as per the requirement of the objective of the study. For the

first objective, the case study method is used to understand and analyze the best practices followed by Indian LSPs. The qualitative data is collected through semi-structured interviews with experts of selected logistics service providers. Further, the challenges are prioritized by using Total Interpretive Structural Modeling (TISM) in order to identify the most crucial barrier. For the second objective, MCDM tools are applied to select the best logistics service provider among all the available alternatives. In the third phase, data is collected through survey method from customers (who are taking services from logistics service providers) about their satisfaction with respect to logistics service quality. The data is collected through well-designed questionnaire. The respondents are the customer organizations which takes services from LSPs. Thereafter, the hypotheses have been tested by using SEM and results analyzed.

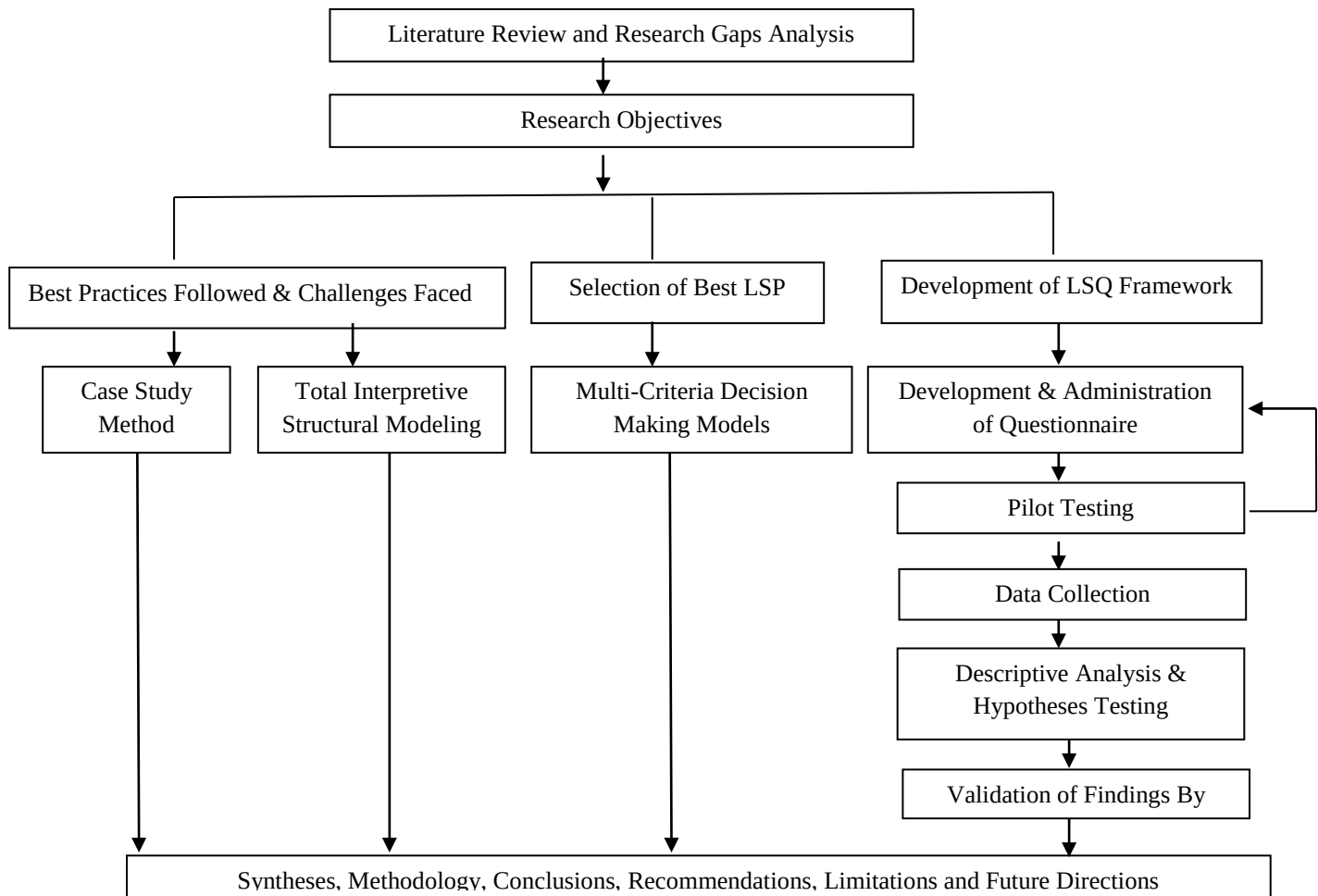


Figure 3.1: Research Framework for the Study

3.3 Research Methodology

Detailed review of literature has been conducted and research gaps are listed. After the research gaps analysis, the research objectives are developed. For achieving the research objectives, a conceptual research framework is proposed. In this research framework, the research objectives are taken as prime component of study and the entire research work will proceed in the direction of fulfillment of the research objectives. The different methods used for the study are explained in detail as follows:

3.3.1 Case Study Method

The case study is defined as “A process of doing research by collecting multiple pieces of evidence from real life experiences which results in an in-depth qualitative analysis of particular problem underhand” (Robson, 2002). In dynamic market conditions, case study method can assist in providing deep understanding of internal processes and systems of the case organizations (Yin, 2003). Eisenhardt (1989) proposed a framework for the process of building theories by using the case study approach. Case research method can be differentiated with traditional approach by giving opportunity to researcher to analyze the study in their own unique way rather than following fixed models and methods. The outcomes of case research method are more effective as results are extracted from in-depth analysis of researcher’s understanding and can lead to some unique and innovative outcomes. The major challenges in applying case research method are time consuming process, availability of limited information, generalization of results, make visits to meet concerned people, etc. The case study method is frequently used in the area of supply chain management and logistics (Persson, and Virum, 2001; Akkermans and Vos, 2003; Eisenhardt and Graebner, 2007; Seuring and Muller, 2008; Oke and Gopalakrishnan, 2009).

In this study, the best practices of logistics service providers are analyzed using the case study method. The purpose of using case research method is to get familiarized with processes and best practices of Indian logistics providers. In this study, best practices are listed through in-depth review of past studies followed by discussions with Indian experts of the logistics companies have been done. A systematic approach is followed starting from selection of case study, collecting information, analysis of information, and disseminate the outcomes. The study has considered three best Indian logistics companies to understand their processes and best practices which they follow. The selection criteria of the companies include their turnover, their origin and the strength of manpower. The companies selected for study have a turnover of more than INR 500 Crores (US \$75.15 Million), originated in India and has more than 5000 dedicated manpower. The middle and senior management of Indian logistics companies has been contacted personally or over phone for conducting interviews in order to collect data for the study. The questions related to their assets, processes and best practices are discussed to capture major issues related to service quality of LSPs. The collected data is analyzed and case study findings are discussed to understand the actual practices of Indian LSPs. Eisenhardt (1989) framework has been used to develop the case study as summarized in Table 3.1.

Table 3.1: Case Research Methodology

Steps	Comments
Defining the Research Question	To identify the service quality issues of an Indian logistics service provider
Objectives	The case research method will help to answer the following questions: • What are the major assets of the organizations? • What are the different processes of the organization? • What are the major factors which affect the service quality of

	logistics service providers? • What are the strengths, weakness, opportunities, and threats (SWOT) of the LSPs in the current environment?
Selection of the Case	Service quality is the prime component considered while selecting the case organizations. The organization is selected on the basis of its turnover, its origin, and manpower strength. The companies selected for study have a turnover of more than INR 500 Crores (US \$75.15 Million), originated in India and has more than 5000 dedicated manpower.
Developing Research Instruments	A structured questionnaire is developed to capture major issues related to service quality which is further followed by interviews and observations.
Data Collection	The data is collected by conducting face to face interviews and discussions with middle and senior management of Indian logistics service providers. In few cases, telephonic interviews are also conducted.
Data Analysis	The data collected from various sources are analyzed to understand the assets, processes, best practices, sustainable and innovative practices. SWOT analysis of the organization is also done.

Source: Adapted from Eisenhardt (1989)

The detailed procedure and application of case study research method is discussed in detail in Chapter 4.

3.3.2 Multi-Criteria Decision Making Models

To achieve the second objective of the research work, various multi-criteria decision-making tools are applied. MCDM tools are considered to be one of the most effective research tools. Lee and Eom (1990) explained the benefits of MCDM tools while dealing with unstructured and multi-objective problems. These approaches measure the alternative ratings based on the preferences or weights given by decision makers to each alternative in a precise and crisp manner. Many approaches like Total Interpretive Structural Modeling (TISM), Analytical

Hierarchy Process (AHP), FAHP (Fuzzy AHP), TOPSIS, Fuzzy TOPSIS, Data Envelopment Analysis (DEA), and DEMATEL, etc. have been developed for solving MCDM problems (Chen et al., 2006; Buyukozkan, and Cifci, 2012; Singh, 2013; Senthil et al., 2014; Singh and Sharma, 2014). The MCDM tools used in this research are described below.

(i) *Total Interpretive Structural Modeling (TISM)*

Warfield (1974) defined ISM as “It is a well-known approach for recognizing associations among specific factors which pertains to the problem or study at hand”. It establishes the contextual relationships among identified factors. The results are inclined towards prioritization of individual factors by taking a collective understanding of these relationships into consideration (Jharkharia and Shankar, 2007). This method is Interpretive as it interprets the relationships of variables on the basis of expert opinion. It is called structured as it follows a structured approach to extract simple outcomes from the complex problems. It is a technique which models the final outcome in hierarchical and graphical format. Total Interpretive Structural Modeling (TISM) is the revised edition of ISM with more advantages in terms of better interpretation of outcomes. It helps in developing well-articulated mental model which interprets both the nodes and links. Moreover, it produces a structural representation of the original problem situation in the form of a digraph that makes communication more effective by retaining few important transitive links. This approach is also proved to be robust, systematic and efficient which makes this method more beneficial over many other methods.

In this study, total interpretive structural modeling is used for analysis of challenges faced by Indian LSPs. This method is to comprehend the contextual relationships amongst all challenges and to prioritize the most crucial barriers. Many researchers have applied TISM technique for the analysis of barriers and challenges in their respective studies (Singh and Kant, 2008; Luthra et

al., 2011; Talib et al., 2011; Jayant and Azhar, 2014; Shibin et al., 2016). Sushil (2012) applied the TISM methodology for developing a hierarchical model for organizational change. Singh and Sushil (2013) applied the TISM methodology to understand the relationship among enablers of Total Quality Management to improve performance of airlines.

In this objective, challenges have been identified from past studies as already discussed earlier in Chapter 2. Then, Structural Self Interaction Matrix (SSIM) has been developed for the identified challenges after taking inputs from four Indian experts belonged to logistics sector. The selected experts are from middle and top management of well-established Indian logistics organizations and associated with same sector from past many years. After SSIM, the reachability matrix has been developed and level partitions have been made by partitioning reachability matrix into different levels. Further, diagraph and TISM hierarchal model has been developed. The concept and steps of the TISM are discussed in detail in Chapter 5.

(ii) *Fuzzy Analytical Hierarchical Process*

Saaty (1980) developed a MCDM tool named AHP for solving complex and structured problems with levels of hierarchy and developed a nine-point rating scale for solving them. It results in the prioritization of alternatives by considering them at different levels of hierarchical framework. The basic method of AHP is (i) breaking down of multifaceted problems into criteria and sub-criteria; (ii) arranging all elements into hierarchical structure; (iii) developing pair-wise comparisons among all alternatives and establishing priorities among all elements at each hierarchy level; (iv) concluding the overall priority of alternatives based on priorities of all hierarchical levels.

AHP gives better results while dealing with crisp information decision applications (exact and ordinary data) but to handle uncertainties associated with the data, additional integration of fuzzy

theory is required. The decision makers show confidence in making linguistic judgments rather than exact values. Fuzzy theory helps in confining the judgments on characteristics like satisfaction, fairness, and dissatisfaction (Senthil et al., 2014). Fuzzy logic allows decision makers to take decisions based on estimated values which may be retrieved through incomplete or uncertain information. The advantage of Fuzzy AHP over AHP is to capture the uncertain imprecise judgment of experts in pair-wise comparison and can be better applicable in dealing complexities with the LSP selection. This advantage of fuzzy AHP makes it more suitable to be used to achieve the objective of the selection of best LSP based on their service quality. Moreover, in literature, many researchers have utilized this MCDM technique to achieve almost similar objectives (Kahraman et al., 2003, Shaw et al., 2012; Kannan et al., 2013; Singh, 2013; Agrawal et al., 2016). In this study, three LSPs have been considered for study and experts' inputs are taken to develop pair-wise comparison matrix. The detailed steps and applications of fuzzy AHP are mentioned in detail in Chapter 6.

(iii) Fuzzy TOPSIS

TOPSIS approach is also one of the popular MCDM tools, introduced by Hwang and Yoon (1981). Hwang et al. (1993) justified many benefits of TOPSIS over other techniques by stating that this method uses different scalar values for both best and worst alternatives all together and it is easy to compute as compared to other existing methods. TOPSIS can give better results even with a large set of alternatives and criteria. These advantages make TOPSIS a better choice as compared to other available MCDM techniques.

In current real-life situations, it is better to capture linguistic judgments rather than crisp or exact values. TOPSIS method uses crisp values for ratings but crisp values are not able to represent real-life situations perfectly. So, to estimate human judgments, fuzzy set theory concept is used.

Therefore, Fuzzy TOPSIS is preferred over TOPSIS due to its increased benefits. This method is used by many authors to prioritize and rank various factors like evaluation of 3PL services (Efendegil et al., 2008; Percin, 2009; Kumar and Singh, 2012), ranking CSFs for implementation of TQM practices (Khanna et al., 2011), evaluation of transportation service quality (Awasthi et al., 2011), selection of computerized maintenance management system (Uysal and Tosun, 2012), evaluation and selection of plant location (Choudhary and Shankar, 2012), prioritizing the barriers of adoption of knowledge management adoption in supply chain (Patil and Kant, 2013) and contractor evaluation and selection in reverse logistics (Senthil et al., 2014), etc.

Fuzzy TOPSIS has been applied for prioritizing the normalized value of elements. Further, weighted normalized decision matrix is developed by multiplying each element with its corresponding weights of criteria and which will result in the selection of best alternative among all possible choices. In this research work, Fuzzy TOPSIS has been applied to select the best LSP out of all alternatives based on inputs received from Fuzzy AHP. The detailed steps and applications of Fuzzy TOPSIS have been discussed in Chapter 6.

(iv) *Sensitivity Analysis*

Sensitivity analysis is the process of capturing uncertainties in the results of a mathematical model by making changes in values to be entered as inputs (Mentzer and Kahn, 1995; Kleijnen and Smits, 2003). It is an approach of recalculation of outcomes under alternative choices to study the impact of a variable. This method is basically used to check the robustness of the results of a system (Percin, 2009). It also enhances the relationship between input and output variables of the model (Senthil et al., 2014; Govindan et al., 2016). In the research work, the sensitivity analysis has been used to test the sensitivity of the final ranks of the alternatives.

From past studies, it has been seen that the minor changes in inputs can bring massive changes in the final rankings of the alternatives (Yazdani et al., 2012).

In the present study, ten different cases are developed for checking the robustness of results of the mathematical model applied for the selection of best LSP. In the sensitivity analysis, the different cases are formed by exchanging weights of two attributes and by keeping weights of other attributes as constant. As for example, for case CC12, the weight of C1 is exchanged with C2 while keeping C3, C4, and C5 as constant. Similarly, for next case CC13, C1 would exchange with C3, while keeping other attributes constant. The process would be continued for all C4 and C5 possible cases. Then corresponding CC_i values are calculated for all the cases by using the TOPSIS method to understand the impact on the priority of each alternative by decreasing or increasing the importance of criteria. In our study, nine out of ten cases have shown the same results as of the initial output of the mathematical model. This method is further explained in detail with elaborative tables and figures in Chapter 6.

3.3.3 Empirical Analysis

To achieve the third objective of the research work, a survey method is used to validate the proposed logistics service quality framework. The empirical analysis (survey method) is a commonly used method by researchers for checking and validating the proposed model in the same area of logistics (Mentzer et al., 2001; Stank et al., 2003; Juga et al., 2010; Ravi and Shankar, 2015). Survey method depends on the facts collected from literature and experience and then allows the data collection through structured questionnaire. The collected data is compiled, examined and analyzed to interpret and validate the results for the proposed framework.

Sample Size and Sampling Method

In this study, the respondents are the organizations (customers) who are taking logistics services from LSPs. A total of 294 survey responses are collected, out of which 24 are incomplete and unengaged responses. Out of 24 inappropriate responses, 5 respondents are those who hardly answered 10 per cent of the questions and 19 respondents give the same response to almost all the questions of the questionnaire. Therefore, 24 responses are eliminated from the entire data set and finally, 270 responses are left for further analysis.

In this research work, we have used snowball sampling in which primary data source nominates other potential data sources for participating in the survey. Snow ball sampling is completely based on referrals, and also known as chain-referral sampling method. In this study, snowball sampling is appropriate sampling technique in order to collect data from the customers of logistics service providers who are taking services from them. It is a very difficult to collect data from a specific set of employees. Therefore, even with considerable effort, we are able to collect data from only 294 respondents.

Questionnaire Development and Administration

Initially, the questionnaire had 52 questions. The industry experts examined the preliminary questionnaire for relevance and content validity. A few additions and deletions in the questionnaire are suggested by experts to make it more relevant in the Indian context. The final questionnaire is attached as Annexure I. The revised questionnaire has 58 questions which included 10 demographic and general questions like name, designation, organization, overall experience, annual turnover of the organization, number of employees in the organization, industry sector to which respondent's organization belongs, services availed from LSPs and current LSPs, etc. The inputs for questionnaire development have been taken both from the

literature review and expert opinion. In this research, respondents have been asked to read statements and specify their response on five-point Likert Scale. In this study, a five-point Likert scale has been developed to evaluate logistics service quality and ranging from Extremely Dissatisfied (1) to Extremely Satisfied (5). Whitley et al. (2013) and Hinkin (1985) found that the Likert scale is the suitable tool of designing and testing the theoretical constructs. The questionnaire is administered in both online and offline mode.

Data Collection

In our research work, the data is collected from the employees working in operations or supply chain department of various Indian organizations. The respondents are the employees of the customer organizations who are taking services from logistics service providers and can give their feedback on the quality of the services received from them. The data is collected in both offline and online modes. For offline, the hard copies of questionnaires were distributed to the known and concerned people and they were requested to fill it carefully. For online filing of questionnaires, a Google form and link is created to expose maximum respondents and it also saves time and cost involved in the survey.

Pilot Testing

The purpose of the pilot study is to check the actual results with the expected results. If any discrepancy occurs, the researcher needs to identify the reasons for the same and rectify it. The pilot testing of the survey is conducted with a sample size of 100. The survey is conducted to capture the responses from different levels of management working in operations or supply chain department and dealing with logistics service providers. Page and Meyer (1999) suggested the minimum threshold limit of 12 responses whereas 100 responses could be collected for pilot study.

Out of 100 questionnaire responses, five are discarded due to incomplete filling of the questionnaire. Cronbach's alpha is used to check the internal consistency of data. In this case, the Cronbach's alpha value is 0.978 that shows a good degree of reliability (Cronbach, 1951).

Data Analysis

For meeting the third objective of research work, a framework has been proposed for measuring logistics service quality. The data is collected through questionnaire and analyzed using empirical methods. The demographics data has been initially analyzed by using descriptive statistics. Then, Exploratory Factor Analysis (EFA) is used to develop a scale for service quality of LSPs by reducing the non-relevant items using SPSS software. Further, the test for checking data reliability (Cronbach alpha) and validity (Convergent and Discriminant Validity) has been conducted for the proposed model. The confirmatory factor analysis and structural models are also developed by applying SEM using AMOS software (Anderson and Gerbing, 1992; Hair et al., 2010). Once the structural model has been developed, research hypotheses were tested to ensure the fitness of the proposed model. The detailed analysis along with tables and figures are mentioned in Chapter 8. In the research work, the approach of using mixed research methods are followed as per the requirement of the research objectives.

3.4 Concluding Remarks

In this chapter, the research design has to be followed for the research work has been discussed. The salient features of mixed research methods have been discussed which includes case study method, MCDM tools and empirical analysis. A systematic approach to reach the findings and conclusions of the study along with validation of results has been mentioned. This method has been utilized for understanding and analyzing the best practices of Indian logistics service providers. Total Interpretive Structural Modeling has been applied to establish the contextual

relationship among all challenges faced by Indian LSPs. MCDM models using Fuzzy AHP and Fuzzy TOPSIS have been applied to select the best LSP among all the available alternatives, considered for the study. Further, sensitivity analysis has been applied to test the sturdiness of the results, received from MCDM techniques. Lastly, the survey method has been used to validate the results for the proposed framework on logistics service quality and also to test the proposed research hypotheses. Although, the brief of all methodologies used in research framework has been discussed but all the methodologies are explained in detail in their respective chapters to maintain the continuity and better understanding of contents. The next chapter is based on the first objective of the study, that is, about the best practices followed by Indian logistics service providers.

Chapter 4

Best Practices Followed By Indian LSPs

4.1 Introduction

For achieving the first objective of the research work, best practices followed by Indian LSPs are identified and analyzed. The available literature in this context gave a fair idea about best practices followed by LSPs all across the globe, which was already discussed in Chapter 2. To understand the best practices of Indian LSPs, the case study method is preferred. For this, it is required to visit and meet people at logistics service provider organizations and collect data and information about their resources, processes and best practices followed by them.

The selection of organization for the case has been done on the basis of the service quality management followed by them. The selected company is popular for its services and followed many best practices to serve the customer. The company is selected on three parameters, that is, the origin of an organization, their turnover and the strength of their dedicated workforce. The case companies are purely Indian, their turnover is more than INR 500 Crores (US \$75.15 Million) and has more than 5000 dedicated workforce. Three such Indian Logistics service providers have been selected for the study based on the above-defined parameters.

The selected organizations are different from each other on the type of services they provided to their customers and the industry segments they are catering to. The first case organization gives more emphasis on inbound transportation where they deal mostly with suppliers and manufacturers. This organization is mostly catering to the automobile sector in comparison to the

*Part of this Chapter has been published as “Sustainable Service Quality Management by Logistics Service Providers: An Indian Perspective”, Global Business Review, 19(3_suppl), S130-S150., 2018.

other industry segments. In inbound transportation, there is a huge requirement of delivering goods on time as a delay in supplying raw material can stop the production line of the manufacturer. The second case organization mainly dealing with shifting of household goods from one place to another at the domestic and global levels. So, obviously, their customers have different expectations from their infrastructure, fleet and manpower handling. The third organization is majorly emphasizing on outbound logistics where they deal mostly with manufacturers to end customers. The requirements of infrastructure, fleet, and dedication from manpower are different in both, inbound and outbound transportation. The organizations are selected with a view to understand the Indian logistics industry from varied perspectives.

One of the case organizations is Om Logistics Ltd. has permitted to disclose their name in the study (Annexure II). The other two organizations have not given permission to disclose their names.

4.2 Case Study Analysis of Indian Logistics Service Providers

As stated above, in this chapter, the case studies of three different Indian LSPs are discussed here in order to understand and analyze their assets, processes, and best practices, sustainable and innovative practices along with SWOT analysis. The framework for case analyses is given in Figure 4.1.



Figure 4.1: Proposed Framework for Sustainable Service Quality Management by LSPs

4.2.1 Case Study1: LSP1 Ltd.

The case study is carried out in the Indian context to understand and analyze the processes and best practices of Indian LSPs more closely. The details for the first case organization, that is, Om Logistics Ltd. (named as LSP1 Ltd.) are discussed below. These are based on visits and face to face interviews with middle and senior management.

4.2.1.1 Organizational Profile

LSP1 Ltd was set up in the mid-1980s in India. They began as an exceptionally solid transporter and further changed itself into a multimodal transport specialist organization. They extended their business over the length and expansiveness of the nation and even to goals over the globe in a protected and savvy way. In the mid-90s, one more company added to the Flagship Company to take into account air freight fragment explicitly. Towards the start of the 21st Century, another organization was propelled under a similar gathering for taking care of universal cargo sending and had built up a specific space for serving global coordination and transportation needs. Services incorporated by LSP1 Ltd. are warehousing, distribution via air, sea, and land, consultancy, cargo management and counseling administrations, etc. In 2000, the company started their own bundling arrangements with joint association with a Japanese organization.

LSP1 Ltd. is considered as India's multi-modular logistics company confirmed with ISO 9001, ISO 14000 and OHSAS accreditations. It offers integrated logistics solutions for including effective handling of surface, ocean, express, train and air freight administrations. With a yearly turnover drifting around INR 1500 Crores (US \$ 225.47 Million) and serving practically all significant businesses, for example, the vehicle, hardware, telecom, retail, pharmaceuticals, etc. At present, LSP1 Ltd. is also participating in many CSR activities.

LSP1 Ltd. deals with the distribution network of more than 3500 client base of domestic, transnational and international presence majorly in Corporate B2B sphere. The organization has been servicing almost all automobile manufacturers in India and more than 2000 auto segment part producers. Their customer base incorporates all significant brand names like Mahindra and Mahindra, Maruti Suzuki India Ltd., SUZUKI Motors, India Yamaha Motors Pvt. Ltd., Toyota, Daimler, Honda Motors India, Heromoto Corp, Tata Motors, Samsung Electronics India Limited, VIVO Mobiles India , Bharati Airtel, Cadila Pharmaceuticals, Arvind Fashions, etc. The organization strives to offer committed services with optimization in quality and cost. The organization is conferred with many awards, recognitions and excellence awards for its outstanding contribution to logistics sector both in domestic and international services. Optimized and strategically planned assets, network, reach, one-stop multimodal logistics solutions, warehousing, and measurable performance parameters defines service quality indices of LSP1 Ltd which are further elaborated in the following sections.

4.2.1.2 Organizational Assets

The LSP1 Ltd., through its technologically advanced assts, ensures timely delivery and assured services to the clients. The organization has significantly invested in modern infrastructure, customized fleet, trained manpower and advanced technology which are further elaborated in the following sections.

State-of-art Warehouses

With its deep know-how of logistics services, LSP1 Ltd. has strategically positioned its state-of-art warehouses near major manufacturing bases on PAN India. The organization offers modernized multi-client and dedicated warehousing spaces over more than 100 locations with its captive warehousing strength of more than 20 Lac square meter on PAN India. All inventory

related activities such as labeling, kitting, recording, and bar-coding of stored goods, etc. are systematically managed with the help of in-house developed inventory management software.

The Services include management of Parts Distribution Centers (PDC), Custom, Goods and Service Tax (GST) bonded and temporary storage on high rising pallet storage systems with enhanced kitting, labeling and distribution services. In the warehouses, around 80 percent of operations involves cross docking practices which is very common for Part Truck Load (PTL) shipments. LSP1 Ltd. manages hub and spoke distribution through more than 40 Cross Dock centers and 700 branches for PTL distribution across more than 14000 pincodes across India.

Fleet

LSP1 Ltd. Offers door to door customized deliveries through more than 4500 modern technologically advanced, all weather containerized vehicles of varied capacities ranging from 0.5 Metric tonnes to 40 Metric tonnes.

Trained Manpower

LSP1 Ltd. has more than 5000 trained workforce who work sincerely, 24 by7 for committed services and customer query resolution. LSP1 Ltd. is strengthened with a team of trained personnel who are recruited from significant Business schools and specialized institutions to ensure continuous manpower support. Various scheduled trainings sessions are provided as a mandatory process to the all levels of staff.

Distribution Network and Range

To allow robust network and synchronized services, the organizations operates more than 700 offices and 40 Cross docks to serve 10000+ delivery locations covering over 80 per cent Pin Codes across India. LSP1 Ltd has a universal impression in excess of 85 nations through its own

offices, joint ventures, exclusive partners etc. It also offers services for the development of merchandise via truck, rail, air and express services which are overseen through logically designed hub and spoke mechanism. It also presents custom clearance benefits over every single significant Seaports, Airports, SEZ (Special Economic Zones), FTWZ (Free Trade Warehousing Zones) and other prominent cargo clearance locations in India. The organization has established their names in handling over-dimensional cargo consignments along with handling project cargo with special and unique requirements.

Information Technology

LSP1 Ltd. uses modern advanced information technology tools along with real time applications which empower them to track and trace consignments through owned servers. The organization also encourages its clients by helping them in sharing data in efficient and secure way. The organization has initiated the use of advanced customer friendly IT applications which further provided versatility with all types of mobile applications Android, BlackBerry, and i-phone and assisted customers with real time sharing of accurate data. The organizations are highly advanced in terms of adoption of ORACLE based databases, in-house developed applications and software which are compatible with SAP to streamline all logistics operations all over the world. The IT backing produces auto data stream in types of every day, week by week, month to month and yearly data which is valuable information for stock management by its customers on short and long term basis. At present, all important departments including Finance, HR, Purchase and Operations etc. of the organization are integrated together through IT platform and promptly open to serve clients queries offline as well as online.

4.2.1.3 Organizational Processes

The organization gives incorporated and convenient services to their clients due to their strong backend processes. The organizational processes along with remarkable resources play an important role in delivering satisfactory services to end customers. Some significant procedures clarified as pursues.

Order Processing

LSP1 Ltd. also creates invoices on the behalf of the customers. The organization takes the responsibility of creating and managing receipts for storing or dispatching of shipments along with sales tax or excise duties for the benefit of their customers. Customers also rely on LSPs for their bulk procurement and storage decisions.

Warehouse Management

The organization also manages warehouses of their clients for smoothing up their regular warehousing operations. The organization also incorporates key parameters like time and motion studies for optimization of resources, designing of warehouse layout, 5S support and adaptable stockpiling arrangements by using latest and coordinated IT tools.

Inventory Management

For managing inventory, the organization prefers to arrange their stocks by using concepts of LIFO, FIFO, etc. LSP1 Ltd. also encourages usage of mathematical models along with IT tools for analyzing the inventory costs, transportation costs and stock management. The organization has a policy to review their stocks after a fixed interval of time to ensure smooth functioning of logistics operations.

Multi-modal Transportation

LSP1 Ltd. offers various modes of transport to the customers for shipment of their goods. An ideal mix of roadways, railways, and the airways are offered by organizations to handle customer consignments and to serve them as per commitments. The organization offers flexibility to the customers in terms of selection of cargo, selection of location, the type of product and the size of shipments.

Value Added Services

LSP1 Ltd. is not only simply concentrating on the common logistics outsourcing activities but also, offering value added services to support their clients. It includes services like labeling of goods, packaging with bubble wrap or directly in carton boxes, sorting of goods and making kits as per customer needs, etc. LSPs also manage document storage, consultancy on supply chain optimization, inputs on packaging redesigning and return logistics. Customers can keep track of their inventories on real-time basis through specially designed customer friendly interface on web portals and mobile applications.

4.2.1.4 Best Practices

In the present conditions, organizations whether in manufacturing or Services are worried about optimal asset utilization and resource preservation for future. The organizations are continuing with numerous activities in order to manage resources at ecological, societal and economic level. LSP1 Ltd. has also taken many initiatives to help, save and protect the natural resources. The organization for its efforts is also certified with ISO 14001:2004 certifications for maintaining green practices for sustainability.

Sustainability Measures

- All the trucks are outfitted with GPS technology which not only helps in tracking the exact location but also aides in diminishing carbon emanation by lessening utilization of fuel. The organization takes exceptional consideration for vehicles which have valid pollution check and carbon emission certificates.
- LSP1 Ltd. plants more than 5000 trees annually in order to enhance green cover around their warehouses. They have a culture of planting tree saplings at various occasions as a step in the direction of environment conservation. Air sanitizing plants are also grown around warehouses or distribution centers to purify the air and make surroundings clean.

Resource Optimization

- In order to optimize resources, LSP Ltd. initiated with proper conservation of available natural resources. Additionally, the organization has installed solar panels on the roofs of the most of the warehouses to generate power and to give back to the society by saving use of electricity.
- LSP1 Ltd prefers use of natural light by making transparent roofs at facilities over electric light bulbs which also helps in reduction of carbon emission.
- The organization also utilize rain water by storing it underground tanks and then further use this water for washing the vehicles, cleaning the floors or gardening purposes.

Education Initiatives

The organization started their non-profit education and training institute to increase the employability in the logistics industry. Various short term courses related to logistics and supply

chain along with practical training sessions are delivered at institute, to enhance the skill set of manpower. This is also in line to PMKVY (Prime Minister Kaushal Vikas Yojna). The meritorious candidates are offered to work with the organization according to their abilities and domain knowledge.

Healthy Working Environment

The organization also shows interest towards employees welfare by providing healthy working environment and employees can cope up with stretched working hours if required. Residential and mess services are also provided to the employees especially working at warehouses to give comfortable and sound environment. LSP1 Ltd. also believes in nurturing feeling of self-discipline and environmental friendly culture in their employees. LSP1 Ltd. is also connected with numerous centers working for charity and society welfare.

4.2.1.5 SWOT Analysis

The SWOT Analysis for LSP1 Ltd. is condensed in Table 4.1. The organization has a strong infrastructure, dedicated manpower, latest IT support, and wide reach as qualities to give incorporated and proficient supply chain solutions for an immense client base with cost benefits. The organization shows less concern towards brand building and creation of skilled manpower in this particular field and has broad dependency on IT solutions. The organization has an extension to grow their organizations to increasingly worldwide goals particularly in SAARC nations. The significant threat for the organization is disorderly nature of logistics sector in India. The organization also gives cost advantage over other logistics companies.

Table 4.1: SWOT Analysis of LSP1 Ltd.

Strengths	Weaknesses
• Integrated Logistics Solution in form of Single Window Solution • More than 4000 Dedicated Fleet (Weather-proof Fleet) • 5000+ Efficient Personnel • 3500+ Strong Client Base • Wide Reach Across Geographical Regions • Customized Solutions at Lower Cost • Adoption of Latest and Advanced IT Technologies • Online Presence 24x7 • Flexible in Dealing All Types of Products	• Branding / Advertising is Less as Compared to Global Brands • High Attrition Rate at Low Level • Untrained Labor • Less Visibility in Market • Extensive Dependability on IT Systems • Low Creativity Due to Cost Considerations
Opportunities	Threats
• Geographical Augmentation • Business Expansion in SARRC Countries • GST implementation can Help to Consolidate the Business in Terms of Cost Benefits • Explore Openings in B2C Segment • Explore Different Parts Beyond the Auto Segment	• Small Players with Low Cost Offerings • Complex Law Structures • Unorganized Sector • Taxation and State Barriers / Toll Charges

4.2.2 Case study2: LSP2 Ltd.

Service quality management practices of the second case organization are presented below.

4.2.2.1 Organizational Profile

LSP2 Ltd. is India's largest mover of household goods and imparting services in packing and moving segment since 1987. From last three decades, the company has been rendering services and gained supremacy in shifting regime by successfully shifted around 16.52 lakhs households and recognized as best moving service providing company specifically in household or office

movements by Limca Book of Records. In India, the company contributes around 85-90 percent of the market share in packing and moving industry which makes them the foremost and unparalleled service provider. The head of the organizations is concerned about understanding the requirements of the customer and providing innovative solutions for the same. Their goal is to provide reliable and hassle-free systematic shifting of goods.

LSP2 Ltd. has an approximate turnover of INR 650 Crores (US \$ 97.70 Million) and has main focus on packing and shifting of goods (domestic as well as international) along with warehousing solutions. All the offices are well connected with online computerized systems to provide easy connectivity to the clients across the country. The clientele list of LSP2 Ltd includes Maruti Suzuki India Ltd., Blue Star India, Bharti Airtel Limited and Eicher etc. along with many well established organizations across and outside the nation.

4.2.2.2 Organizational Assets

LSP2 Ltd. has a variety of fleet, trained manpower, IT infrastructure and wide geographical coverage across countries to satisfy their wide customer database. The major resources of LSP2 Ltd. are mentioned in next section.

State-of-art Warehouses

Currently, the organization has 15 Lakh square feet area of warehouses under CCTV surveillance for the safeguarding of inventory. Almost all warehouses are maintaining international standards in delivering high-quality services. The warehouse engineering and space planning and use of innovative technologies for temperature control are adopted as per international standards. As per the requirements of customers, temporary safe storage options for household goods are also

available in world class warehouses. Moreover, the warehouses require negligible or zero maintenance due to the nut and bolt free leak proof infrastructure.

Fleet

For household movements, they require a special type of trucks as household goods may comprise antiques, glasses, television and refrigerator, etc which need special care. Forklifts and trolleys are used by LSP2 Ltd. for safe and easy loading and unloading of goods. Double door carriers are having two doors-one at the front and other at the rear-which makes loading and unloading convenient and safe. The organization is equipped with more than 1000 self-owned fleet, 200 vehicles on contract basis and GPS fitted 5000 trucking cubes along with more than 100 car picking carriers to provide efficient transportation services. They offer complete services from home to home, starting from packing things of each room of existing home/office separately and then settling and arranging things at relocation accordingly.

LSP2 Ltd. tries to protect shifting goods from rain and dust by using international quality tools and processes. While transporting, they ensure 'zero' transshipment to prevent any type of breakage and to ensure delivery of goods in perfect shape. The organization is also equipped with special carriers to carry plants safely in such a way that plants are open to the air, get sunlight and separated from household goods to prevent breakage. The company owns 70+ specially designed and customized car carriers which ensure safe and scratch free relocation of the customer's car. The company has also researched in developing a special carrier which is capable enough to transport household goods and car at the destination at the same time.

Trained Manpower

The organization is supported by 6000+ dedicated trained manpower. As compared to other 3PLs, the niche area of household movements at LSP2 Ltd. requires focused training of employees. Currently, the organization consists of highly professional and dedicated 3000 direct employees and around 3000 indirect people to provide best in class services. The organization has an active training department which provides comprehensive knowledge to each of the personnel and ensures that the staff remains updated and well trained. The organization has well-trained packing team which know how to deal with different articles. Before transportation of goods, the packing team first ensures that all necessary documents are ready for movement and all payments are made before processing for next stage. The packing team always informs their clients before arrival so that clients get ready with all important preparations. If required by the customer, the team also unpacks their household goods and settles them at desired locations. The organization also allocates a dedicated person as shifting assistant to each customer who acts as a one-stop solution to all the queries of the customer.

In warehousing, the organization keeps trust worthy employees to ensure safety of stored goods. In case of any loss, the good will and brand name of organization may affect. They also offer internships to IIM students to conduct surveys and analysis of current processes and future opportunities for the organization.

Distribution Network and Range

The organization is widely spread owning more than 103 offices and 100+ branches in various cities which are serving 1264 PAN locations within India. They are also covering 182 countries all across the world which shows their wide international presence. The organization has many branches which are looking after specific logistics activities like infrastructure, warehousing,

highway terminal, air cargo terminal, car carrier or transportation, home storage and integrated logistics, etc. They have also incorporated advanced techniques and procedures of shifting. They have also started using high-quality packing material.

Information Technology

The organization is equipped with world-class technology to track and trace their shipments through its own servers. All vehicles, trucks, and carriers are equipped with GPS technology and can be tracked online round the clock with Central control room located at Mumbai. LSP2 Ltd. provides 24x7 assistance by customer care support along with shifting assistant who updates customers on the delivery status. In case of exigencies, the customer care support helps customers to get quick redressal of claims.

All field supervisors have provided with individual tabs to track and trace the shipments and manage inventories in warehouses. They also inform clients about the arrival status of consignments and also prefer to take appointments online or offline before making a visit to the client's house. They have strong IT systems including a Warehouse Management Systems (WMS) implemented at their warehouses. The application systems are customized as per requirements of the customers.

4.2.2.3 Organizational Processes

Order Processing

LSP2 Ltd. uses easy phone numbers so that it can be remembered easily by their customers and customers can easily reach to them. Their dedicated staff is expert in handling personal and commercial shifting of goods as per the convenience of the customers. The orders are processed

in accordance with individual requirements and to provide customer satisfaction with their quality services.

Warehouse Management

Due to GST implementation as new opportunities arising for LSPs, small vendors would like to collaborate with big retailers to achieve economies of scale. Therefore, keeping market requirements into view, the organization developed a new branch specifically for warehousing with a joint partnership of "Bank of America". The initiative has led to development of huge warehouses equipped with latest technologies on attractive locations (on national highways like NH-8, NH-32-Gurgaon, Jamalpur etc.) with connectivity to the main roads so that the truck movements become easy and convenient. The organization has further made huge investment in procuring land for constructing warehouses. The acquired land is not yet completely developed into warehouses due to the high construction cost of the well-equipped warehouses.

High-Quality Packaging Processes

LSP2 Ltd. follows international quality packaging material to provide utmost safety to goods during the shifting process. Innovative ways of packaging are firstly adopted by this organization only. Their unique and effective packaging techniques are discussed below.

LED Box: LSP2 Ltd. uses hard structured cardboard LED boxes for packing LCDs/ LEDs to increase safety by 25 per cent. The idea of this innovation is popped up by research done by IIM Ahmedabad in 2015. Earlier, wooden crates were used for packing LCDs/LEDs and hammers were used to fix the nails in wooden boxes which resulted in damages like hairline fractures, screen breakage, etc. In cardboard boxes, a strong layer of foam provides cushioning effect and

grip to the screen and increases the safety of LCDs/ LEDs. These cardboard boxes are made of standard size matching with the available variety of screen sizes of LCDs/LEDs in the market.

Hard Cardboard Carton Box & Sheets: The Company prefers to use hard structured boxes rather than one-time use cartons. These boxes are more robust and durable in order to handle more delicate household stuff and give better safety from external damages. After lots of experiments, they use reusable hard cardboard sheet for packing process which increases the quality by 100 per cent and saves cost by 26 per cent.

Wardrobe Carton: They have developed unique and innovative rugged boxes which help in shifting the entire wardrobe in "ready-to-wear" condition from one place to another. The boxes are durable, spacious and waterproof.

Cage for Pets and Plant Carriers – LSP2 Ltd. has developed specially designed and ventilated cabins with strong fences for safe shipments of plants. They have also developed safe, airy and comfortable cages for shifting pets.

Multimodal Transportation

LSP2 Ltd. provides flexible, agile and customized services to their customers. The blend of technology, skilled manpower, and geographic coverage result in complete supply chain solutions. The different modes of transportation by road, air, and the sea are used to provide timely and safe delivery to customers. The organization is available with multimodal transportation to handle the bulk shipments, urgent movements and dealing with high-value products.

Inventory Management

LSP2 Ltd. has a policy to check and keep a record of their inventories in the warehouses on the very first day as the new month begins. They make cycle count at the beginning of each new month for the previous month inventory.

Cycle Count= Book Stock-Physical Stock.

Their objective is to match both the stocks. Physical stock must match exactly with the book stock. If they find any discrepancy, they try to identify the reasons and take strict actions to rectify it to avoid any future problem.

4.2.2.4 Best Practices

Safety Concerns for Household Goods

LSP2 Ltd. ensures utmost safety for household goods. The organization has a set of experienced people including well trained escorts with road management team for achieving the goal of satisfied customer after relocation. They hire truck drivers only who are having professional driving practices and can ensure safe handling and delivery of shipments. They also keep standby trucks and security supervisors at various locations to deal with emergencies. The organization ensures safety by providing safety belts to avoid any damage which can occur due to sudden halt of the truck. Clients can also use their personal locks to ensure adequate privacy and safety. Their household carriers can be detached to fit with any other vehicle if required. The shipments are also insured and covered with total-risk free (FOV). If there is any such case then claim settlement will be done within 21 days.

The hardboard sheet fabric also makes robust packing of furniture which helps to protect it from scratches and damages. LSP2 Ltd. has also spread shock absorber spongy carpets (named as

Target) all over the floor of all carriers to reduce breakage and damages against jerks and the hard floor surface of the vehicles.

Quality Control

LSP2 Ltd. is certified with ISO 39001:2012 along with ISO 9001:2015 accreditations for its services and holds a top position in household shifting segment. Additionally, they also won numerous awards by Innovative Practices Award 2015, Mahindra Transport Excellence Award 2012, Navjyoti Gratitude Award (2011-2012), Pride of India - Excellent Transport and Logistics Award, 2012, etc. The organization believes that customer feedback is not only necessary for reviewing the working processes but also provides a ground for improvement. This concern makes this organization very innovative and first choice for household shifting.

Innovative Practices

LSP2 Ltd. welcomes innovative ideas and conducts many research projects to find out new ways to do the same work with cost-effectiveness, reduction in damages and conserving the environment. The organization is first to start with several new innovations. The first innovation was development of a closed body truck in 1995 and then supplied it to Samsung. In 2001, they launched the first portable house and in 2014, they first came up with the idea of trucking cube. There is a common problem of mixing of different goods during transshipment when customers prefer to follow Less Than Truckloads (LTL) shipments. A new innovative idea of Trucking Cube helps customers to own their private space to ship their goods from one place to another. The cubes are available in various sizes as per customer requirements like 4 feet, 6 feet, 8 feet, 12 feet, 16 feet and 20 feet. The major benefits of using trucking cube are zero transshipment, reduction in logistics cost by 8 per cent besides customers goods remaining unseen and untouched. In addition, customers can self-lock the cube and retain the keys with them for

security purposes. There is also a reduction of 16 per cent in packaging cost due to low ply required. It is handed with automation like forklift, cranes, etc. It is very beneficial for pharmaceutical sector where the risk of contamination of other things with medicines is high. This innovation has also impact on society by reducing fuel consumption by 25 per cent. Moreover, there is an approximate loss of INR 42,000 Crores due to transshipment in India annually; this will definitely reduce after the increase in the use of trucking cubes.

One more unique thing the organization does is more related to the sentiments and emotions of the customers. The team of packers gives special care and importance to idols, religious scriptures, etc. First of all, they wash hands before packing items related to worship like God/Goddess idols and keep in cartons with extreme care and get loaded in last in the carrier. Similarly, at the time of unloading, first the carton of worship items gets opened. The packer will wash hand, take off his shoes, clean the space where altar (place where God idols are placed in their house for worship) has to be installed and then first keep the idols of temple on the place.

Customization

LSP2 Ltd. offers customized solutions due to the mandate requirement of their business of dealing with household goods and all the movements are completely based on individual requirements. They take utmost care of the goods during shifting as they value the emotions and sensitivity of customers.

Societal Practices

LSP2 Ltd. believes in giving back to society. They prefer to use reusable and recyclable materials in the packaging process and help in conserving natural resources. For instance, they have introduced specialized and functional fabric canvas bags in place of plastic and paper bags

which are easily reusable and recyclable for packaging purposes. They are also maintaining their vehicles by providing timely services, pollution check, etc. to ensure clean and green environment. They have their own workshops in Mumbai and Gurugram for maintenance of the fleet. Their trucking cube innovation also helps in the reduction of consumption of fuel by 25 per cent.

4.2.2.5 SWOT Analysis

It is attempted here to identify and analyze the major Strengths, Weakness, Opportunities, and Threats (SWOT) for LSP2 Ltd. The SWOT analysis has been discussed in Table 4.2.

Table 4.2: SWOT Analysis of LSP2 Ltd.

Strengths	Weaknesses
• Country's Largest Packers and Movers Service Facilitator • 1000 + GPS Enabled Vehicles and Fleet 5000+ Trucking Cubes • Trained Workforce-Manpower (6000+) • Strong Customer Database across the Nation and Globe • 103 Self-owned Offices Covering 1264 Destinations within India • International Presence in 182 countries. • Usage of Packing materials of International Standards • Availability of latest IT Technologies • Online Presence 24X7	• Limited Brand Awareness • High Attrition Rate at Low Level • Lack of Skilled Labor • Extensive Dependability on IT Systems • Obstacles Due to Infrastructure
Opportunities	Threats
• Expansion of Business into Global Markets • Expand and Explore Business in other Industry Segments • Increase in CSR and Innovative Activities	• Existing Small Players with Low-Cost Offerings • Unorganized Sector • Entrance of New Players in the Same Industry Segment

4.2.3 Case study 3: LSP3 Ltd.

The third case organization, LSP3 Ltd. (name changed) has been considered for the study. The data is collected and analyzed to understand the processes and best practices followed by the organization. The case organization is discussed in detail in the following section.

4.2.3.1 Organizational Profile

LSP3 Ltd. has started its journey in 1997 in the field of logistics with an aim of delivering best logistics services to its customers and to provide smoothness to their businesses. Further, the organization brought drastic changes and pushed their business to unbelievable heights. LSP3 Ltd. initiated with value added cargo services and is connected across all its hubs through web-enabled software. Gradually, they expanded their business by adopting GPS technology, an increase in the number of fleet and an increase in destination locations. Currently, the organization is considered to be India's fastest and most admired supply chain and logistics brand with an annual turnover of around INR 1600 Crores (US \$ 240.50 Million). The organization is one of the most popular and well-established in logistics industry in India.

The organization provides one-stop integrated solutions to its clients and enable them to concentrate on their prioritized activities. The organization primarily provides services of express distribution, 3PL and consulting. The main emphasis of LSP3 Ltd is towards the outbound logistics operations. Majorly the organization caters to the different industry verticals like pharmaceuticals, apparels, FMCG, consumer goods, and electronics, etc. The organization provides active consulting support on supply chain solutions which is required by industry to meet the diverse geographical challenges in a country like India. They have hired about 2000+ internationally certified professionals having global experience and combined with a deep understanding of best practices followed across India and other countries. The consulting

services offer the benefits of reduction in overall costs, understanding and satisfying customer requirements in better way and improving the performance of logistics functions.

LSP3 Ltd. is one of leading organization awarded with the Golden Peacock Award (1999), 'Best Supply Chain Company of the Year' for its quality services (2008), International Business Excellence Award (2008), Glory of India Award by the Institute of Economic Studies (2009), IDC insights award by ICONIC (2017) and the Limca's Book of records with the title largest supply chain and logistics company of India (2018), etc. The organization is awarded with many more recognitions including Lifetime Achievement Award, Indira Priyadarshini Award, Udyog Rattan Award, and Retail Leadership Award by Asia Retail Congress to name a few. The organization is in active association with Federation of Indian Chambers of Commerce and Industry (FICCI) and CII's National Committee on Logistics & Transport. The assets, processes, and best practices followed by LSP3 Ltd. are discussed in detail in the next section.

4.2.3.2 Organizational Assets

LSP3 Ltd. is equipped with huge resources which enables them to satisfy customer's manifold requirements and deliver goods on the committed time. The organization has enriched with strong infrastructure, dedicated manpower, advanced IT backups and wide distribution network. The assets of the case organization have been discussed below.

State-of-art Warehouses

LSP3 Ltd. has developed many warehouses or logistics parks to provide hassle-free services to their customers. The organization has set-up 35 warehouses with capacity of more than 14 million square meters across the country. Most of the warehouses are near to the national highways for better connectivity. The docks are designed internationally with 60-80 feet concrete

docking area to ensure minimum waiting time of trucks and smooth running of logistics operations. All the warehouses are operating continuously during the year. The logistics parks and warehouses are equipped with 16 feet cantilevered shed, temperature controlled and ventilated buildings, 24 by 7 power back up, latest types of equipment for material handling and industrial lighting for all weather secured logistics operations, etc.

Fleet

The organization offers express services at the doorstep of the customers with enriched fleet covering a wide range of 1 ton to 15 tons of shipments. LSP3 Ltd. is equipped with 6000+ GPS-enabled vehicles which move around 800,000 km every day on 1100+ dedicated routes. The fleet is ISO-certified, fully containerized and weatherproof. The company is continuously investing in the procurement of the best quality of vehicles in order to enhance vehicle efficiency.

Trained Manpower

LSP3 Ltd. has more than 5000 well-trained professionals who work with full dedication round the clock. The manpower is highly trained for providing customized logistics services and handling customer queries. A program named Team Development Program (TDP) has also been initiated by the organization in order to evaluate the performance of the employees and to increase the bonding between employees. The blend of direct and indirect employees takes the full responsibility of smooth functioning of all logistics operations. The employees follow stringent rules to provide timely deliveries.

Distribution Network and Range

LSP3 Ltd. provides strong connectivity with wide distribution network coverage and delivers to each and every pin code in India. The organization owns a robust network of over 440 delivery

gateways and 830 destinations which is spread over 35 states and union territories. The company manages transactions of more than 100 million packets every year. The company has developed more than 1100 routes which are connected through 48 mega hubs. The company facilitates customers with a commitment to fast delivery through direct or hub and spoke network across the nation. In order to provide multimodal solutions, LSP3 Ltd. also provides cost-effective air routing through well-designed air network and support of 54 state-of-art air hubs.

Information Technology

LSP3 Ltd. is enriched with advanced and latest graphical user interface which provides real-time platform for tracking shipments at each moment by their GPRS enabled smart tablet devices. The Management Information Systems (MIS) of the company maintains records and database of all transactions and operations. The company facilitates by providing 24 by 7 online assistance to the customers with their strong IT backup support. The information transfer and query handling are very efficient and secure at the customer end. The organization optimizes its route planning by using transshipment route optimizer and keep integrated both, consignee and consignor by sending alerts through SMS on/ before delivery. The electronic signature is also taken by consignee after delivery and an immediate receipt as an "e- proof of delivery" is given to the customer. The company also provides customer-friendly IT applications with compatible mobile operating systems to have transparent and instant information. The applications based on software like ORACLE and SAP work at the backend to provide smooth conduct of all operations of the organization across the world. Bar-coding and RFID techniques are used to monitor and control the management of packed and stored inventories. Inventory management, warehousing, HR processes, financial processes, performance metrics, and all procurement processes are easily manageable, transferable and maintained by updated IT resources.

4.2.3.3 Organizational Processes

LSP3 Ltd. provides quality services to its customers with the available resources and support processes. The various processes followed by LSP3 Ltd. are discussed in this section.

Order Processing

LSP3 Ltd. manages services of generating invoices for the stocks dispatched, labeling, kitting, packaging the goods, sales return, goods and service taxes, custom and excise formalities and statutory compliances. Bulk procurement, specific sales processes, and storage issues of clients are also handled by this organization. The organization integrates the client's invoicing system with their waybill generation system which makes the process easier for customers.

Warehouse Management

LSP3 Ltd. follows world-class warehouse management system for handling receipt, storage, packaging, processing and loading-unloading of goods in the warehouses and keeps track of each and every single transaction. The organization is equipped with high-quality material handling equipment for making processes efficient and secure. They have strong cross dock systems with easy flow and integration with warehouse control systems by Automatic Storage and Retrieval Systems (ASRS) systems. The management carefully designs the warehouse layout, aisle, resource planning, 5S maintenance and flexible storage solutions as per customer specific requirements. The inventory management and maintenance of all warehouse transactions are managed by robust IT systems through Warehouse Management Software (WMS). They also follow the concept of virtual warehousing by providing multi-state warehousing replenishment model.

Inventory Management

The organization follows specific rules and design strategies for picking, replenishing, kitting and storing inventories in warehouses. They use robust IT systems like ASRS systems to store and retrieve goods and each item is scanned before reaching to its desired location in the warehouse. Their WMS software which is integrated with ERP systems takes care of integration among order management and inventory management. The management also follows stringent processes to count and monitor inventory. The cycle count of “A” category items are done once in two weeks, “B” category once a month and “C” category are counted once in a quarter. The organization maintains the stock with an accuracy of more than 99 per cent.

Multi-modal Transportation

LSP3 Ltd. uses a blend of multi-modal transportation in form of the surface, rail and air to offer customized services. Their prime goal is to ensure time-bound deliveries by following the hub and spoke model in order to minimize the distance covered. The company has covered the largest supply chain distribution network and is also appreciated for the fastest transit time. LSP3 Ltd. has developed 54 state-of-the-art air hubs which are further associated with different air taxi operators to ensure smooth and timely door to door delivery. The company gives flexibility to the customer to choose and decide on the mode of transport as per its urgency and cost.

Value Added Services

LSP3 Ltd. is mostly focused on outbound transportation so their emphasis is on small lot sizes readiness to dispatch and then directly ready for display at different retail outlets. The company offers major services to the online retail industry which calls for quick shipments include proper packaging, kitting, binning, labeling of goods and safe returns of unsold items, etc. For catering

books and periodicals segment, the organization uses a specific type of packaging on the basis of its weight, cost, and timelines for delivery. LSP3 Ltd. also handles scheduling, sequencing, documentation, just-in-time services, packaging design, repackaging and consultancy as a value-added service. There is a need for the return of damaged or unsold goods frequently in many other business segments which the company is serving. It requires facilitating customers with reverse logistics services which include assessment of items to be returned, the final decision of disposition of items, repackaging, and final return of items.

4.2.3.4 Best Practices

LSP3 Ltd. is actively concerned with the optimization of resources and maintaining them for long term sustainability. In the current competitive environment, the organization has to show concern towards sustainable practices, environmental issues, and society. The organization has also initiated many steps to serve students, soldiers and also cater to specific needs of the individual by delivering small packets and gifts at desired locations. LSP3 Ltd. is providing world-class services with ISO certification for its initiatives towards the environment and society.

Customized Practices

- ***Stock to Shelf:*** The organization offers the customized services to cater to retail clients in maintaining stocks and delivering of stock on promised timeliness. LSP3 Ltd. provides specific services for managing the supply chain for retail outlets and malls. The movement of goods, packaging, feeding warehouses, security clearance, and inspection are the time-definite processes provided to ensure stock management and re-assembling and setting of goods at the shelf of the retail stores.

- ***Campus to Home:*** These specialized services cater to the student segment especially, managing their shifting from home to Hostel/PG. They even offer free service of delivering 20 kg from Campus to Home and easily accessible by SMS, email or a call. The organization also provides support to students by assisting them in packaging and documentation, flexible payment systems and online tracking of consignments, etc.
- ***Sainik Express:*** This is a customized service specially designed for soldiers to manage fast delivery of their baggage at reasonable price. It includes convenient door pick up and drop of baggage, flexible prices and inbuilt risk coverage. The entire idea is to provide assistance and convenience to frequent travelers across the country.
- ***Easy to Move:*** LSP3 Ltd. offers this unique service where one can ship small size packets (more than 10 kg) and even personal gifts at a reasonably uniform rate at around 883 destinations which include approximately 23,008 pin-codes, across the country. The customer is updated with every transaction, provide flexible ways for payment and quick transit time.
- ***Customized Services:*** This organization gives special attention to the unique requirements of each customer. The customer has different requirements in terms of type of product, the types of storage and the risk involved. They also provide a dedicated and specialized team of highly skilled manpower and special vehicles as per customer needs to handle, monitor and coordinate all the operations smoothly.

Vendor Managed Inventory (VMI)

LSP3 Ltd. replenishes the inventory of their vendors of the automotive industry of their own whenever required. The organization monitors its stock regularly and ensures timely delivery from sufficient stock availability at its warehouses. This service facilitates the packing and unpacking of goods, de-boxing of goods, assessing the quality and provides value-added services as per requirement. The organization generates e-bills which provide flexibility of tracking and tracing of shipments.

Sustainable Practices

LSP3 Ltd. works towards resource optimization and sustainability. The organization prefers to use renewable resources in order to conserve resources for long term sustainability. They strictly follow the "Go-Green" concept by converting their all processes to paperless processes. They use widely adopting digital processes to generate e-invoicing and e-Proof of delivery rather than physical bills. Most of the forklifts used in their warehouses are battery operated. The organization prefers to use small CNG vehicles to fulfill the needs of the retail segment. They also use solar panels at warehouses to minimize energy consumption. All the warehouses are surrounded by a green belt where a large number of trees are planted. Usually, the transparent panels are used as a roof of warehouses to allow the natural sunlight and make optimum use of natural resources. Most of the offices and warehouses of the organization are harvesting rainwater to recycle the water.

Societal Practices

The organization drives CSR activities for the upliftment of the society. The organization is doing various activities for the welfare of communities across the country. For instance, they train their employees and drivers for their safety and update them with safety norms for a safer work environment. LSP3 Ltd. is also actively working towards many social issues like education, health-care, community development, and disaster relief, etc. The organization has opened various career oriented skill institutes like driving school, container school, etc. for encouraging rural youth. They offer knowledge dissemination on supply chain management by e-learning programs, workshops, customized courses, and training. The organization has upgraded and trained around 40,000 candidates until now. They also contributed in Marathon titled “Run for health” which is for enhancing running habits and increase awareness about health among citizens of the country.

4.2.3.5 SWOT Analysis

The strengths, weakness, opportunities, and threats are identified for LSP3 Ltd. The SWOT analysis of LSP3 Ltd. is shown in Table 4.3.

Table 4.3: SWOT Analysis of LSP3 Ltd.

Strengths	Weaknesses
• Market Leader of Supply Chain Industry • Well-known Brand in the Country • Fleet Size of More Than 6000+ GPS-Enabled Vehicles which Moves on 1100+ Dedicated Routes, 54 State-of-art Air-Hubs • About 5000+ Well-Trained Professionals • 35 State of the art Warehouses With Space of over 14 Million Square Feet Across The Nation • Robust Network of Over 440 Delivery Gateways and 830 Destinations Spread over 35 States And Union Territories • Advanced Track and Trace Facility • Online Presence 24x7 • Innovative and Customized Services	• Fewer Advertisements in comparison To Global Brands • High Attrition Rate at Lower Management Level • Lack of Trained Labor in a Specific Area • Infrastructural Issues • High Dependency on IT Systems
Opportunities	Threats
• Business Expansion in Global Markets • Availability of Wide Resources Calls for Expansion of Business in Other Industry Segments • Enhancement of Social, Sustainable and Innovative Practices	• Existing Small Players with Low-Cost Offerings • Entrance of Domestic and International Players

4.3 Comparative Analysis of Case Studies Considered for Study

Although the purpose of considering three different logistics service providers is to understand and get familiarize with different types of logistics services but in all the three case studies, service quality is of prime importance. In this section, a comparative analysis of three logistics service providers has been discussed below in Table 4.4:

Table 4.4: A Comparative Analysis of Three Case Logistics Companies

Case Organizations	LSP1	LSP2	LSP3
Customers Type	Suppliers and manufacturers	Corporates or individuals (office/ household shifting)	Manufacturers and Retailers
Annual Turnover	INR 1500 Crores	INR 650 Crores	INR 1600 Crores
Assets	More than 4000+ GPS enabled trucks Manpower strength- 5000+ 3500+ customers database 450 offices, 30 regional hubs across country 20 million square feet space in warehousing Online presence 24x7	More than 1000 + self-owned GPS fitted vehicles, 2000 vehicles on contract and 5000+ GPS fitted Trucking cubes Manpower strength 6000+ Shifted around 16.52 lakhs households Strong network of 103 self-owned offices covering 1264 destinations within India 15 Lac square feet area of warehouses Online presence 24x7	6000+ GPS-enabled vehicles Manpower strength- 5000+ 4000+ customers database Network of over 440 delivery gateways and 830 destinations which is spread over 35 states and union territories 14 million square feet across the nation Online presence 24x7
Processes	Order Processing Warehouse Management Inventory Management Multi-modal transportation Value added services	Order Processing Warehouse Management Inventory Management Multi-modal transportation High-quality packaging process	Order Processing Warehouse Management Inventory Management Multi-modal transportation Value added services

Best Practices Sustainable Practices	Plant at least 5000 trees in a year Use of solar panels Rainwater harvesting to recycle water Healthy Working environment	Use reusable and recyclable materials in the packaging process Introduced specialized and functional fabric canvas bags in place of plastic and paper bags Uses hard structured cardboard LED boxes for packing LCDs/LEDs	"Go-Green" concept by converting their all processes to paperless processes Use small CNG vehicles Use of solar panels Transparent panels are used as a roof of warehouses Rainwater harvesting to recycle water
Innovative Practices	Education initiatives Customized Solutions Vendor Managed Inventory (VMI)	First to launch a closed body truck, portable house and first came up with the idea of trucking cube Unique and innovative rugged boxes for shifting the entire wardrobe in "ready-to-wear" condition Specially designed and ventilated cabins for pets and plants Special care and importance to altar packing	Education Initiatives Customized solutions Vendor Managed Inventory (VMI)
Opportunities	Explore opportunities in B2C Segment Explore other segments beyond the Auto segment	Expand and explore business in other industry segments Increase in CSR and innovative activities	Business expansion in global markets Availability of wide resources calls for expansion of business in other industry segments
Threats	Small players with low-cost offerings	Existing Small players with low-cost offerings	Existing Small players with low-cost offerings

	Unorganized sector	Unorganized transportation Sector	Unorganized transportation Sector
	No Entry Issues and changing environmental guidelines.	Entering new players in the same industry segment	Entering and exit of domestic and international players

4.4 Concluding Remarks

In this chapter, the assets, processes and best practices along with SWOT analysis of all the three case organizations have been discussed. The objective is to identify and analyze the best practices followed by the selected LSPs through the case study method. Three case organizations have been selected on the basis of their origin, annual turnover, and manpower strength. The case organizations are focusing on different industry segments with their specific requirements. The case organization 1 is more into inbound operations whereas Case organization 2 is majorly emphasized on shifting of household goods from one place to another at national and international level. The case organization 3 deals with outbound operations. The comparative analysis of the three case organizations in tabular format has been also discussed. In the next chapter, the later part of first objective, that is, challenges faced by logistics service providers will be discussed in detail.

Chapter 5

Challenges Faced by Indian Logistics Service Providers

5.1 Introduction

In the previous chapter, the best practices followed by LSPs have been discussed through case studies. LSPs face many challenges while delivering services to their customers. The challenges are listed through review of literature and shortlisted for the study by taking expert opinion. In this chapter, the structural association between the shortlisted challenges has been developed and the prioritization order of challenge resolution is also discussed.

In India, “MAKE IN INDIA” initiative of the government has increased opportunities for LSPs to expand their businesses. Furthermore, technology advancement and ascend in globalization can be considered to have triggered organizations to improve upon their practices. This has led to the requirement of new products and consequently increased need of LSPs’ capabilities for serving global needs. A major issue seen in the context of increased requirements is gap in the current capacities of LSPs, which are not synchronized with industry requirements.

In developing countries like India, infrastructural bottlenecks are one of the major concern areas which need to be improved on priority. The pathetic road conditions, air and seaport capacities, poor connectivity, heavy traffic congestion, and issues at check posts and tolls, etc. are a few to name (Mitra, 2006). The national highways constitute only 2 per cent of the Indian roads but are handling around 40 per cent of the total freight movement by roadways.

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Lack of advanced and updated IT tools (Sauvage, 2003) and limited trained workforce (Govindan et al., 2014) also restrict the growth of LSPs. High investment and low margin due to untimely payment system by Indian shippers slow down the pace of logistics service providers. Moreover, the government policies and inspection strategies are not up to the mark and can be considered as one of the important hurdles in the success story of LSPs (Rajesh et al., 2011). These barriers affect the service quality of logistics service providers.

To increase the service quality of LSPs, the challenges are required to be identified, prioritized and eliminated. In this study, an attempt to identify and develop a structural relationship among challenges. Then an appropriate framework for overcoming these challenges is also proposed. A framework is developed for finding structural association among challenges and analyzed by using Total Interpretive Structural Modeling (TISM) approach in this research work. The driving power and dependence power is also found for these challenges and the categorization of these challenges has also been attempted using MICMAC analysis.

5.2 Identification of Challenges

Based on past studies and inputs from experts, various challenges are listed and discussed as follows.

Infrastructural Bottlenecks: For economic development and urbanization, logistics infrastructure is found to be critical enabler. Due to globalization, India is improving position in world trade channeling upsurge in transport volume (Venkatesh et al., 2017). The Indian government has already taken steps to expand and improve existing road and rail networks and modernizing harbors and airports (Mitra, 2013). But expansion of logistics infrastructure is not synchronized with the expected industry requirements. In developed countries, vehicles move around 800-1000 km in a day whereas In India, it runs only 250-300 km in a day (Sanyal,

2006). This creates the major problem of mismatching of transport capacities as required as shown in Table 5.1. Pathetic condition of roads, poor connectivity, and high toll rates, corruption on highways and hinterlands, and non availability of air and seaports are the important infrastructural obstacles (Sahay and Mohan, 2006).

Table 5.1: Core Infrastructural Bottlenecks

Modes of Transport	Infrastructure	Key Constraints
Road	• Total road network- over 142,126 km in 2019 • National highways include 2 per cent of Indian roads; they handle 40 per cent of the traffic.	• Bad condition of roads • Low average speed (30-40km/hr) • Low Daily average distance travelled (250 km) • Issues at check-post and toll-post
Railways	• Total Track Length-121,407 Km in 2019	• Low service guarantee • No dedicated freight corridors • Low connectivity to industry • No fixed schedule for departure/arrival
Airports	• Domestic/International Airport-125 • 5 main metros account for over 85 per cent of total freight traffic	• Only major airports has infrastructure to handle air cargo • High Waiting time • Poor warehousing infrastructure
Ports	• Ports-212 (Major 12 & Minor 200) • Capacity -Major ports at 500 Million tonnes and Minor ports at 230 Million tonnes	• Heavy congestion at ports • Lack of good connectivity with roads • Out-dated equipment and technology • Low port capacities and number of berths

Lack of Efficient Technical System: GPS technology and tracking and tracing of shipments are already available advanced IT tools which are in process and used by shippers but there are very less about 2 per cent LSPs which have efficient technical systems (Luisa et al., 2013). The country is continuously upgrading its resources technically but adoption rate is still very low. There is a need to develop efficient technical systems and create awareness about importance of

IT adoption to all the stakeholders for better economic development (Sauvage, 2003).

Cost Implications: Logistics sector requires huge investment for resources like vehicles, trained manpower and warehouses, etc. In India, logistics sector requires high investment and considered as low-margin business (Mitra, 2013). The untimely payment pattern by Indian shippers creates shortage of adequate working capital for LSPs. Inadequate and improper infrastructure is also one of the important reason which discourages investors to show interest in the sector. Varying guidelines of compliances along with high operational costs make the business unattractive (Govindan et al., 2012; More and Basu, 2013).

Inefficient Inspection Strategies: The customs and border authorities did not follow rigid guidelines and policies for inspection are not properly defined (Mitra, 2013; Rajesh et al., 2011). Goods are handled at multiple times at check-posts which can cause delay in delivery. Earlier, in India, the government levied various direct and indirect taxes on goods which makes their movement difficult within and across countries but after GST (Goods and Service Tax) implementation, things become better.

Fragmented and Unorganized Sector: Logistics sector in India is considered to be highly fragmented and unorganized business. It is interplay of many small and large players where large players have dedicated fleet but small players may owned 5 or less than trucks (Mitra, 2006). Few large LSPs usually serve well established and known organizations with comparatively better available resources than small players. On the other hand, small players are ready to work for low margin which creates unavoidable obstacles for large ones (Ding et al., 2012).

Conventional Ways of Operations: In developing country, there is very slow adoption of automation due to unavailability of required tools and cost aspects. Majority of the operations including loading and unloading of goods, warehousing, use of pallets and connecting with entire network, are manual (Mitra, 2006). More automation of operations can assist in creating nation-wide broadband logistics IT network and can help speed up all processes resulting in better customer satisfaction (Sharma et al., 2011).

Lack of Government Support Policies: Logistics sector is not recognized as industry in India despite of 13 percent contribution towards GDP (Luthra et al., 2011). However, this sector can generate huge rate of employability. The logistics sector is considered as backbone of Indian economy and can be responsible reason for industrial and economic growth of various industries. The Indian government has shown less concern towards development of stringent policies or rigid frameworks which one need to follow before entering into logistics sector (Govindan et al., 2012).

Lack of Appropriate Performance Metrics: No performance standards or benchmarks have been defined by Indian government to regulate the logistics sector (Mitra, 2013). Hundreds of logistics service providers resources are not up to the mark and are working with limited assets. There is lack of rigid guidelines and performance metrics that one has to follow for establishing and selecting as logistics service provider (Rajesh et al., 2011). Therefore, this barrier directly affects the quality of logistics services.

Shortages of Trained Workforce: In India, due to relatively lesser importance given to logistics sector, there are only a few institutes which offer courses related to logistics and supply chain management (Govindan et al., 2014). Although this sector contributes very high in

GDP, unavailability of trained manpower for delivering desired logistics services is a big barrier (Thai et al. 2011; Abdulrahman et al., 2014).

Less Awareness towards Sustainability Measures: Unawareness of LSPs towards sustainability is an important factor which leads to low implementation of sustainable practices (Colicchia et al., 2013; Abbasi and Nilsson, 2016). In India, some LSPs have initiated adoption of sustainable practices in some of their processes. LSPs use reusable and recyclable packaging material, use solar panels, eco-friendly fleet and green practices as a contribution for environment and society. Still, there is need to create awareness at a larger scale so that many more can start adopting sustainable practices and make optimum use of available resources.

From the past studies, many challenges such as “Complex State Documentation” and “Lack of Coordination among Supply Chain Partners” were considered important but these challenges automatically eliminated from the system after implementing Goods and Service Tax (GST) by Indian government. All the above discussed challenges are clubbed and shown in Figure 5.1.

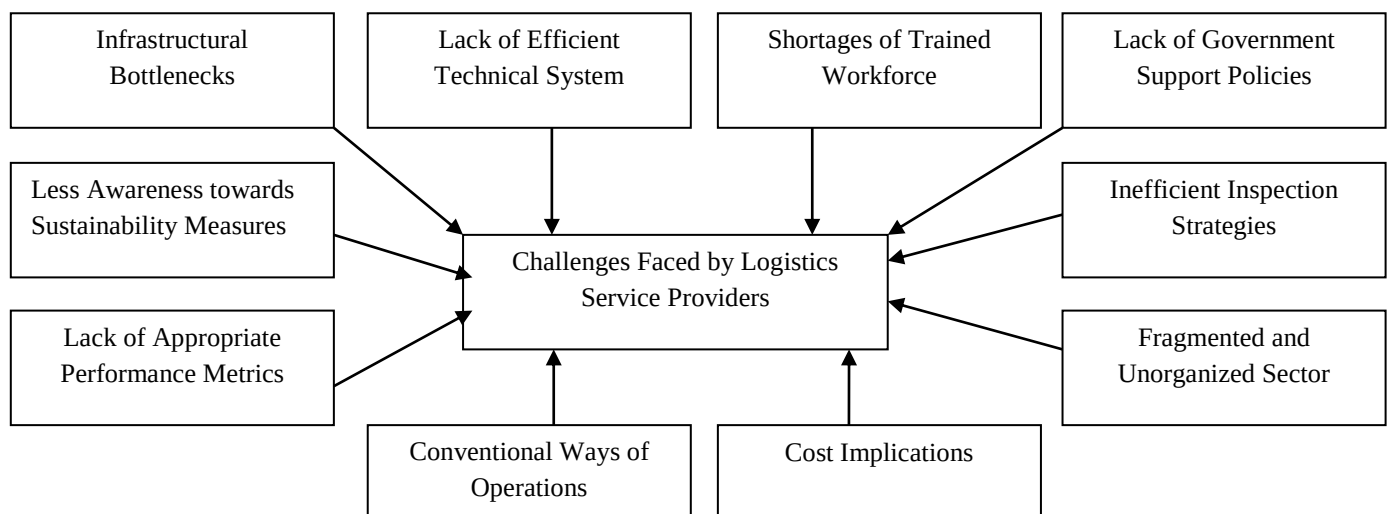


Figure 5.1: Challenges Faced by Logistics Service Providers

5.3 Analysis of Challenges Using TISM Methodology

The objective of this study is to understand the cross relationship between different challenges so that these issues can be rectified for the betterment of service quality of LSPs. Total Interpretive Structural Modeling (TISM) helps to comprehend the association between the identified factors to explain the problem with better accuracy as compared to analysis based on individual factors (Jharkharia and Shankar, 2007; Sushil, 2012). TISM assists decision makers to decide by taking the collective understanding of these relationships into consideration. Moreover, it produces a structural representation of the original problem situation in form of a digraph that makes communication more effective to others. TISM approach helps in developing well-articulated mental model which interprets both the nodes and links. The TISM approach has also proved to be robust, systematic and efficient. All these advantages of TISM over other methods make it is more suitable for the problem at hand.

TISM methodology has been applied to many fields by various authors. Sushil (2012) applied the TISM methodology for developing a hierarchical model for organizational change. Singh and Sushil (2013) applied the TISM methodology to understand the relationship among enablers of Total Quality Management to improve performance of airlines. Balaji and Arshinder (2016) have employed TISM methodology in the food wastage management. TISM methodology has been used include (but is not limited to) vendor selection (Khatwani et al., 2015), reverse logistics (Ravi et al., 2005), supply chain sustainability (Faisal, 2010; Mangla et al., 2014; Dubey et al., 2017), supply chain agility (Agarwal et al., 2007), green practices in supply chain (Shibin et al., 2016), etc. The steps for TISM based research and analyses are shown in Table 5.2.

Table 5.2: Steps for TISM Based Analysis

S.No.	Steps for Total Interpretive Structural Modeling
I	Identification of the barriers affecting the process of interest
II	Define the contextual relationship among n challenges by developing pair wise comparisons $[n(n-1)/2]$ of all n-barriers by taking inputs from experts.
III	Interpretation of pair-wise comparisons. Experts give their suggestions for each I to j link. It could be 'in favor' or 'against' the relationship between i and j challenge and if it is 'in favor' then further interpretations are required.
IV	Build Structural Self-Interaction Matrix (SSIM) for the barriers based on symbols (discussed below)
V	Develop Reachability matrix from SSIM matrix and check for transitivity of the matrix. (Transitivity: A-> B; B-> C then A-> C)
VI	Partition of Reachability matrix into different levels.
VII	Diagram has been developed and few transitive links are preserved which found to be important based on their interpretations.
VIII	Convert diagram into TISM based model (in which links are also interpreted along with the nodes) by replacing variable nodes with statements.
IX	Review the TISM Model and check for any conceptual inconsistency or if required make necessary changes.

The ten challenges to Indian LSPs are already identified in Chapter 2. In this case, $n = 10$ and the possible pairs can be made is $(n(n-1)/2)$, which is 45. Nine direct pairs can be made by using $n-1$ formula. Pair-wise comparisons can be developed after taking inputs from the concerned experts. Interpretation of pair-wise comparisons also has to be made as per inputs given by experts in the form of “yes” or “no”. If “yes” is marked then there is need to go for further interpretation and identify the reasons behind it.

5.3.1 Structural Self Interaction Matrix (SSIM)

SSIM matrix has been developed for the identified challenges on the basis of inputs taken from four Indian experts. The experts selected for the present study belonged to the well-established logistics companies and working at middle and top management in different domains. Expert 1 is the Head Logistics with experience of 18 years, Expert 2 is the Manager in operations department with experience of 10 years, Expert 3 is the Senior Manager in supply chain

department with 12 years of experience and Expert4 is the Assistant Manager of operations department with 7 years of experience. The names of experts and their organizations cannot be disclosed due to reasons of confidentiality. The experts were asked to develop the structural relationships among the challenges so that the prioritization of challenges can be done to provide fruitful outcomes.

For developing SSIM, V, A, X and O are the four symbols used to explain the structural relationship between challenges as follows:

V-Variable i will lead to Variable j;

A-Variable j will lead to Variable i;

X-Variable i and j will lead to each other;

O -Variable i and j are unrelated.

The relationship of each challenge with other challenges for developing SSIM is tabulated in Table 5.3.

Table 5.3: Structural Self-Interaction Matrix (SSIM)

S.No	Challenges	10	9	8	7	6	5	4	3	2	1
1	Infrastructural bottlenecks	O	V	O	X	V	V	V	V	V	
2	Lack of Efficient Technical Systems	O	A	V	A	V	O	V	A		
3	Cost Implications	V	O	V	A	V	X	O			
4	Inefficient Inspection Strategies	O	O	X	A	V	A				
5	Fragmented and Unorganized Sector	V	V	V	A	V					
6	Conventional ways of Operations	O	A	A	O						

7	Lack of Government Support Policies	V	V	V							
8	Lack of Appropriate Performance Metrics	V	A								
9	Shortages of Trained Workforce	O									
10	Unawareness towards Sustainable Practices										

5.3.2 Reachability Matrix

SSIM is converted into initial reachability matrix by exchanging the values of V, A, X and O with 0 or 1 as per the relationship mentioned by experts for that particular case and shown in Table 5.3. The rules followed for substituting 1s and 0s in place of V, A, X and O are as follows:

1. V: Value of (i,j) is 1 and value of (j,i) is 0;
2. A: Value of (i,j) is 0 and value of (j,i) is 1;
3. X: Value of (i,j) is 1 and value of (j,i) is 1;
4. O: Value of (i,j) is 0 and value of (j,i) is 0.

Transitivity is also checked for all possible transitive links. Once, all the transitive links are found then, accordingly, revise the reachability matrix as mentioned in Table 5.4. The driving power and dependence power of each challenge are calculated. Driving power explains the influencing power of a particular factor with respect to other factors whereas dependence power reflects the dependency of one factor on other factors. The driving power for each challenge is calculated by adding the horizontal sum of all values on the basis of the relationship with other challenges whereas dependence power for each challenge is the vertical sum of that individual challenge with respect to other challenges (Attri et al., 2013)

Table 5.4: Final Reachability Matrix

S.No	Challenges	1	2	3	4	5	6	7	8	9	10	Driving Power
1	Infrastructural Bottlenecks	1	1	1	1	1	1	1	1*	1	0	9
2	Lack of Efficient Technical Systems	0	1	0	1	0	1	0	1	1*	1*	6
3	Cost Implications	0	1	1	1*	1	1	0	1	1*	1	7
4	Inefficient Inspection Strategies	0	0	0	1	0	1	0	1	0	0	3
5	Fragmented and Unorganized Sector	0	1*	1	1	1	1	0	1	1*	1	8
6	Conventional Ways of Operations	0	0	0	0	0	1	1*	0	0	0	2
7	Lack of Government Support Policies	1	1	1	1	1	1	1	1	1	1	10
8	Lack of Appropriate Performance Metrics	0	0	0	1	0	1	0	1	0	1	4
9	Shortages of Trained Workforce	0	1	0	1*	0	1	0	1	1	1*	5
10	Unawareness towards	0	0	0	0	0	0	0	0	0	1	1

	Sustainable Practices											
	Dependence Power	2	6	4	7	4	9	3	8	5	7	

5.3.3 Level Partitions

From the Table 5.4, two sets have been developed for each challenge, that is reachability and antecedent set. A set of variables which consists of itself and other challenges that are affected is said to be reachability set whereas the set of variables which consists of itself and other challenges which may create impact on other challenges is said to be antecedent set. After that, an intersection set has to be made by taking common from both reachability and antecedent set. The challenges for which the set of reachability and the intersection are identical, are positioned on the highest level of the hierarchy of the TISM model. Once the challenges at highest level are known then they will be eliminated from the process. Then the same steps will repeat for identifying challenges for the next hierarchy level (as shown in Tables 5.5 - 5.9). This process continues, until all the challenges are positioned at different hierarchical levels of TISM (as shown in Table 5.10). Further, Diagraph and TISM framework is developed by using these levels of hierarchy.

Table 5.5: Level Partitions: Iteration-I

Challenge	Reachability	Antecedent	Intersection	Level
1	1,2,3,4,5,6,7,8,9	1,7	1,7	
2	2,4,6,8,9,10	1,2,3,5,7,9	2,9	
3	2,3,4,5,6,8,9,10	1,3,5,7	3,5	
4	4,6,8	1,2,3,4,5,7,8,9	4,8	
5	2,3,4,5,6,8,9,10	1,3,5,7,8,9	3,5,7,8,9	

6	6	1,2,3,4,5,6,7,8,9	6	I
7	1,2,3,4,5,6,7,8,9,10	1,7	1,7	
8	4,6,8,10	1,2,3,4,5,7,8,9	4,8	
9	2,4,6,8,9,10	1,2,3,5,7,9	2,9	
10	10	2,3,5,7,8,9,10	10	I

Here, as from Table 5.5, the first leveling of challenges can be done. The challenges 6 and 10 are the challenges with weak driving power and high dependence power as shown in Table 5.4. These challenges are more of dependence nature and found to be not very critical for LSPs.

Table 5.6: Level Partitions: Iteration-II

Challenge	Reachability	Antecedent	Intersection	Level
1	1,2,3,4,5,7,8,9	1,7	1,7	
2	2,4,8,9	1,2,3,5,7,9	2,9	
3	2,3,4,5,8,9	1,3,5,7	3,5	
4	4,8	1,2,3, 4,5,7,8,9	4,8	II
5	2,3,4,5,8,9	1,3,5,7,8,9	3,5,8,9	
7	1,2,3,4,5,7,8,9	1,7	1,7	
8	4,8	1,2,3,4,5,7,8	4,8	II
9	2,4,8,9	1,2,3,5,7,9	2,9	

From Table 5.6, challenges 4 and 8 are found to be at the second level. These are dependent challenges with high dependence power and low driving power. They usually depend on other challenges. Therefore, these challenges do not create big hurdles for LSPs.

Table 5.7: Level Partitions: Iteration-III

Challenge	Reachability	Antecedent	Intersection	Level
1	1,2,3,5,7,9	1,7	1,7	
2	2,9	1,2,3,5,7,9	2,9	III
3	2,3,5,9	1,3,5,7	3,5	
5	2,3,5,9	1,3,5,7,9	3,5,9	
7	1,2,3,5,7,9	1,7	1,7	
9	2,9	1,2,3,5,7,9	2,9	III

Challenges 2 and 9 have reached level 3 in Table 5.7. Challenge 2 and 9 are coming as linkage variables which show they are linked with other challenges. The high level of coupling here indicates that if these challenges are rectified, the other challenges will also get improved, hence these challenges are marked critical.

Table 5.8: Level Partitions: Iteration-IV

Challenge	Reachability	Antecedent	Intersection	Level
1	1,3,5,7	1,7	1,7	
3	3,5	1,3,5,7	3,5	IV
5	3,5	1,3,5,7	3,5	IV
7	1,3,5,7	1,7	1,7	

In Table 5.8, challenges 3 and 5 have reached level 4. These challenges are driver barriers which have high driving power and less dependence power. These barriers are critical to LSPs as their presence act as an obstacle to bringing success to LSPs.

Table 5.9: Level Partitions: Iteration-V

Challenge	Reachability	Antecedent	Intersection	Level
1	1,7	1,7	1,7	V
7	1,7	1,7	1,7	V

Challenge 1 and 7 is found to be at fifth level as shown in Table 5.9. These are the most crucial challenges to LSPs. Infrastructural bottlenecks and lack of government support policies are the challenges which are big hurdles in the path of success of LSPs. They have high driving power and less dependence on other challenges. The LSPs need to rectify these challenges at the topmost priority. The leveling of all challenges is shown in Table 5.10.

Table 5.10: Levels of All LSPs Challenges

Challenge	Reachability	Antecedent	Intersection	Level
1	1,7	1,7	1,7	V
2	2,9	1,2,3,7,9	2,9	III
3	3,5	1,3,5,7	3,5	IV
4	4,8	1,2,3, 4,5,7,8	4,8	II
5	3,5	1,3,5,7	3,5	IV
6	6	1,2,3,4,5,6,7,8,9	6	I
7	1,7	1,7	1,7	V
8	4, 8	1,2,3,4,5,7,8	4,8	II
9	2,9	1,2,5,7,9	2,9	III
10	10	2,3,5,7,8,9,10	10	I

5.4. Classification of Challenges

The challenges faced by LSPs are classified into various clusters depending on their driving and dependence power by using MICMAC analysis. The four categories into which identified challenges are classified are “Autonomous”, “Dependent”, “Linkage” and “Driver (independent) variables” (Mandal and Deshmukh, 1994).

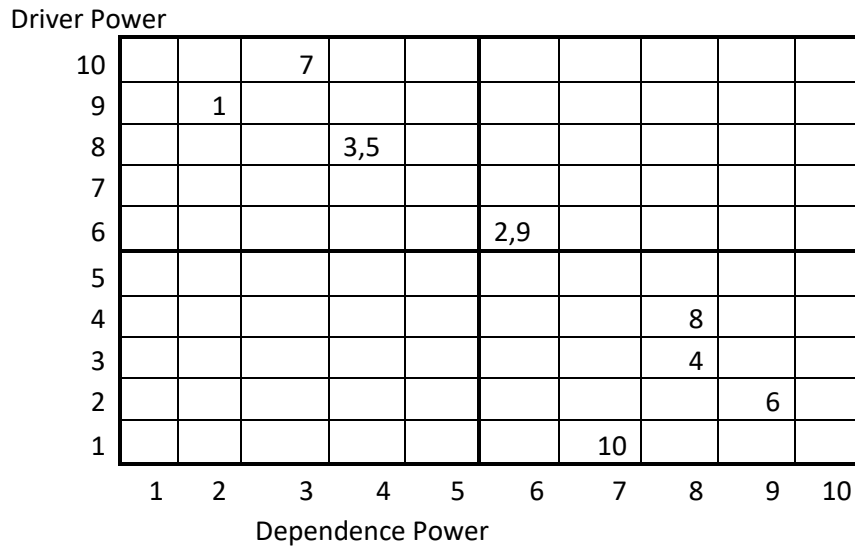


Figure 5.2: Cluster of LSPs Challenges

In MICMAC analysis, the variables which lie in the first quadrant, have weak driving power and weak dependence power, these are termed as autonomous variables. The autonomous variables are usually of less importance to the system and remain disconnected. There is no challenge which has been identified as autonomous challenge as shown in Figure 5.2. In the second quadrant, the variables lie with weak driving power and high dependence power (Challenges like 4, 6, 8 and 10). These are termed as dependent variables as shown in Figure 5.2. The third quadrant variables have high driving power and high dependence power lie and termed as linkage variables. These challenges have strong affect on other challenges and also also get affected by other challenges (Challenges like 2 and 9 from Figure 5.2) (Singh et al., 2008). In the fourth quadrant, the variables with high driving power and low dependence power are clustered. These are termed as independent or driver variables (Challenges like 1, 3, 5 and 7 from Figure 5.2).

5.5. Formation of TISM Model

From the development of reachability matrix as shown in Table 5.4, the structural model has been developed. In the structural model, arrows are used to show the association between two challenges. For instance, relationship between challenge i to challenge j will be pointing through an arrow from i to j. After positioning arrows, initial diagram is developed. Further, TISM based model is created after retaining few transitive links from diagram as shown in Figure 5.3.

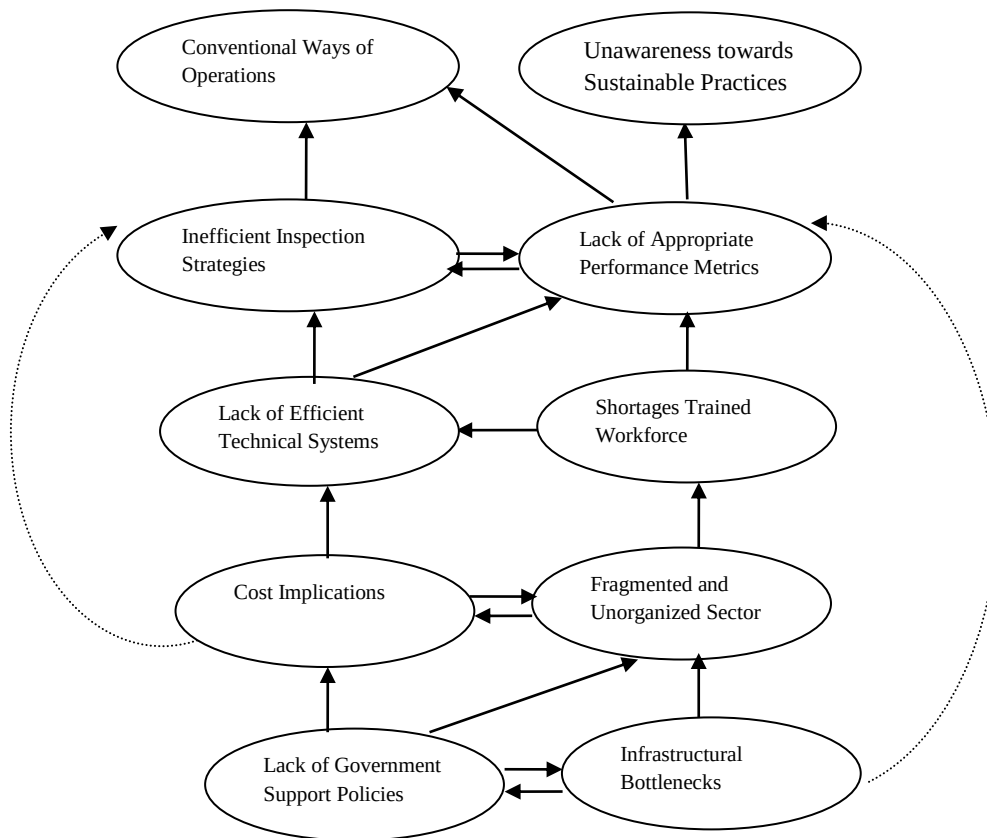


Figure 5.3: TISM Based Model

5.6. Discussion

The leveling of challenges faced by LSPs have been done and discussed to understand the effect of each challenge on performance of LSPs. The leveling of the challenges on the basis of MICMAC analysis and TISM structural model are discussed as follows.

- "Unawareness towards Sustainable Practices" and "Conventional Ways of Operations" is occurring at the highest level of TISM model. The challenge "Unawareness towards Sustainable Practices" is dependent variable which has weak driving and high dependence power as shown in Figure 5.2. This challenge is not a big barrier to LSPs as per the current scenario. There is a need to create awareness about sustainable practices and implementation of these practices for long term business continuity. Many LSPs have already initiated sustainable practices in the form of reusable and recyclable packaging materials, CNG vehicles, planting more trees, rain water harvesting, use of solar panels, etc. Still, the adoption is at a small scale. LSPs have not given priority to adoption of sustainable practices as the Indian logistics have many other priorities (Luthra et al., 2011). "Conventional Ways of Operations" is also a dependent challenge which depends on other challenges with high dependence power and cannot be considered as a critical barrier. Rigid policies and proper benchmarks are not clearly defined for Indian LSPs to follow. Most of the organizations, therefore, tend to continue with the conventional ways of operations. The restriction of manpower towards learning new technologies along with hurdles of adoption of advanced tools by management increases the conduction of operations in manual and conventional manner.

- “Inefficient Inspection Strategies” and “Lack of Appropriate Performance Metrics” is at the second level of the TISM based model. These are dependent challenges which have high dependency on other challenges. LSPs must define and follow their stringent inspection methods in order to increase the safety and security of goods. However, inspection strategies are difficult to implement properly for Indian logistics sector due to unclear benchmarks. Performance metrics should be properly defined so that LSPs are encouraged to improve the quality of services.
- The challenges like “Lack of Efficient Technical Systems” and “Shortage of Trained Workforce” are placed at the third level in the hierarchy. These are linkage variables which have high dependence and driving power. Therefore, these challenges affect other challenges and also get affected by them. There is a need to define strict internal and external auditing compliances to rectify these type of challenges. The non-availability of trained workforce affects in lack of efficient technical systems and lack of appropriate performance metrics. The same problems are also faced by Australian logistics companies (Thai et al., 2011). Despite logistics sector contributing 13 per cent to GDP, there are very less institutes that offer courses and trainings to enhance the skills of the employees (Mitra, 2013). These challenges have to be dealt with due diligence and rectified for ensuring better service quality of LSPs.
- “Cost Implications” and “Fragmented and Unorganized sector” are coming at the fourth level of TISM model. These challenges seek major attention from the government in order to provide excellence in logistics services. Fragmented and unorganized logistics sector restricts the use of technology at all levels, which in turn, results in adoption of conventional and manual processes. These are driver variables which have high driving

power and low dependence power. LSPs have to pay special attention on these challenges to smoothen up their processes and logistical operations. LSPs offer tailor made solutions to their clients for their survival and growth but not something, which adds value to logistics practices of the country. In countries like Malaysia and China, fragmentation of the sector is found to be a complex issue and needs attention (Ali et al., 2008). The challenge “Cost implications” drives the system and shows low dependence on other challenges. Cost implications means “financial restrictions of LSPs on procuring and utilizing resources”. Availability of funds will drive the improvement in current processes and systems followed by Indian LSPs. The government support in terms of interest and investment can enhance the current market status of Indian logistics sector. The transitive link between cost implications and inefficient inspection strategies has been preserved as this directly shows the less government inclination and support towards logistics sector affect the development of stringent inspection strategies to improve the level of service quality.

- At the fifth level, the challenges like "Infrastructural Bottlenecks" and "Lack of Government Support Policies" are placed. In India, infrastructural bottlenecks including conditions of roads, integration among road, airways and seaways, road network coverage, tolls, etc. are the main obstacles in delivering goods at committed time. The Government has initiated many infrastructural projects along with Make in India or implementation of GST to support LSPs but still, there is a long way to go. These challenges are required to be rectified on priority to increase the level of service quality provided by LSPs. Infrastructural bottlenecks are also linked with lack of appropriate performance measures with transitive links. Inadequate infrastructure assists in low

adoption and implementation of guidelines for performance measurement. This is the critical barrier which required quick attention. Similarly, lack of government support policies has also emerged as crucial driver variable which affects the entire logistics sector directly. There are huge requirements of strict compliances, stringent policies and pre-defined benchmarks for the logistics sector from Indian government. Some government policies are in place but their implementation as per requirement of market conditions is not sufficient. Thus, these two challenges have to be removed on priority in order to improve the level of quality of services by LSPs.

5.7. Concluding Remarks

In this chapter, ten challenges are identified from in-depth review of literature and discussed with experts. TISM approach has been used to categorize all the challenges into different clusters and to understand the contextual relationships among them. The analysis of challenges from TISM methodology found that the infrastructural bottlenecks and lack of Government support policies are the most critical challenges and to be rectified on priority. The Government of India has already started various mega infrastructural projects like “Dedicated Freight Corridors (DFC)”, “Inland Water Ways” (Coastal line shipping), and “Sagarmala” but still, they are far from the meeting actual requirements of LSPs as well as customers. Cost limitations are also a big obstacle to LSPs while investing in their resources.

Challenges like “Cost implications” and “Fragmented and Unorganized Sector” drives the entire logistics sector and can be considered as critical challenges. LSPs also have cost limitations which affect their procurement and maintenance policies. "Lack of Efficient Technical Systems" and "Shortage of Trained Workforce" are the linkage challenges which affect the other challenges and simultaneously, affected by other challenges also. Advanced

and updated technology and software are required to integrate all supply chain partners and smoothen up the entire supply chain process. LSPs have to work towards removal of these challenges as their elimination will help in reducing the effect of other challenges also. Conventional methods are preferred by Indian LSPs over latest technologies due to resistance of workforce in learning and adopting new methods.

Indian Government started encouraging workforce through Pradhanmantri Kaushal Vikas Yojna Scheme (PMKVY) and providing short training programs for market readiness in logistics sector. The Government has initiated with couple of things in logistics sector but still there is huge gap which is required to fill. Lack of appropriate performance metrics and inefficient inspection strategies are dependent variables which show dependency the other challenges. So, Government must define standard performance metrics to streamline the logistics operations. Unawareness of sustainable practices and conventional ways of operations are found to be less critical for LSPs. At present, LSPs inclination towards adoption and contribution of sustainable practices is limited. In this chapter, the later part of first objective is discussed. In next chapter, the second objective of the research work that is, the selection of best LSP based on service quality will be discussed and analyzed using MCDM tools.

Chapter 6

Selection of Logistics Service Provider Based on Service Quality

6.1 Introduction

After discussing the best practices followed and challenges faced by LSPs, the second objective of the research work has been considered. The aim of study is to identify and analyse different service quality dimensions of LSPs and to propose a framework to select best LSP based on service quality by means of a real case illustration. The identification of service quality dimensions of LSPs has already discussed in Chapter 2. The MCDM tools like “Fuzzy AHP” and “Fuzzy TOPSIS” are used for choosing the best LSP. Sensitivity analysis is also done to validate the robustness of the proposed framework.

In order to serve customers with optimum service quality in dynamic and globalised markets, organizations give emphasis on selecting appropriate LSP. Selection of appropriate LSP is very crucial to respond to market demands with competitive prices.

The selection of LSPs is usually done on the basis of criteria decided by the organization. The categorization between various LSPs can be done on the basis of industry they serve, targeted market and the type of product they deal with. Organizations also evaluate the performance of LSPs to acknowledge the fulfilment of promised expectations and to decide upon the continuity of business with them (Sharma et al., 2015). LSPs are interested to understand the customer’s expectations from them and what all attributes considered by customers while evaluating their service quality.

Many studies have been done on the selection of LSPs but this study is about selection of LSPs based on their service quality. Therefore, there is a need to identify critical service quality dimensions of LSPs, through which organizations could evaluate their performance. The organizations can take better decision of choosing their LSP based on identified service quality dimensions (Percin, 2009). Although there are some past studies available in this context (Mentzer et al., 2001; Stank et al., 2003; Juga et al., 2010) but the proposed framework in the present study is specifically designed to serve the market requirements in Indian context, which is not researched significantly. Requirements of LSPs in Indian business environment are different from that of developed countries due to inadequate infrastructure and unorganized logistics sector in India. There is a need to propose a holistic approach for selecting LSPs.

Framework for selecting best LSP based on service quality with a real life case illustration has been proposed. Robustness of the model is tested through sensitivity analysis.

6.2 Service Quality Framework for Logistics Service Providers

Service quality dimensions are those parameters on which, the performance of logistics service providers will be evaluated. LSPs can improve on these parameters to provide excellence in their services and can increase their profitability and market share. The literature reviewed for this study is widely diverse in terms of industry segments and geographical locations. In this research work, initially 35 service quality dimensions of LSPs are listed from vast literature review and after taking inputs from experts (as shown in Annexure III). Therefore, the expert's opinion is taken to understand the requirements of customers by LSPs and to prioritize the important components of service quality. The experts are from the customer organizations who are taking services from LSPs and can provide inputs on parameters considered while selecting LSPs. The identified experts belonged to different industry verticals and with huge experience of more than

10 years. Expert-1 is senior operation manager in automobile sector with experience of more than 10 years. Expert-2 is supply chain head in retail sector with experience of more than 18 years. Expert-3 is operations head in electronics sector with 25 years of experience. The experts are purposely chosen from different industry segments so that the results can be generalized for selection of all LSPs serving different industry verticals (Bask, 2001). The experts assisted in identifying the important service quality dimensions of LSPs as per the current requirements of the competitive market. Further, they helped to sort 17 dimensions out of 35 identified service quality dimensions and to categorize these sorted dimensions into 5 clusters. The 17 service quality dimensions are further clubbed into five clusters (5C's) based on past studies and discussion with experts as shown in Table 6.1. These five clusters (5C's) are “Commitment”, “Competence”, “Communication”, “Creativity & Customization” and “Coordination & Collaboration”.

Table 6.1: Service Quality Dimensions for Logistics Providers

Clusters	Service Quality Dimensions	Brief Description	References	Measurement
Commitment	Reliability (REL)	Ability to perform the promised service without failure	Jothimani et al. (2014); Kaynak et al. (2014); Juga et al. (2010); Stank et al. (2003); Mentzer et al. (2001); Franceschini et al. (2000); Ghobadian (1994); Parasuraman et al. (1985, 1988)	Qualitative and Quantitative
	Responsiveness (RES)	Ability to respond faster to customers in delivering goods		
	Assurance (ASS)	Ability to deliver goods without damage		
Competence	Infrastructure (INF)	Adequate number of fleet and facility available to LSPs	Juntunen et al. (2015); Jothimani et al. (2014); Basligil et al. (2011); Juga et al. (2010);	Qualitative and Quantitative
	Skilled Manpower (MAN)	Equipped with adequate number of trained personnel		

	Network Coverage (NTW)	Ability to cover area (local/global) for distribution of shipments smoothly	Naim et al. (2010); Hamdan et al. (2008); Stank et al. (2003); Zapfel et al. (2002); Ellinger et al. (1997)	
	Capacity (CAP)	Ability to handle volume business of customers		
	Cost Optimization (COST)	The cost paid to LSPs for their services.		
Communication	IT Support	Equipped with latest technologies and software to support transactions	Evangelista et al. (2013); Kannan et al. (2012); Jayaram et al. (2010); Juga et al. (2010); Hamdan et al. (2008); Jharkharia et al. (2007); Mentzer et al. (2001); Yu et al. (2001)	Qualitative & Quantitative
	Information Quality	Frequency and quality of content provided to customer		
	Response Time	Ability to respond back to customer order/queries/complaints		
Creativity and Customization	Process Flexibility (FLEX)	Ability to change in processes as per customer requirements	Evangelista et al. (2015); Jothimani et al. (2014); Evangelista et al. (2013); Busse and Wallenburg (2011); Naim et al. (2010); Hamdan et al. (2008); Hertz et al. (2003); Franceschini et al (2000); Gonroos(1984)	Qualitative
	Innovation Capability (INN)	Serving customers with creative and customized services		
	Technology Adoption (TECH)	Ability to upgrade services with latest tools and technologies		
Coordination and Collaboration	Integrated Logistics Management (ILM)	Coordinating and integrating all logistics activities among different channel partners.	Ravi et al. (2015); Jiang et al. (2014); Kaynak et al. (2014); Forslund (2012); Jayaram et al. (2010); Naim et al. (2010); Sahay	Qualitative
	Mutual Trust	Understanding and trust among business partners		

	and Relationship (MTR)	for successful transactions	et al. (2006); Fleischmann et al. (2000); Ellinger et al. (1997); Buttle (1996); Gonroos (1984); Parasuraman et al. (1985)	
	Resource Optimization (RO)	Ability to optimize the available scarce resources with clients		

For survival, LSPs have to show commitment towards their promised deliveries with reliability, responsiveness and assurance (Kaynak et al., 2014). The competitive features like infrastructure, skilled manpower, geographical coverage and capacity of fleet or warehouses usually act as differentiating factors among service providers and also affect the selection decision (Juga et al., 2010). A cost efficiency measure also becomes responsible reason for selection or rejection of service provider from available choices. The most important part of evaluation of logistics services is time to time quality communication between source and destination for timely, speedy and accurate delivery of final goods. Moreover, use of Information, Communication and Technology (ICT) has enhanced accurate and effective coordination between all parties involved and also has direct impact on efficiency of supply chain performance by tracing and tracking shipments easily (Fasanghari et al., 2008). The quality and frequency of information dissemination also make extensive impact on the overall quality of service provided. Declining margins, competitive environment and need of innovative services are the important factors which affect the growth of LSP (Tan et. al., 2014). Flexibility in processes (Naim et. al, 2010) and innovation in services supports LSPs to deal with rising globalization and unseen market uncertainties. In current scenario, LSPs need to provide customized and creative services by making better use of IT services. LSPs also act as an intermediary, which integrates all supply chain partners and helps in better communication by sharing information among all active

channel partners. The strong relationship among intermediaries can result in sharing of resources, effective decision making and long term collaboration.

6.3 Development of the Framework

A 5C's framework is proposed for selecting best LSP on the basis of their service quality in the form of hierarchical model as shown in Table 6.1 and represented in Figure 6.1. This hierarchical framework will be used for applying Fuzzy AHP methodology. This hierarchy is divided into four levels, including overall goal of selecting a best LSP at Level 1. At level2, all five clusters are placed, which is further followed by 17 service quality dimensions at level 3 and the final selection of best logistics service provider out of three alternatives is done at level 4.

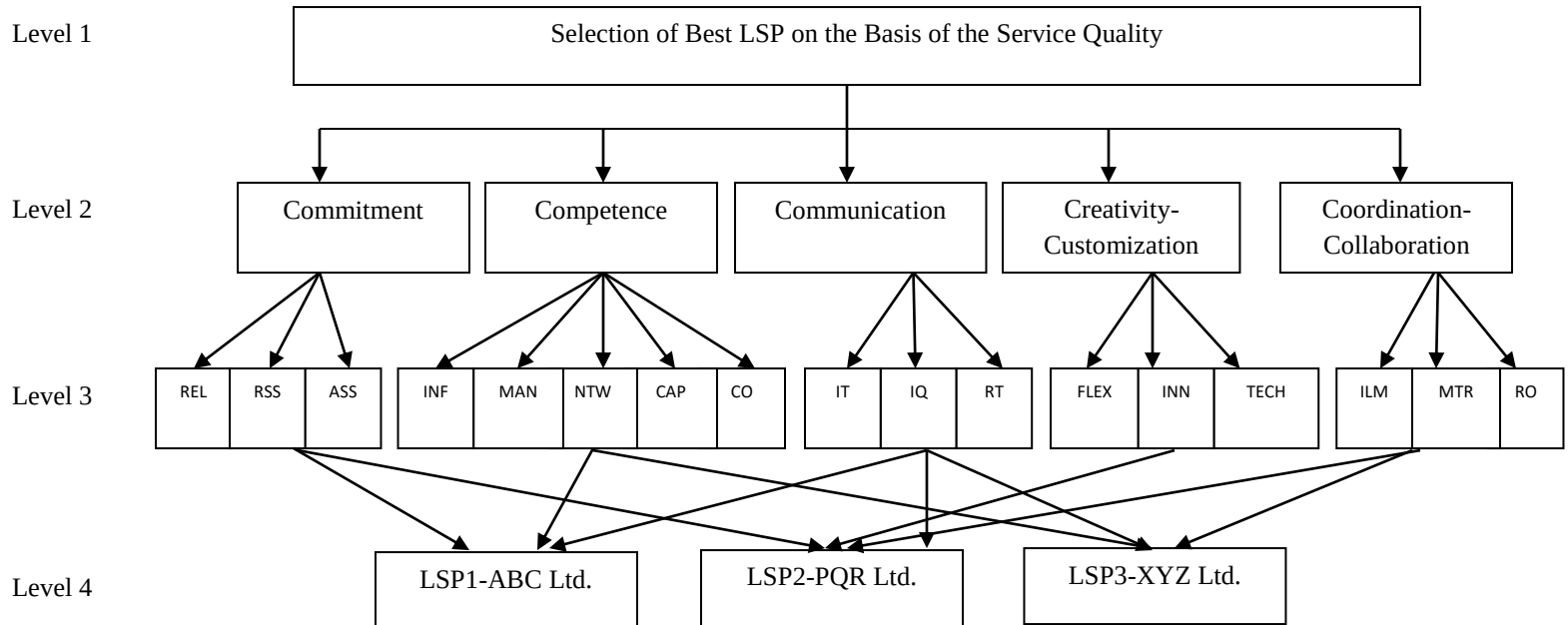


Figure 6.1: Hierarchy model for Selecting Best LSP

6.4 Fuzzy Analytical Hierarchy Process (FAHP)

Saaty (1980) developed a MCDM tool to deal with complex problems. AHP is widely adopted by researchers in many fields like business, engineering, government, food, health care, transportation, supply chain and reverse logistics, etc. (Singh and Sushil, 2013; Agrawal et al., 2016).

AHP gives better results when we deal with crisp information (exact and ordinary data) but to handle uncertainties associated with the data, an additional integration of fuzzy theory is required. Proposed hierarchical framework (Figure 6.1) will be used for applying fuzzy AHP. Linguistics scales are defined for each factor is given in Table 6.2.

Let $X = \{x_1, x_2 \dots x_n\}$ be an object set, and $U = \{u_1, u_2 \dots u_m\}$ be a goal set. According to the method of extent analysis given by Chang (1996), each object is taken and extent analysis for each goal g_i , is performed, respectively. Therefore, M-extent analysis values for each object can be obtained and are represented as follows:

$$M_{g_i}^1, M_{g_i}^2, \dots, M_{g_i}^m, \quad i = 1, 2, \dots, n, \quad \dots(6.1)$$

Where, all the $M_{g_i}^j$ ($j = 1, 2, \dots, m$) are triangular fuzzy numbers represented by (l, m, u), l, m and u is the least possible, most likely and largest possible. The steps of the fuzzy AHP (Chang, 1996) are as follows:

Step 1: The value of fuzzy synthetic extent with respect to the i^{th} object is defined as

$$S_i = \sum_{j=1}^m M_{g_i}^j \otimes \left[\sum_{i=1}^n \sum_{j=1}^m M_{g_i}^j \right]^{-1} \quad \dots(6.2)$$

To obtain $\sum_{j=1}^m M_{g_i}^j$ perform the fuzzy addition operation of M-extent analysis values for a particular matrix such that

$$\sum_{j=1}^m M_{g_i}^j = (\sum_{j=1}^m l_j, \sum_{j=1}^m m_j, \sum_{j=1}^m u_j) \quad \dots(6.3)$$

and to obtain $\left[\sum_{i=1}^n \sum_{j=1}^m M_{g_i}^j \right]^{-1}$, perform the fuzzy addition operation of $M_{g_i}^j$ ($j = 1, 2, \dots, m$) values such that

$$\sum_{i=1}^n \sum_{j=1}^m M_{g_i}^j = (\sum_{i=1}^n l_i, \sum_{i=1}^n m_i, \sum_{i=1}^n u_i) \quad \dots(6.4)$$

The inverse of the vector in “equation (2)” can be computed as,

$$\left[\sum_{i=1}^n \sum_{j=1}^m M_{g_i}^j \right]^{-1} = \left(\frac{1}{\sum_{i=1}^n u_i}, \frac{1}{\sum_{i=1}^n m_i}, \frac{1}{\sum_{i=1}^n l_i} \right) \quad \dots(6.5)$$

Table 6.2: Linguistic Variable for Importance Weight of Each Factor

Linguistic Variable	Triangular Fuzzy Numbers
Equally Important	(1,1,1)
Weakly Important	(2/3, 1, 3/2)
Fairly Important	(3/2, 2, 5/2)
Strongly Important	(5/2, 3, 7/2)
Absolutely Important	(7/2, 4, 9/2)

Source: Singh and Sharma (2014)

Step 2: The degree of possibility of $M_2 = (l_2, m_2, u_2) \geq M_1 = (l_1, m_1, u_1)$ is defined as

$$V(M_2 \geq M_1) = \sup_{y \geq x} [\min(\mu_{M_1}(x), \mu_{M_2}(y))] \quad \dots(6.6)$$

and can be equivalently expressed as follows:

$$V(M_2 \geq M_1) = \text{hgt}(M_1 \cap M_2) = \mu_{M_2}(d)$$

$$= \begin{cases} 1, & \text{if } m_2 \geq m_1, \\ 0, & \text{if } l_1 \geq u_2, \\ \frac{l_1 - u_2}{(m_2 - u_2) - (m_1 - l_1)}, & \text{otherwise,} \end{cases} \quad \dots(6.7)$$

Where, d is the ordinate of the highest intersection point D between μ_{M_1} and μ_{M_2} shown in Figure 6.2.

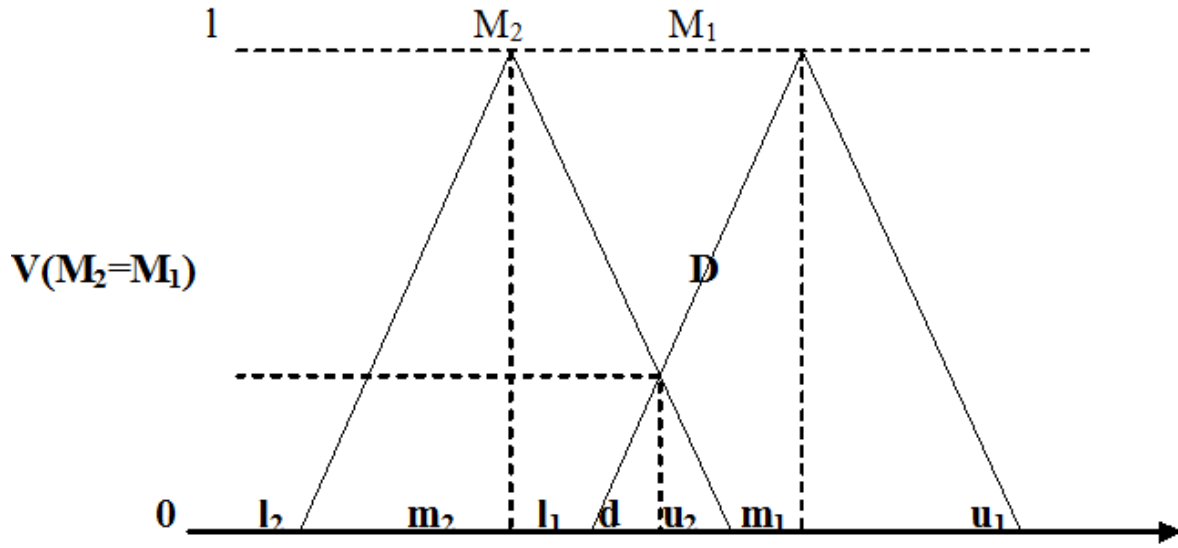


Figure 6.2: The Interaction between Triangular Fuzzy Numbers, M_1 and M_2

To compare M_1 and M_2 , we need both the values of $V(M_2 \geq M_1)$ and $V(M_1 \geq M_2)$.

Step 3: The degree possibility for a convex fuzzy number to be greater than k, convex fuzzy numbers M_i ($i=1, 2, \dots, k$) can be defined as

$$\begin{aligned} V(M \geq M_1, M_2, \dots, M_k) &= V[(M \geq M_1) \text{ and } (M \geq M_2) \text{ and } \dots \text{ and } (M \geq M_k)] \\ &= \min V(M \geq M_i), i = 1, 2, 3, \dots, k \end{aligned} \quad \dots(6.8)$$

$$\text{Assume that, } d'(A_i) = \min V(S \geq S_k) \quad \dots(6.9)$$

for, $k=1,2,\dots,n$ and $k \neq 1$. Now the weight vector can be given by the following formulae,

$$W' = \{d'(A_1), d'(A_2), \dots, d'(A_n)\}^T, \quad \dots(6.10)$$

Where A_i ($i=1, 2, 3, \dots, n$) are n elements.

Step 4: By normalization, the normalized weight vectors are given as,

$$W' = \{d(A_1), d(A_2), \dots, d(A_n)\}^T,$$

Where “W” is a non- fuzzy number

Step 5: Integrate the opinions of decision makers and apply geometric average to combine the fuzzy weights of decision makers.

6.5 Technique for Order Preference by Similarity to Ideal Solution (TOPSIS)

Hwang and Yoon (1981) developed a MCDM approach to find solutions from countable number of alternatives. The concept on which this approach works is that the solution must have shortest distance from positive ideal solution and also have farthest distance from negative ideal solution. TOPSIS method is used to prioritize the items with normalized values. To get the weighted normalized decision matrix, the weights calculated through Fuzzy AHP is multiplied by the normalized value of each item. This method is widely used in many different areas like robot design, material selection, risk analysis, service quality assessments, reverse logistics, and comparative performance analysis of various companies etc. (Bottani and Rizzi, 2006; Yazdani et al., 2012).

Fuzzy TOPSIS has advantages over conventional TOPSIS in reflecting natural human thinking style under actual environment (Senthil et al., 2014). The linguistic scales for rating alternatives

is given in Table 6.3. The steps for evaluation by Fuzzy TOPSIS approach given by Chen et al. (2006) are-

Step 1: Decide the linguistic rating values for the alternatives with respect to criteria.

Let us assume that there are m possible alternatives called $S = \{S_1, S_2, S_3, \dots, S_m\}$ which are evaluated against the criteria, $B = \{B_1, B_2, B_3, \dots, B_n\}$. The criteria weights are represented by w_j ($j = 1, 2, 3, \dots, n$).

The performance rating of each expert E_k ($k = 1, 2, 3, \dots, k$) for each criteria B_j ($j = 1, 2, 3, \dots, n$) with respect to alternative S_i ($i = 1, 2, 3, \dots, m$) are denoted by $\tilde{R}_k = \tilde{A}_{ijk}$ ($i = 1, 2, 3, \dots, m$; $j = 1, 2, 3, \dots, n$; $k = 1, 2, 3, \dots, k$) membership function $\mu_{\tilde{R}_k}(x)$.

Table 6.3: Linguistic Variables for Alternatives Ratings

Linguistic Variables	Corresponding TFN
Very Poor	(1,1,3)
Poor	(1,3,5)
Medium	(3,5,7)
Good	(5,7,9)
Very Good	(7,9,11)

Step 2: Find out aggregate fuzzy ratings for alternatives.

All the experts give fuzzy rating in triangular fuzzy number (TFN) $\tilde{R}_k = (l_k, m_k, n_k)$, $k = 1, 2, 3, \dots, k$. Then convert fuzzy rating of all experts into aggregate fuzzy rating $\tilde{R} = (l, m, n)$ $k = 1, 2, 3, \dots, k$ where

$$l = \min_k \{ l_k \}, \quad m = \frac{1}{k} \sum_{k=1}^k m_k, \quad n = \max_k \{ n_k \}$$

Fuzzy rating of K^{th} decision maker are $\tilde{X}_{ijk} = (l_{ijk}, m_{ijk}, n_{ijk})$, $i = 1, 2, 3, \dots, m$, $j = 1, 2, 3, \dots, n$, then aggregate fuzzy rating $\tilde{X}_{ij}(l_{ij}, m_{ij}, n_{ij})$ where

$$l_{ij} = \min_k \{ l_{ijk} \}, \quad m_{ij} = \frac{1}{k} \sum_{k=1}^k m_{ijk}, \quad n_{ij} = \max_k \{ n_{ijk} \} \dots (6.11)$$

Step 3: Construct the fuzzy decision matrix.

The fuzzy decision matrix for the alternatives ($\tilde{D}$) is constructed as follows:

$$\tilde{D} = \begin{matrix} & \begin{matrix} B1 & B2 & & Bn \end{matrix} \\ \begin{matrix} S1 \\ S2 \\ \\ Sm \end{matrix} & \begin{pmatrix} \tilde{x}_{11} & \tilde{x}_{12} & \dots & \tilde{x}_{1n} \\ \tilde{x}_{21} & \tilde{x}_{22} & \dots & \tilde{x}_{2n} \\ & & & \\ \tilde{x}_{m1} & \tilde{x}_{m2} & \dots & \tilde{x}_{mn} \end{pmatrix} \end{matrix}$$

$i = 1, 2, 3, \dots, m; j = 1, 2, 3, \dots, n$

Step 4: Construct the Normalized Fuzzy Decision Matrix

The raw data has been normalized with the help of linear scale transformation. to convert into comparable scale. The normalized fuzzy decision matrix $\tilde{N}$ is given by:

$$\tilde{N} = [r_{ij}]_{m \times n}, i = 1, 2, 3, \dots, m; j = 1, 2, 3, \dots, n,$$

$$\text{Where } \tilde{r}_{ij} = \left(\frac{l_{ij}}{n_j^*}, \frac{m_{ij}}{n_j^*}, \frac{n_{ij}}{n_j^*} \right) \text{ and } n_j^* = \max_i \{ n_{ij} \} \text{ (benefit criteria) } \dots (6.12)$$

$$\tilde{r}_{ij} = \left(\frac{l_j^-}{n_{ij}}, \frac{l_j^-}{m_{ij}}, \frac{l_j^-}{l_{ij}} \right) \text{ and } l_j^- = \min_i \{ l_{ij} \} \quad (\text{cost criteria}) \quad \dots(6.13)$$

Step5: Construct the Weighted Normalized Matrix

The weight (a_j) of evaluated criteria is multiplied with normalized fuzzy decision matrix ($\tilde{r}_{ij}$) to get weighted normalized matrix ($\tilde{w}$).

$$\tilde{W} = [\tilde{w}_{ij}]_{m \times n} \quad i = 1, 2, 3, \dots, m; \quad j = 1, 2, 3, \dots, n \quad \dots(6.14)$$

Where $\tilde{w}_{ij} = (\tilde{r}_{ij}) \times (a_j)$

$\tilde{w}_{ij}$ is a triangular fuzzy number which is represented by $(\tilde{l}_{ijk}, \tilde{m}_{ijk}, \tilde{n}_{ijk})$

Step 6: Find out Fuzzy Positive Ideal Solution (FPIS) and Fuzzy Negative Ideal Solution (FNIS).

The FPIS and FNIS of the alternatives find out by:

$$\text{FPIS : } A^* = (\tilde{p}_1^*, \tilde{p}_2^*, \tilde{p}_3^* \dots \tilde{p}_n^*) \quad \dots(6.15)$$

Where $\tilde{p}_j^* = (\tilde{l}_j^*, \tilde{m}_j^*, \tilde{n}_j^*)$ and $\tilde{n}_j^* = \max_i \{ \tilde{n}_{ij} \}$

$$\text{FNIS: } A^- = (\tilde{p}_1^-, \tilde{p}_2^-, \tilde{p}_3^- \dots \tilde{p}_n^-) \quad \dots(6.16)$$

Where $\tilde{p}_j^- = (\tilde{l}_j^*, \tilde{l}_j^*, \tilde{l}_j^*)$ and $\tilde{l}_j^* = \min_i \{ \tilde{l}_{ij} \}; i = 1, 2, 3, \dots, m; \quad j = 1, 2, 3, \dots, n$

Step 7: Find out the distance of each alternative from Fuzzy Positive Ideal Solution (FPIS) and Fuzzy Negative Ideal Solution (FNIS)

The distance (d_i^+, d_i^-) value for each alternative $i = 1, 2, 3, \dots, m$ from FPIS and FNIS is computed as follows:

$$d_i^+ = \sum_{j=1}^n dp(\tilde{w}_{ij}, \tilde{p}_j^*), \quad i = 1, 2, 3, \dots, m \quad \dots(6.17)$$

$$d_i^- = \sum_{j=1}^n dp(\tilde{w}_{ij}, \tilde{p}_j^-), \quad i = 1, 2, 3, \dots, m \quad \dots(6.18)$$

Step 8: Find out the Closeness Coefficient (CCi) of each alternative

The closeness coefficient can be calculated by finding the ratio between the distance to the fuzzy negative ideal solution to the sum of fuzzy positive and negative ideal solution.

$$CCi = \frac{d_i^-}{d_i^+ + d_i^-} \quad \dots(6.19)$$

Step 9: Give rank to the alternatives according to decreasing order of closeness coefficient (CCi).

6.6 Case Illustration

In order to illustrate the use of proposed framework (Figure 6.1) for selecting LSP based on their service quality, an industrial case has been discussed in this study. In this study, three LSPs have been considered. The inputs from experts have been taken on clusters and dimensions of proposed framework for selecting a best LSP by using Fuzzy AHP and Fuzzy TOPSIS. The brief profiles of considered LSPs along with their salient characteristics are described in this section.

(i) *ABC Ltd (Name changed)*

ABC Ltd is well established logistic company in India and also expanded well in the Asia Pacific region and SAARC countries. It was established in 1989 and progressively achieved remarkable

success by offering integrated express distribution and customized supply chain solutions across diverse industries. This organization has an annual turnover of US\$ 230.02 Million with large fleet of more than 5000 vehicles, 215 reefer fleets and an assured space across 32 airlines. The services are capable enough of covering 667 districts out of 671 districts. Currently, the organization is serving more than 9000 customers from top 10 industrial sectors in 200 countries with an efficient workforce of about 5500 employees. It has also launched CSR initiatives focused on environment, children and education.

(ii) PQR Ltd (Name changed)

PQR Ltd is multi-modal logistics company with provides integrated solution to all aspects of the logistics. It was established in 1980 and currently the company is a leading organization which are serving big share of market. The organization has an annual turnover of US \$128.01 Million with about 3500+ fully contained and weather proof fleet and more than 5000 dedicated persons. It covers more than 80000 miles per day and 5000 cargo movements per day. The business is expanded over 1500 destinations pan India with around 450 offices and 25 regional hubs across India and has sound global reach to 200 countries. The company is well equipped with web technology and has more than warehousing space of 15 million square feet with modern material handling equipment. The services are spread across various industry verticals. The firm is also certified with ISO 14001: 2004 for its concern towards environment and society.

(iii) XYZ Ltd (Name changed)

XYZ Ltd is one of the popular organizations among top logistics companies in logistics industry in India. The company began its journey in 1997 and provides excellent high quality logistics services. The organization has approximately annual turnover of US \$195.78 Million with strong collection of over 4000 containerized and all-weather-proof fleet. All vehicles are GPS enabled

and traverses over 600,000 kilometres every day. The wide network covers over 610 destinations, spread across 35 states and union territories of India. It delivers to each and every pin code in India through 249 delivery gateways, more than 1000 dedicated routes, linked through 48 hubs and mega hubs. It is also equipped with huge infrastructure in terms of warehousing space of 8 million square feet and latest web enabled technologies. Currently, the company serves nine different business verticals. Various CSR initiatives for environment and society have also initiated by this organization.

6.7 Data Analysis and Findings

Results have been analysed in two parts. In first part, the weights for all clusters and dimensions of proposed framework have been evaluated by using Fuzzy AHP. In second part, Fuzzy TOPSIS has been applied to select best LSP out of all alternatives based on inputs received from Fuzzy AHP.

6.7.1 Analysis Based on Fuzzy AHP

For selection of best LSP among all alternatives, judgments on service quality dimensions has been taken from experts in same area and fed into AHP Model. Pair-wise comparison of all the factors is made on the basis of linguistic scale defined in Table 6.2. By using Equations (6.1 - 6.2), the pair-wise comparison matrices of major criteria and sub criteria are developed and shown in Table 6.4. The final individual and global weights are evaluated by using Equations (6.3 - 6.10) by applying Fuzzy AHP method and as shown in Table 6.5.

Table 6.4: Pair-wise Comparison Matrix of the Major Criteria and Sub Criteria

	Table 6.4(a): Pair-wise Comparison Matrix of the Major Criteria				
	C1	C2	C3	C4	C5
C1	(1,1,1)	(0.285,0.333,0.4)	(0.667,1,1.5)	(3.5,4,4.5)	(2.5,3,3.5)
C2	(2.5,3,3.5)	(1,1,1)	(1.5,2,2.5)	(3.5,4,4.5)	(0.667,1,1.5)
C3	(0.667,1,1.5)	(0.4,0.5,0.667)	(1,1,1)	(3.5,4,4.5)	(3.5,4,4.5)
C4	(0.22,2.25,0.285)	(0.22,2.25,0.285)	(0.22,2.25,0.285)	(1,1,1)	(0.285,0.333,0.4)
C5	(0.285,0.333,0.4)	(0.667,1,1.5)	(0.22,0.25,0.285)	(2.5,3,3.5)	(1,1,1)
The weight vector for all C's: $W_C=(0.20,0.27,0.25,0.13,0.14)^T$					
Table 6.4(b): Pair wise Comparison Matrix of Sub Factors with respect to C1 (Commitment)					
	REL	RES	ASS		
REL	(1,1,1)	(1.5,2,2.5)	(0.667,1,1.5)		
RES	(0.4,0.5,0.667)	(1,1,1)	(1.5,2,2.5)		
ASS	(0.667,1,1.5)	(0.4,0.5,0.667)	(1,1,1)		
The weight vector for all sub factors of C1: $W_{C1} = (0.43,0.36,0.20)^T$					
Table 6.4(c): Pair wise Comparison Matrix of Sub Factors with respect to C2 (Competence)					
	INF	MAN	NTW	CAP	COST
INF	(1,1,1)	(0.285,0.33,0.4)	(0.667,1,1.5)	(3.5,4,4.5)	(2.5,3,3.5)
MAN	(2.5,3,3.5)	(1,1,1)	(1,1,1)	(3.5,4,4.5)	(0.667,1,1.5)
NTW	(0.667,1,1.5)	(1,1,1)	(1,1,1)	(3.5,4,4.5)	(3.5,4,4.5)
CAP	(0.22,0.25,0.285)	(0.22,0.25,0.285)	(0.22,0.25,0.285)	(1,1,1)	(0.285,0.33,0.4)
COST	(0.285,0.33,0.4)	(0.667,1,1.5)	(0.22,0.25,0.285)	(2.5,3,3.5)	(1,1,1)
The weight vector for all sub factors of C2: $W_{C2} = (0.20,0.23,0.28,0.13,0.15)^T$					
Table 6.4(d): Pair wise Comparison Matrix of Sub Factors with respect to C3 (Communication)					
	IT	IQ	RT		
IT	(1,1,1)	(1.5,2,2.5)	(0.285,0.33,0.4)		
IQ	(0.4,0.5,0.667)	(1,1,1)	(2.5,3,3.5)		
RT	(2.5,3,3.5)	(0.285,0.33,0.4)	(1,1,1)		
The weight vector for all sub factors of C3: $W_{C3} = (0.20,0.41,0.38)$					
Table 6.4(e): Pair wise Comparison Matrix of Sub Factors with respect to C4 (Creativity and Customization)					
	FLEX	INN	TECH		
FLEX	(1,1,1)	(7/2,4,9/2)	(5/2,3,7/2)		

INN	(2/9,1/4,2/7)	(1,1,1)	(2/7,1/3,2/5)
TECH	(2/7,1/3,2/5)	(5/2,3,7/2)	(1,1,1)
The weight vector for all sub factors of C4: $W_{C4} = (0.51, 0.05, 0.43)^T$			
Table 6.4(f): Pair wise Comparison Matrix of Sub Factors with respect to C5 (Coordination and Collaboration)			
	ILM	MTR	RO
ILM	(1,1,1)	(2/7,1/3,2/5)	(3/2,2,5/2)
MTR	(5/2,3,7/2)	(1,1,1)	(7/2,4,9/2)
RO	(2/5,1/2,2/3)	(2/9,1/4,2/7)	(1,1,1)
The weight vector for all sub factors of C5: $W_{C5} = (0.32, 0.45, 0.23)^T$			

Table 6.5: Global Weight of the Main and Sub-Factors for Selection of Best LSP

S.No.	Factors	Individual Weight	Global Weight
1	Commitment (C1)	0.20	0.20
	• Reliability (REL)	0.43	0.088
	• Responsiveness (RES)	0.36	0.073
	• Assurance (ASS)	0.20	0.041
2	Competence (C2)	0.27	0.27
	• Infrastructure (INF)	0.20	0.055
	• Manpower (MAN)	0.23	0.064
	• Network coverage (NTW)	0.28	0.077
	• Capacity (CAP)	0.13	0.036
	• Reasonable Cost paid (COST)	0.15	0.041
3	Communication (C3)	0.25	0.25
	• IT Support (IT)	0.20	0.051
	• Information Quality (IQ)	0.41	0.104
	• Response Time (RT)	0.38	0.097

4	Creativity & Customization (C4)	0.13	0.13
	• Process Flexibility (FLEX)	0.51	0.065
	• Innovation Capability (INN)	0.05	0.007
	• Technology Adoption (TECH)	0.43	0.055
5	Coordination & Collaboration (C5)	0.14	0.14
	• Integrated Logistics Management (ILM)	0.32	0.047
	• Mutual Trust Relationship (MTR)	0.45	0.065
	• Resource Optimization (RO)	0.23	0.033

Results show that priority weight differs for all criteria. Based on priority weights, different clusters can be ranked in descending order as Competence (0.27), Communication (0.25), Commitment (0.20), Coordination & Collaboration (0.14) and Creativity & Customization (0.13). Most important cluster is Competence, which should be taken into consideration while selecting LSP. Under Competence, the major sub factor is network coverage with priority weight of 0.077 followed by manpower (0.064) and infrastructure (0.055) as shown in Table 6.5. In past scholarly articles, it was found that the priority weights for geographical coverage and location of facilities is comparatively low, which is a little contradiction, may be due to comparatively less globalization than today's business requirement (Basligil et al., 2011). But many authors also supported to have optimized decentralized and distributed networks and better eco-friendly transport infrastructure for providing competitive services to the organizations (Jothimani et al., 2014; Senthil et al., 2014). After Competence, second priority should be given to Communication.

In Communication, quality of information (0.104) and response time (0.097) are two important sub factors required for smooth and fast communication between different supply chain partners.

These findings emphasize on the increasing importance of communication by logistics providers to remain competitive in dynamic market conditions. Also, in order to serve across boundaries specifically in the era of e-commerce, competency of logistics provider can act as a competitive advantage to the firm.

Commitment is the third important cluster. In this cluster, reliability (0.088) is considered as most important sub factor of Commitment, followed by responsiveness (0.073) and assurance (0.041). These results can be validated through many past studies, where reliability and responsiveness act as important quality indicators to evaluate performances of various logistics aspects (Kumar and Singh, 2012; Singh, 2013). A fourth important cluster for selection is Coordination and Collaboration. While coordinating with other partners, mutual trust and their long term relationship with partners (0.065) is most important factor. This is followed by integrated logistics management (0.047) and resource optimization (0.033). These finding imply that mutual trust along with long term relationship among supply chain partners are important factors. The above results are also aligned with past results, where mutual understanding and cumulative decision making are considered as strong pillars while coordinating in any supply chain (Carballosa and Tarres, 2011; Singh, 2013). Basligil et al. (2011) also highlighted the importance and benefits derived from the collaboration which resulted in increased efficiency by sharing common resources.

Creativity and customization is weighted least in comparison to other main criteria. In this cluster, process flexibility (0.065) is an important factor as compared to technology adoption (0.055) which is followed by innovation capability (0.007). Such kind of cluster usually plays a supportive role to enhance organizations beliefs of more satisfied end consumers. Process flexibility helps organizations to provide more alternatives to customers. Latest technology

enables organizations to be compatible with latest developments in the external world and innovative ideas can help them to deliver their services in some unique way. Past studies done in many other countries like Australia, Greece and Spain supported the fact that use of advanced technology, availability of appropriate and on-time information, and flexibility in processes is the need of the hour for LSPs to grow and face upcoming challenges in dynamic competitive environment (Daugherty et al.,1996; Carballosa et al., 2011; Evangelista et al., 2013).

6.7.2 Analysis based on Fuzzy TOPSIS

In this study, the relative weights of shortlisted criteria are calculated by using Fuzzy AHP and these weights as shown in Table 6.5 are used as inputs for fuzzy TOPSIS. The fuzzy TOPSIS will be used to find out the final rankings of all the available alternatives. The TOPSIS analysis has been done by taking inputs from same experts considered for first part of study. These input received from the experts are shown in Table 6.6.

Table 6.6 Inputs of Experts on 5C Framework for Different LSPs

Table 6.6(a): Expert-1 : Judgment Based on Different Factors																	
Criteria			Commitment			Competence			Communication			Creativity and Customization			Coordination and Collaboration		
LSP	REL	RES	ASS	INF	MAN	NTW	CAP	COST	IT	IQ	RT	FLEX	INN	TECH	ILM	MTR	RO
ABC	M (3,5,7)	G (5,7,9)	G (5,7,9)	G (5,7,9)	VG (7,9,11)	VG (7,9,11)	VG (7,9,11)	VG (7,9,11)	VG (7,9,11)	M (3,5,7)	P (1,3,5))	P (1,3,5))	P (1,3,5))	G (5,7,9)	G (5,7,9)	G (5,7,9)	M (3,5,7)
PQR	G (5,7,9)	G (5,7,9)	G (5,7,9)	G (5,7,9)	G (5,7,9)	M (3,5,7)	VG (7,9,11)	VG (7,9,11)	VG (7,9,11)	M (3,5,7)	G (5,7,9)	P (1,3,5))	P (1,3,5))	G (5,7,9)	G (5,7,9)	G (5,7,9)	M (3,5,7)
XYZ	G (5,7,9)	G (5,7,9)	G (5,7,9)	G (5,7,9)	G (5,7,9)	VG (7,9,11)	VG (7,9,11)	G (5,7,9)	G (5,7,9)	G (5,7,9)	G (5,7,9)	P (1,3,5))	P (1,3,5))	M (3,5,7)	G (5,7,9)	G (5,7,9)	G (5,7,9)
Table 6.6(b): Expert-2 : Judgment Based on Different Factors																	
ABC	VG (7,9,11)	G (5,7,9)	VG (7,9,11)	M (3,5,7)	VG (7,9,11)	G (5,7,9)	G (5,7,9)	G (5,7,9)	G (5,7,9)	G (5,7,9)	G (5,7,9)	M (3,5,7)	G (5,7,9)	G (5,7,9)	VG (7,9,11)	G (5,7,9)	G (5,7,9)
PQR	VG (7,9,11)	VG (7,9,11)	VG (7,9,11)	VG (7,9,11)	G (5,7,9)	G (5,7,9)	VG (7,9,11)	VG (7,9,11)	VG (7,9,11)	G (5,7,9)	VG (7,9,11)	VG (7,9,11)	G (5,7,9)	G (5,7,9)	VG (7,9,11)	VG (7,9,11)	G (5,7,9)

XYZ	VG (7,9,11)	VG (7,9,11)	VG (7,9,11)	G (5,7,9)	VG (7,9,11)	G (5,7,9)	VG (7,9,11)	G (5,7,9)	G (5,7,9)	G (5,7,9)	VG (7,9,11)	M (3,5,7)	G (5,7,9)	G (5,7,9)	VG (7,9,11)	G (5,7,9)	G (5,7,9)
Table 6.6(c) : Expert-3 : Judgment Based on Different Factors																	
ABC	M (3,5,7)	P (1,3,5)	G (5,7,9)	M (3,5,7)	G (5,7,9)	G (5,7,9)	G (5,7,9)	G (5,7,9)	M (3,5,7)	G (5,7,9)	M (3,5,7)	VG (7,9,11)	M (3,5,7)	G (5,7,9)	G (5,7,9)	M (3,5,7)	VG (7,9,11)
PQR	G (5,7,9)	M (3,5,7)	G (5,7,9)	P (1,3,5)	G (5,7,9)	VG (7,9,11)	G (5,7,9)	VG (7,9,11)	M (3,5,7)	G (5,7,9)	M (3,5,7)	G (5,7,9)	G (5,7,9)	M (3,5,7)	VG (7,9,11)	VG (7,9,11)	VG (7,9,11)
XYZ	M (3,5,7)	M (3,5,7)	M (3,5,7)	M (3,5,7)	G (5,7,9)	M (3,5,7)	M (3,5,7)	G (5,7,9)	M (3,5,7)	M (3,5,7)	M (3,5,7)	M (3,5,7)	M (3,5,7)	M (3,5,7)	G (5,7,9)	M (3,5,7)	G (5,7,9)

Table 6.7: Closeness Coefficient

Alternatives	D+	D-	CCi	Rank
ABC	0.28447	16.76697	0.983317	3
PQR	0.231579	16.80423	0.986406	1
XYZ	0.23375	16.7964	0.986274	2

The Fuzzy evaluation matrix is constructed with the help of linguistic variables defined for the evaluation of each alternative in Table 6.3. Aggregated Normalized and weighted Fuzzy Matrix with all distance values is evaluated by using Equations (6.11- 6.14) and shown in Table I, II, and III (Annexure-IV). The distances for each alternatives are calculated by using Equations (6.15- 6.16). The D^+ values and D^- values are calculated for all alternatives by using Equations (6.17- 6.18) are (0.28447, 0.231579, 0.23375) and (16.767, 16.804, 16.796) respectively. Once the distances are calculated, and then the closeness coefficient (CCi) for each alternative is calculated by using Equation 6.19 as shown in Table 6.7. The alternative with higher CCi value will be considered at the first rank. PQR Ltd. (0.9864) is followed by XYZ Ltd. (0.9862) and ABC Ltd. (0.9833) as per the CCI values calculated in Table 6.7. After detailed analysis, we can say that PQR Ltd. is considered to be best LSP with highest CCi value of 0.9864 among all alternatives. PQR Ltd. covers wide domestic and geographic range by adopting latest and innovative practices with support of competitive cost strategies, quality infrastructure and updated advanced technologies and resulting in better customer satisfaction than their competitors. All these aspects validate the reason of better performance of PQR Ltd. as compared to other alternatives.

6.7.3 Sensitivity Analysis

The sensitivity analysis is used to confirm the stability of the model (Percin, 2009). This analysis has been done to test the sensitivity of the final ranks of the alternatives as shown in Table 6.7. It has observed from past scholarly articles that minor changes in attributes weights may bring considerable changes in the final rankings of the alternatives (Yazdani et al., 2012). A sensitivity analysis is performed to investigate the robustness of the proposed model by considering all different possible cases. Basically, in sensitivity analysis, weights of the two attributes are exchanged by keeping weights of other attributes as constant. Initially,

weights of first criterion C1 are replaced with C2 while keeping C3, C4 and C5 as constant. Then similar analysis will be continued with exchanging C1 with C3, C4 and C5 sequentially and will result in combination of ten possible cases as given in Table 6.8. Then corresponding CCI values are calculated for all the cases by using TOPSIS method to understand the impact on the priority of each alternative by decreasing or increasing the importance of criteria. In this case, the model is confirmed to be very robust as the relative ranking of alternatives remain same for nine cases out of ten possible cases as shown in Table 6.8. The results obtained from sensitivity analysis for nine cases indicate that $PQR > XYZ > ABC$, with exception of a deviation of ranking from PQR to XYZ in a particular case (CC14). It validates earlier findings from fuzzy TOPSIS.

The graphical representation of sensitivity analysis results is also shown in the form of radar and line chart in Figure 6.3 and 6.4. In Figure 6.3, the LSP with the lowest rank is plotted closest to the mid-point and as rank increases it goes farther from the mid-point. So, it is clearly visible from Figure 6.3 that ABC Ltd. is closest to the mid-point which has lowest rank and PQR Ltd. is the farthest from the mid-point which has highest rank among all the alternatives. However, Figure 6.4 represents simple comparative analysis of all the three alternatives in form of line chart for all the possible cases. In Figure 6.4, x-axis represents the all possible ten cases (Conditions) as shown in Table 6.8 and y-axis represents the range of all possible CCI values. The Figure 6.4 clearly depicts that PQR Ltd. has the highest CCI value among all alternatives for nine cases out of all possible ten cases. This method can be further expanded by exchanging weights in different ways.

Table 6.8: Results of Sensitivity Analysis

S.N O	Possible Cases	w1	w2	w3	w4	w5	ABC	PQR	XYZ	Rank
1	CC12	0.273957	0.202595	0.251583	0.127604	0.144262	0.982584	0.986661	0.986174	PQR>XYZ>ABC
2	CC13	0.251583	0.273957	0.202595	0.127604	0.144262	0.983386	0.986537	0.986286	PQR>XYZ>ABC
3	CC14	0.127604	0.273957	0.251583	0.202595	0.144262	0.983039	0.985284	0.985306	XYZ>PQR>ABC
4	CC15	0.144262	0.273957	0.251583	0.127604	0.202595	0.980713	0.983230	0.982109	PQR>XYZ>ABC
5	CC23	0.202595	0.251583	0.273957	0.127604	0.144262	0.983056	0.986426	0.986238	PQR>XYZ>ABC
6	CC24	0.202595	0.127604	0.251583	0.273957	0.144262	0.981273	0.984738	0.984181	PQR>XYZ>ABC
7	CC25	0.202595	0.144262	0.251583	0.127604	0.273957	0.983061	0.986958	0.98634	PQR>XYZ>ABC
8	CC34	0.202595	0.273957	0.127604	0.251583	0.144262	0.983033	0.984883	0.984704	PQR>XYZ>ABC
9	CC35	0.202595	0.273957	0.144262	0.127604	0.251583	0.984359	0.986767	0.986505	PQR>XYZ>ABC
10	CC45	0.202595	0.273957	0.251583	0.144262	0.127604	0.983117	0.986146	0.986027	PQR>XYZ>ABC

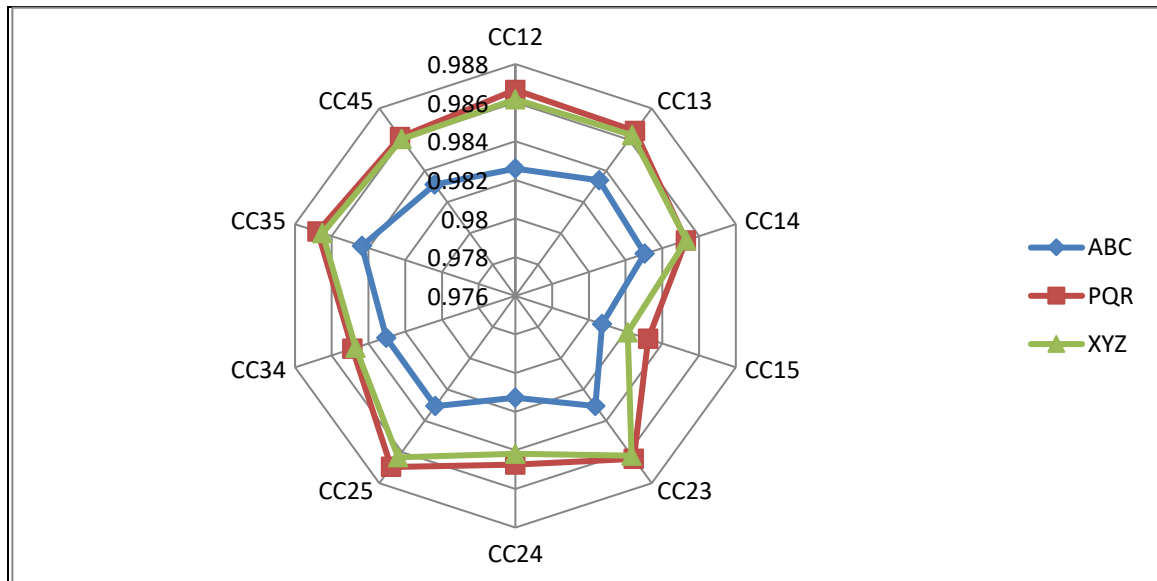


Figure 6.3 Radar Chart Representation of Sensitivity Analysis

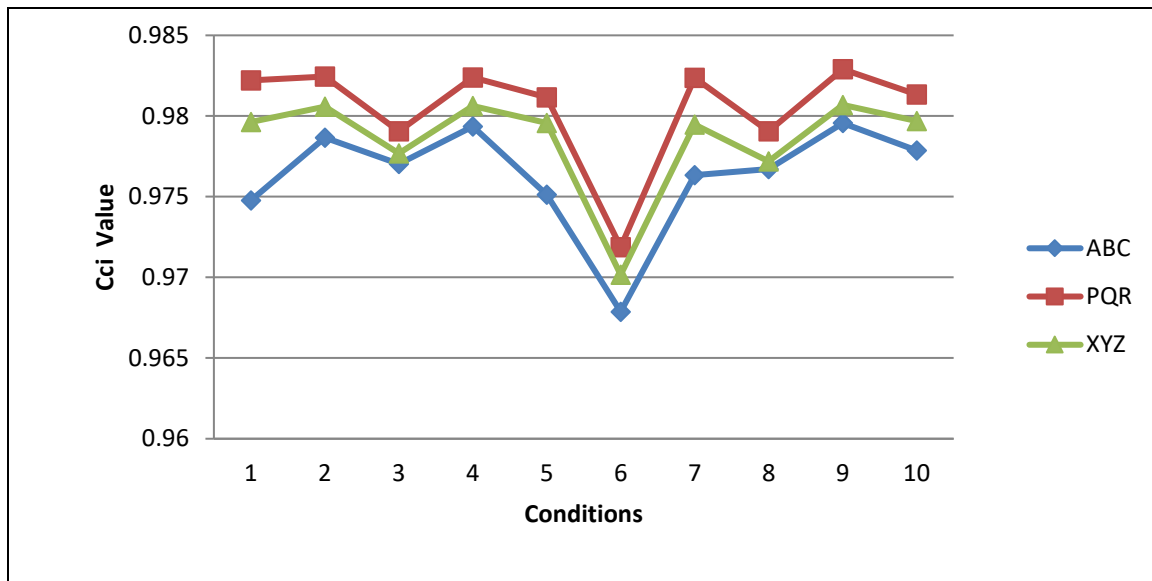


Figure 6.4: Line Chart for Ranking of Alternatives for Different Cases

6.8 Concluding Remarks

Outsourcing of logistic services has become strategic issue in today's globally competitive environment. Therefore, the selection of LSPs on the basis of service quality is very important to ensure efficient and cost effective supply chain. In this chapter, service quality dimensions for LSPs are identified from detailed literature review and a framework has been proposed to select LSPs based on service quality. Hybrid multi-criteria approach is used to evaluate and select the best logistics provider. Fuzzy AHP has been applied to locate the initial weights of selected factors criteria and then Fuzzy TOPSIS has been applied to find out the final rankings of all available alternatives of LSPs. The local and global weights are obtained for all clusters and sub criteria by using Fuzzy AHP.

It is observed that the main criteria for LSP selection are Competence (0.27), Communication (0.25), Commitment (0.20), Coordination & Collaboration (0.14) and Creativity & Customization (0.13). These findings imply that LSPs should try to improve their different competencies such as warehousing, timely delivery, flexibility, etc. on continuous manner. The findings also imply that LSPs also need to maintain strong communication in terms of

better information quality and quick response to queries. The LSPs commitment towards work is very important to maintain long term relationship with their supply chain members. They are required to emphasise more on quick responsiveness, assured delivery and flexible processes. After prioritizing the criteria for LSP selection, Fuzzy TOPSIS is applied to choose best LSP out of all the given alternatives in the study. Out of three case organizations, PQR Ltd. (0.9864) is found to be best LSP followed by XYZ Ltd. (0.9862) and ABC Ltd. (0.9833). Sensitivity Analysis has also applied to confirm the robustness of the model.

It can be concluded that the combination of fuzzy AHP and TOPSIS is useful technique when we have to deal with vagueness and imprecise nature of data. This chapter has contributed to understand the dynamics of selection and evaluation of LSPs based on their service quality but exploratory approach is followed to meet the first two objectives. In the next chapter, a logistics service quality framework has been developed after taking inputs from past studies and experts to achieve the third objective of the study.

Chapter 7

Development of Theoretical Logistics Service Quality (LSQ) Framework and Research Hypotheses

7.1 Introduction

After discussing first two research objectives in Chapter 4, 5 and 6, the third research objective has been discussed in detail in this chapter. This objective is to develop a theoretical framework for measuring logistics service quality based on inputs received from literature review and experts' opinion. The theoretical framework is further analyzed and validated through statistical analysis in Chapter 8. According to Weick (1995), the conceptual framework can be developed from the insights collected from literature in the form of theory building. Many researchers have proposed a conceptual model to bridge the gap between theory and reality and also validate the results by hypotheses testing and statistical analysis. According to Meredith (1993), theoretical framework building is the summarization of past studies, the addition of a few more relevant elements, deletion of undesired elements, and collection of common elements and analysis of different elements.

In chapter 6, for selecting the best logistics service provider, a 5C framework is proposed whereas for achieving objective 3, a different logistics service quality framework is proposed by keeping detailed empirical analysis in mind. There are three main reasons for not continuing with the same 5 C framework for objective 3. Firstly, the 5Cs framework is designed on the basis of inputs from industry experts and the terminology of all 5Cs along with their items is not well rooted from the literature. Secondly, the number of items considered under constructs in 5Cs framework is found to be comparatively less than the requirement for empirical analysis. There is need to develop a separate framework which is more close to the frameworks developed in past studies. Thirdly, the 5C framework has been

analyzed by using fuzzy AHP and Fuzzy TOPSIS. If large number of items is added in 5Cs framework then it would become difficult to develop pair wise comparisons for large number of items and calculations become very difficult. Interestingly, the first two objectives follows the exploratory research methodology and for objective 3, to develop a generic logistics service quality framework which will be applicable for larger masses, survey method and empirical analysis has been conducted.

7.2 Theoretical Framework

In this study, a theoretical framework has been developed for measuring customer satisfaction from logistics service quality in the Indian context. All the constructs and corresponding items of the logistics service quality framework have already discussed in Chapter 2. The constructs considered for the framework have been initially taken from literature review and then reviewed by industry experts from the viewpoint of its relevance in the Indian context. The theoretical model is further validated using statistical methods. The scale development for the theoretical framework is discussed in detail in this chapter.

From the literature review, seven constructs have been identified for the proposed framework. Therefore, all constructs along with their literature will be discussed in detail in this chapter. The **operational quality** is one of the constructs which defines the capability of LSPs to deliver promised services on time and makes considerable impact on customer satisfaction and customer loyalty. The second construct is **resources quality** which represents the availability of fleet and infrastructure with LSPs and directly influences customer satisfaction. **Information quality** is also an important construct which affects customer satisfaction and impacts customer loyalty. **Personnel contact quality** means the behavior of personnel contacted while dealing with LSPs. **Customization and innovation** in services also drive customer satisfaction and loyalty. **Customer satisfaction** from resources and services are measured through a theoretical framework by taking it as a construct. **Customer**

loyalty is also influenced by customer satisfaction as this relation is also highlighted by many researchers in literature. The theoretical framework has been developed with seven constructs and forty eight items as shown in Figure 7.1.

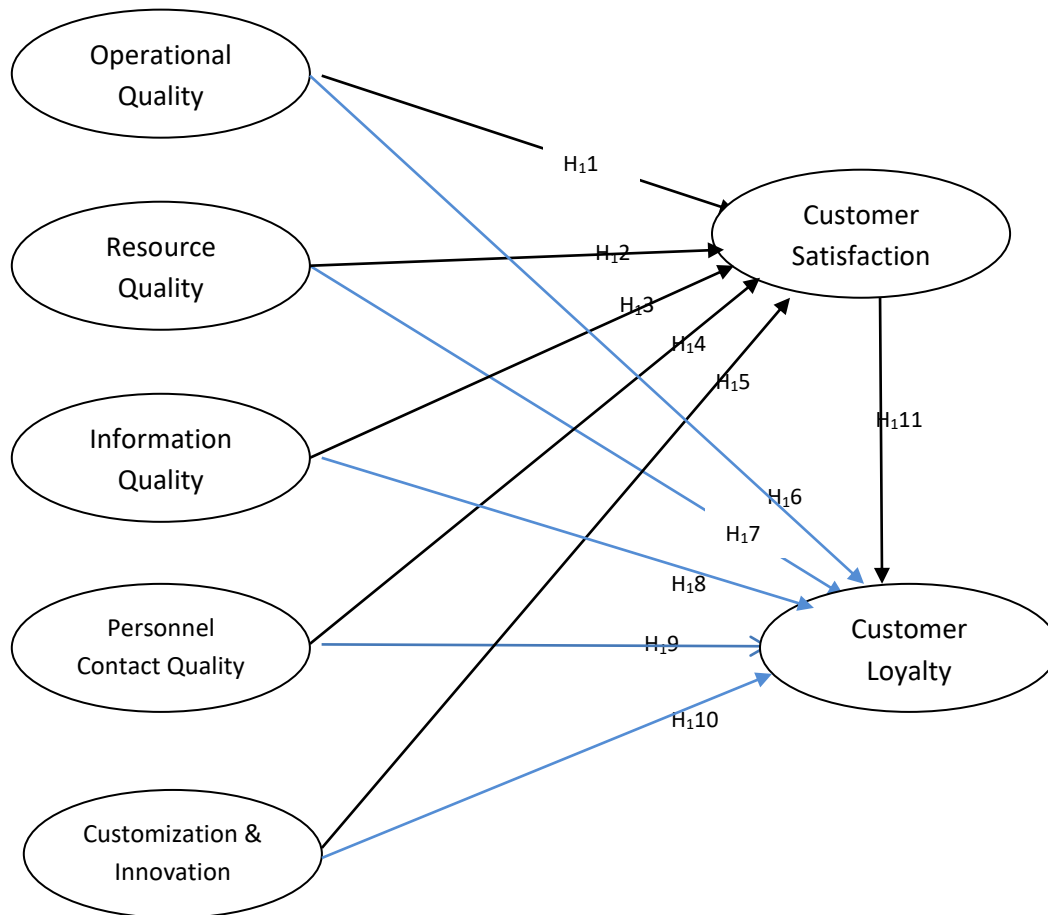


Figure 7.1 Theoretical Framework for Logistics Service Quality (LSQ)

The corresponding measurable items in each construct have been taken from the literature review and few items are added or deleted on the basis of inputs received from industry experts and discussed in next section.

7.2.1 Linkage between Operational quality, Customer Satisfaction, and Customer Loyalty

“Operational Quality” refers to the quality issues related to processes of LSP. In past studies, various researchers named this construct as “Operational service quality”, “Operational service” and “Operational logistics service quality”. Timely delivery, promised delivery

without failure, delivery without any loss, delivery of right product to the right place, and prompt delivery are used as items under this construct to measure logistics service quality (Davis, 2006; Juga et al., 2010; Bouzaabia et al., 2013; Juntunen et al, 2015). Additionally, handling of trade documents, having sufficient capacity and adequate control to inventory are also few items which are added to this construct with inputs of industry experts. This makes this construct deal with a total of 8 items. In literature, the linkage between operational quality and customer satisfaction has been explored by many researchers and subsequently, they have also suggested the relationship of operational quality with customer loyalty (Juga et al., 2010, Juntunen et al., 2010; Prakash, 2011; Izogo et al, 2015). The construct and its corresponding items along with detailed references are discussed in Table 7.1.

Table 7.1: “Operational Quality” with its Constituting Items

S.No	Construct	Items	Description	References from Literature	References from Literature
1.	Operational Quality	Right	Delivers the right product to the right place	Juga and Juntunen (2010) Operational service quality (Construct) Statements: 1. Ability to keep schedules 2. Ability to offer service promptly 3. Ability to provide sufficient capacity Shows relationship with customer satisfaction and loyalty. Davis (2006) Explored	Juntunen et al. (2010) Operational service (Construct) Statements: Recent experiences in logistics service related to keeping schedules Recent experiences in logistics service related to promptness of service Shows relationship with Customer satisfaction and commitment.
		Capacity	Having sufficient temporary or permanent storage capacity		
		Promised	Delivers the promised services without failure		
		Loss	Delivers goods without loss or damage		
		Doc	Handles trade documents effectively		

		Prompt	Gives prompt services	logistics service quality along with customer loyalty.	Bouzaabia et al. (2013) Named as Operational logistics service quality (LSQ) Statements: (in Retail LSQ) LSQ2. Purchased products work very well LSQ3. Delivery of products purchased is always correct LSQ4. Product received from the store is undamaged LSQ7. Correction of delivered quality discrepancies is satisfactory LSQ8. In the case of non-conforming product, there are no problems when returning products LSQ9. Deliveries arrive on the date promised Shows relationship with Customer satisfaction and loyalty Gronroos 1984 Functional quality
		Inventory	Gives adequate importance to your inventory controls	Named as operational logistics service quality Statements: Operational LSQ Special order lead time (special Orders are non-regular orders).	
		Time	Delivers goods on scheduled date/time	Order lead time variation (consistency of meeting promised delivery dates). Timeliness (product is delivered on or before the requested delivery date). Order release quantities (availability and ability to obtain order quantities desired). Order accuracy (how closely shipments match your orders upon arrival- right order, right number, no substitutions). Order discrepancy handling (how well Manufacturer X addresses any discrepancies in orders after the orders arrive). Shows relationship with Customer satisfaction and loyalty	
		Consistency	Shows consistency in services		

7.2.2 Linkage between Resources Quality, Customer Satisfaction, and Customer Loyalty

In proposed framework “Resources Quality” means the quality of available infrastructure, fleet, network, and skilled manpower. The items which are included under this construct based on literature review and experts’ opinion are adequate fleet, skilled workforce, wide network coverage, usage of modern fleet and facility which are proper functioning, strong IT infrastructure, financial stability, and managing reverse logistics. Many researchers in literature have considered almost the same measurable items under resources. In our framework, we have almost used the same scale as Thai (2008) and Yeo et al. (2015), except, shifted “shipment tracking” in “Information Quality” construct as per expert’s suggestion as shown in Table 7.2. Two more items, that is, “Adequate IT infrastructure” and “Manage reverse logistics” are also added under this construct after the guidance of industry experts and the inclination of a researcher looking at its importance in the current Indian market. Many researchers have shown the relationship between resources and customer satisfaction and loyalty (Prakash, 2011; Izogo and Ogba, 2015).

Table 7.2: "Resources Quality" with its Constituting Items

S.No	Construct	Items	Description	References from Literature	References from Literature
2.	Resources Quality	Fleet	Availability of fleet and physical facility	Thai (2008) Taken resources as dimension and defend by taking many author's works including tangibles and infrastructures under resources. Statements- 1. Equipment and facilities	Yeo et al. (2015) Taken resources as a construct Statements: Resource- related PSQ The port that we are using always has available equipment and facilities to meet our
		Workforce	Availability of adequate workforce		
		Financial	Financial stability		
		Network	Geographical reach and network		

			coverage	2. Equipment and facility condition 3. Financial stability 4. Shipment tracking capability 5. Physical infrastructures	requirements
		Modern	Fleet and physical facility are modern and always function properly		The equipment and facilities of the port that we are using are modern and always function properly
		Infra	Adequate, maintained and updated Information Technology (IT) infrastructure		The port that we are using has strong and stable financial stability The port that we are using has an excellent shipment track and trace capability
		Equipment	Availability of physical equipment like Pallets, trolleys, forklifts etc.		The port that we are using excellent physical infrastructure such as berths, yards, warehouses,
		Reverse	Manages reverse logistics		distribution centers, and hinterland connection networks Shows relationship with customer satisfaction

7.2.3 Linkage between Information Quality, Customer Satisfaction, and Customer Loyalty

In this framework, “Information Quality” implies the availability of maintained and updated IT resources which can provide accurate, timely and adequate information. Many researchers have been used "information quality" as a construct (Mentzer, 2001; Saura, 2008, Huang, 2009). The researcher also finds this construct relevant and important to measure logistics service quality and its impact on customer satisfaction. Mostly, the scale used to define information quality is same as mentioned in the past studies (Information is complete, timely, accurate, adequate, credible) except the addition of two items (“Tracking of shipments” and

“Applications of IT and EDI in customer service”) as shown in Table 7.3. The high dependency of today's customer on GPS technology has enhanced and motivated the addition of these two new additional items under information quality which affects the service quality of logistics service providers. Various researchers have established the relationship among information quality, customer satisfaction and customer loyalty (Bienstock et al., 2008; Chu and Wang, 2012).

Table 7.3: “Information Quality” with its Constituting Items

S.No	Construct	Items	Description	References from Literature	References from Literature
3.	Information Quality	Complete	Information communicated by logistics service provider is complete	Mentzer et al. (2001) Information quality Statements:	Saura et al. (2008) Information quality Statements:
		Timely	Information communicated by the logistics service provider is timely	Catalog information is available Catalog information is adequate	The information about the order is available and appropriate for its purpose Shows relationship with customer satisfaction
		Accurate	Information communicated by logistics service provider is accurate	Shows relationship with customer satisfaction	And customer loyalty
		Adequate	Information communicated by logistics service provider is adequate	Thai (2013) Information Quality Statements:	Rafiq and Jaafar (2007) - Revised Mentzer et al. (2001) Information quality
		Credible	Information communicated by logistics service provider is credible	Application of IT and EDI in customer service Introduction of IT innovation in customer service	Statements- The information communicated by the 3PL provider is timely.
		Tracking	Tracking and tracing of		The information communicated by the

			shipments	Availability of order information	3PL provider is accurate.
		Application	Application of IT and EDI in customer service	Shipment tracking capability Shows relationship with customer focus Huang et al. (2009) (Retail LSQ) Information Quality Statements: The RD provider timely information on retailing delivery The RD provider provides accurate information on retailing delivery	The information communicated by the 3PL provider is adequate. The information communicated by the 3PL provider is complete. The information communicated by the 3PL provider is credible.

7.2.4 Linkage between Personnel Contact Quality, Customer Satisfaction, and Customer Loyalty

“Personnel Contact Quality” refers to the behavior of personnel of LSPs while dealing with customers and it also makes a huge impact on the logistics service quality. Most of the items under this construct have been taken from literature (Mentzer et al., 2001, Rafiq and Jaafar, 2007, Saura et al., 2008). Few additions of items in scale have been done as required and suggested by industry experts. The items included under this construct are efforts made by personnel to understand the situation, courteous behavior of personnel, easy access, product knowledge and experience of personnel, positive attitude, building trust, maintains confidentiality and handling complaints by personnel as shown ini. Many authors have explored the impact of personnel contact quality on customer satisfaction and loyalty (Mentzer et al., 2001; Juga et al., 2010).

Table 7.4: “Personnel Contact Quality” with its Constituting Items

S.N o	Construct	Items	Description	References from Literature	References from Literature
4.	Personnel Contact Quality	Confidence	Maintains confidentiality in all operations	Mentzer et al. (2001) Personnel contact quality	Saura et al. (2008) Personnel contact quality Statements: QS1. The contact person appointed by the supplier makes an effort to understand my position QS2. The product knowledge/experience of the firm’s personnel is adequate shows a relationship with customer satisfaction and customer loyalty
		Effort	Makes an effort to understand my situation	Statements: The designated DLA contact person makes an effort to understand my situation	
		Courteous	Maintains courteous behavior while dealing	Problems are resolved by the designated DLA contact person	
		Access	Easily accessible when needed	The product knowledge/ experience of DLA personnel is adequate	
		Queries	Handles queries and complaints effectively	Shows relationship with customer satisfaction	
		Experience	Product knowledge and experience of the logistics service provider is adequate	Rafiq and Jaafar (2007) Personnel contact quality	
		Attitude	Shows a positive attitude while dealings	Statements: The designated DLA contact person makes an effort to understand my situation Problems are resolved by the designated DLA contact person The product knowledge/ experience of DLA personnel is adequate	

				Shows relationship with customer satisfaction	
		Mutual	Builds mutual relationship and trust		

7.2.5 Linkage between Customization and Innovation Quality, Customer Satisfaction and Customer Loyalty

“Customization and Innovation Quality” refers to the fulfillment of specific and changing needs of the individual customers and tries out some innovative ways to provide services. In literature, most of the researchers have taken customization and innovation as separate constructs (Flint, 2005; Coelho and Henseler, 2012) whereas Victorino (2005) had considered both customization and innovation as a combined construct. In our study, customization and innovation have been collectively considered as a construct. The scale developed for measuring this construct has been made from the integration of existing scales of customization and innovation, as discussed in Table 7.5. This construct includes creativity, adopting new ways to do things, doing things for the first time, serving specific and customized needs, trying new ideas and concern towards the environment. The relationship between customization, innovation, customer satisfaction, and customer loyalty has been explored by many authors in past studies (Victorino, 2005; Simon and Honore, 2012).

Table 7.5: “Customization and Innovation Quality” with its Constituting Items

S.No	Construct	Items	Description	References from Literature	References from Literature
5.	Customization	Creativity	Shows creativity in its methods of operations	Coelho and Henseler (2012) Customization	(Ostrom and Iacobucci (1995) Taken customization
		New ways	Seeks out new ways		

			to do things	Statements	as a construct
		First	My logistics service provider is often the first to initiate with new services	“My company” offers me products and services that satisfy my specific needs (totally disagree to totally agree)	Hu (2016) Shows the relationship between customer satisfaction level and customized logistics service (CLS) (Retail industry)
		Environment	Shows concern towards the environment	x12 “My company” offers products and services that I couldn’t find in another company (totally disagree to totally agree)	
		Specific	Offers me services that satisfy my specific needs	x13 If I changed between companies I wouldn't obtain products and services as customized as I have now (totally disagree to totally agree)	
		Changing	Accommodates my changing and urgent requirements	Shows relationship with customer satisfaction and loyalty	
		Ideas	Tries out new ideas frequently		
	Innovation			Bellingkrodt (2015) Statements: Innovativeness (Calantone et al., 2002) To which extent do you agree to the following statements? Inno 1 Our company	Flint (2005) Introduced, defined and developed a conceptual model for logistics innovation Simon and PetnjiYaya (2012) Shows the relationship of innovation with customer satisfaction

				frequently tries out new ideas Inno 2 Our company seeks out new ways to do things Inno 3 Our company is creative in its methods of operation Inno 4 Our company is often the first to market with new products and services Inno 5 Our new product introduction has increased over the last 5 years Inno 6 Innovation in our company is perceived as too risky and is resisted	Panayides (2005) Statements: 1. Our company frequently tries out new ideas (INN1) 2. Our company seeks out new ways to do things (INN2) 3. Our company is creative in its methods of operation (INN3) 4. Our company is often the first to market with new products and services (INN4) 5. Our new product/service introduction has increased over the last 5 years (INN5) Shows the relationship between innovation and supply chain effectiveness and supply chain performance
	Customization and Innovation			Victorino (2005) Taken customization and innovation together	

7.2.6 Customer Satisfaction along with its Constituting Items

In this framework, “Customer Satisfaction” is also taken as one of the constructs. It basically includes the satisfaction of customers from the fleet, infrastructure, manpower, management and overall service quality of logistics services. The idea of developing this framework is to study the impact of quality of logistics services on customer satisfaction and customer loyalty. Many past studies have also taken customer satisfaction as their construct in an almost similar type of studies. The scale adopted to define “customer satisfaction” construct is completely taken from literature (Stank et al., 2003; Yeo et al., 2015) as discussed in Table 7.6.

Table 7.6: “Customer Satisfaction” with its Constituting Items

S.No	Construct	Items	Description	References from Literature	References from Literature
6.	Customer Satisfaction	Satisoverall	We are satisfied with the overall service quality of the logistics service providers	Juga and Juntunen (2010) Customer satisfaction Statement: Satisfaction with the main service provider	Chu and Wang (2012) Shows the relationship of logistics performance with customer satisfaction In general, we are satisfied with the overall performance of our major 3Pl
		Satisprocess	We are satisfied with the processes or operations of the logistics service providers	Mentzer et al. (2001) Customer satisfaction Statements: What is your general impression of the service DLA provides?	We are satisfied with the price of the service we receive from our major 3Pl
		Satisfleet	We are satisfied with the fleet, facilities and physical infrastructure of the logistics service providers	Which word best describes your feelings toward DLA? How satisfied are you with DLA service?	We are satisfied with the quality of the service we receive from our major 3PL Overall, we are satisfied with the value of services provided

		Satismgmt	We are satisfied with the management and employees of the logistics service providers	Tian et al. (2008) Customer Satisfaction Statements Defined Likert scale from 1 to 5 for customer satisfaction measuring 1 to be strongly disagree and 5 to be strongly agree SA1. We had a pleasant and satisfying experience with the major 3PL firm. SA2. We enjoyed the valuable relationship with the major 3PL firm. *SA3. Our relationship with the major 3PL firm was an unhappy one (Dropped in the final scale) Yeo et al. (2015) Customer satisfaction Statements: Overall, we are satisfied with the facilities, equipment and other infrastructures of the port that we are using SATIS1 Overall, we are satisfied with the management and employees of the port that we are using	by our major 3PL Saura et al. (2008) Customer satisfaction Statements: SA1: We are delighted with the overall distribution service relationship with them SA2: We wish more of our suppliers were like this one Stank et al. (2003) Customer satisfaction Statements: CS1: I am delighted with my firm's overall relationship with this service provider. CS2 I wish more of my firm's service providers were like this one. CS3 There is always some problem or another with this service provider (reverse-scaled)
		Delight	We are delighted with our relationship with the logistics service provider		

				SATIS2 Overall, we are satisfied with the service quality of the port that we are using SATIS3 We will refer service of the port that we are using to our business partners SATIS4 We will continue using the services of the port we are using SATIS5	

7.2.7 Customer Loyalty along with its Constituting Items

“Customer Loyalty” is also considered as a construct in the proposed framework. The relationship among operational quality, resources quality, information quality, personnel contact quality, customization and innovation quality, and customer satisfaction is developed through this framework. The relationship with customer satisfaction and customer loyalty was also established by many authors in past studies (Juga et al., 2010; Rahman, 2011; Izogo and Ogba, 2015). The scale adopted for customer loyalty has the same scale which was adopted by Juga and Juntunen, (2010) as discussed in Table 7.7. One more item “Committed” is added to the scale developed after taking experts suggestion into consideration.

Table 7.7: "Customer Loyalty" with its Constituting Items

S.No	Construct	Items	Description	References from Literature	References from Literature
3.	Customer Loyalty	Committed	We are committed to the relationship with logistics service	Juga and Juntunen (2010) Customer Loyalty Statements:	Stank et al. (2003) Customer Loyalty Statements: CL1 The relationship that

			providers	With high probability, we will continue the relationship with our present logistics service providers as long as possible	my firm has with this service provider is something we are very committed to.
		Outsource	We will outsource more activities to our logistics service providers in the coming years	With high probability, we will outsource more activities to our main logistics service provider in the coming years	CL2 The relationship that my firm has with this service provider is something we intend to maintain definitely.
		Recommend	We are likely to recommend our logistics service providers to other organizations	We are likely to recommend our main logistics service provider to our business partners	CL3 Maintaining a long-term relationship with this service provider is very important to my firm.
		Continue	We will continue the relationship with our present logistics service providers as long as possible	Saura et al. (2008) Customer Loyalty Statements: L1. Consider this supplier your first choice to buy these services L2. If all the other attributes are similar (price, product, quality), we will buy always to this supplier by their logistics service	CL4 I would recommend that my successor continue using this service provider.
		Committed	We are committed to the relationship with logistics service providers		Tian et al. (2008) Customer Loyalty Statements: Measured loyalty behavior on Likert scale of 1 to 5 by taking 1 to be strongly disagree and 5 to be strongly agree LO1. The next time we have logistics outsourcing demand, we will use this major 3PL provider. LO2. Over the long-term (three to five years), we will use this major 3PL as our primary logistics provider. LO3. When non-competitors need logistics services and ask our reference, we will recommend our major 3PL.

To test the proposed LSQ framework, the following null hypotheses along with alternate hypotheses have been developed as follows:

H₀1: Operational quality does not have significant impact on customer satisfaction.

H₁1: Operational quality has significant impact on customer satisfaction.

H₀2: Resource quality does not have significant impact on customer satisfaction.

H₁2: Resource quality has significant impact on customer satisfaction.

H₀3: Information quality does not have significant impact on customer satisfaction.

H₁3: Information quality has significant impact on customer satisfaction.

H₀4: Personnel Contact quality does not have significant impact on customer satisfaction.

H₁4: Personnel Contact quality has significant impact on customer satisfaction.

H₀5: Customization and Innovation quality does not have significant impact on customer satisfaction.

H₁5: Customization and Innovation quality has significant impact on customer satisfaction.

H₀6: Operational quality does not have significant impact on customer loyalty.

H₁6: Operational quality has significant impact on customer loyalty.

H₀7: Resource quality does not have significant impact on customer loyalty.

H₁7: Resource quality has significant impact on customer loyalty.

H₀8: Information quality does not have significant impact on customer loyalty.

H₁8: Information quality has significant impact on customer loyalty.

H₀9: Personnel Contact quality does not have significant impact on customer loyalty.

H₁9: Personnel Contact quality has significant impact on customer loyalty.

H₀10: Customization and Innovation quality does not have significant impact on customer loyalty.

H₁10: Customization and Innovation quality have significant impact on customer loyalty.

H₀11: Customer satisfaction does not have significant impact on customer loyalty.

H₁11: Customer satisfaction has significant impact on customer loyalty.

7.3 Concluding Remarks

The theoretical LSQ framework is developed for measuring customer satisfaction from the service quality of Indian LSPs. In this chapter, scale has been developed for all constructs in order to develop proposed LSQ framework. To test and validate the proposed framework and corresponding hypotheses, data is collected from the customers who are taking services from logistics service providers through a structured questionnaire. The data is collected for all the constructs and items considered for the proposed framework. Then the data is analyzed by using statistical tools like Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA) and Structured Equation Modeling (SEM) by using SPSS and AMOS software. The step by step data analysis for the proposed framework is discussed in Chapter 8.

CHAPTER 8

Data Analysis and Hypothesis Testing

8.1 Introduction

One of the main objectives of the research work is to develop and validate the service quality framework for Indian logistics service providers. In this study, a Logistics Service Quality framework (LSQ framework) is developed in the Indian context to understand all important service quality dimensions that impact customer satisfaction and customer loyalty as discussed in Chapter 7.

In this chapter, the compilation and examination of quantitative data which is collected through survey method by a structured questionnaire is analyzed and the results related to the validity of the proposed model are interpreted and discussed. The findings will provide the overall representation of dimensions of service quality responsible for providing customer satisfaction and loyalty. The focus of research work is to find out the logistics service quality issues of LSPs in various Indian organizations surveyed, as most of the literature supporting studies of other countries.

8.2 Data Analysis

The entire process of development of the survey and validation of the model has broken down into five steps (Hinkin, 1998). Item generation is the foremost step followed by survey administration. Exploratory Factor Analysis (EFA) for initial item reduction is the third step, Confirmatory Factor Analysis (CFA) for confirming the factor structure is the fourth step and then assessing the convergent and discriminant validity of the factors is the last step of the process.

Construct validity is established through CFA. The next step is to test and validate the structural relationships of the service quality attributes with latent variables by using Structural Equation Modeling. Further, the correlations among service quality attributes, customer satisfaction, and customer loyalty would be assessed.

8.2.1 Step 1: Item Generation

The survey items are generated on the basis of past studies on LSPs and various service quality models and thus combined into the LSQ model as service quality dimensions, as discussed in Chapter 7 of this thesis. It becomes essential to rationalize and test the recognized dimensions (items). Each item is analyzed thoroughly in order to avoid any problems like unclear questions, unconstructive questions, vague or ambiguous questions, restricted language, and miss-placed modifiers, etc. (Page & Meyer, 1999; Groves et al., 2011; Whitley et al., 2013). At the preliminary stage, some of the questions are modified and reworded as per industry expert's suggestions to make them more relevant in the Indian context. One question on Customer loyalty was "Over long period of time we will prefer to use this 3PL as our primary logistics provider" which was rephrased as "We will continue the relationship with our present logistics service providers as long as possible". One more question on customization "If I changed between companies I wouldn't obtain products and services as now" is rephrased as "Offers me services that satisfy my specific needs". Similarly, few more questions are revised in the questionnaire to make it more respondent-friendly and to make it relevant according to Indian culture.

8.2.2 Pilot Testing

The pilot test is administered to 100 employees working in operations or supply chain department of various Indian organizations. The respondents are the employees who are taking services from logistics service providers and can give their feedback on the quality of

the services received from them. Pilot testing is done to ensure that the survey items were relevant and of interest and easily understandable by the intended population (Page & Meyer, 1999; Whitley et al., 2013). The survey is arbitrary and respondents are employees working at different levels of management in operations or supply chain field. An attempt has been made to record data from various industry verticals in order to generalize this study.

Initially, the questionnaire had 52 questions and the industry experts from well known Indian organizations had examined the preliminary questionnaire for relevance and content validity. They have suggested a few additions and deletions in the initial questionnaire to make it more relevant in the Indian context. Then the revisions had been made and the final questionnaire has 58 questions. The final questionnaire is distributed to the employees of the Operations department of various organizations. The respondents are requested to give their comments regarding conciseness, duplication, accuracy, and relevance of the questions. 100 responses are considered for pilot testing which exceeds the minimum threshold of 12 respondents for a pilot test (Page & Meyer, 1999).

All the questions are checked for supposed results. It has been observed by the researcher that each question is fine-tuned and fulfilling the purpose of the survey. Out of 100 questionnaire responses, five responses are discarded due to incomplete filling of the questionnaire.

Tabachnick and Fidell (2001) advocated for at least 300 sample size to conduct factor analysis or reliability check whereas some type of initial clarity of responses is important to move further. Similarly, Pallant (2005) proposed at-least 150 samples are required to make statistical interpretations. Therefore at this stage of pilot testing, only internal reliability test like “Cronbach's alpha” is calculated to check the internal consistency among items as shown in Table 8.1. In this case, Cronbach's alpha value is 0.948 that shows a good degree of reliability (Cronbach, 1951).

Table 8.1 Reliability Statistics-Cronbach's Alpha Value

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	Number of Items
.948	.948	48

8.2.3 Step 2: Questionnaire Administration

The important part of the study is to administer the questionnaire carefully and to check the responses received from respondents are in expected mode. In the questionnaire, most of the questions are designed and measured on the Likert scale. Likert scale is found to be the most appropriate way of designing theoretical constructs (Hinkin, 1985; Whitley et al., 2013). Due to exploratory nature of research work, the researcher has intended to develop a factor structure using EFA. Therefore, the five-point Likert scale is found to be the most suitable for this study. In the present study, a five-point Likert scale has been utilized which is ranging from Extremely Dissatisfied (1) to Extremely Satisfied (5).

Lissitz and Green (1975) also reported the stable value of Cronbach alpha reliability at five-point Likert scale or above whereas it shows improvement when we move from two points to a five-point scale. Seven point scale provides more variability in responses which may give better results but increases the survey filling time of respondents and can lead to survey exhaustion among respondents (Devellis, 2003). Five Likert scales is basically an odd-numbered instrument which assists respondents to choose for the middle option like neutral when they are not very clear with the final response to be made.

The Survey is conducted both offline and online. For offline, the hard copies of questionnaires are distributed to the known and concerned people and requested them to fill it carefully. For online filling of questionnaires, an online form of the questionnaire is created and the corresponding link has been sent through Google Drive (Dillman and Bowker, 2001; Groves et al., 2011). Whitley et al. (2013) highlighted the importance of online questionnaire

to save the time of the researcher and also increases the convenience of respondents. The questionnaires are distributed to the respondents in both offline and online mode.

8.3 Analysis of Survey Results

After collecting the data, the first step is to verify for any errors in the data set and formatting of the data in the desired format for analysis. Then, data inconsistency is checked for all the data points. During data screening, the researcher has checked for missing values and unengaged responses in the complete data set. Out of the 294 survey responses collected, there are 24 incomplete and unengaged responses. 5 out of 24 respondents hardly answer 10% of the questions and 19 respondents are given the same response to almost all the questions of the questionnaire. Therefore, 24 responses are eliminated from the entire data set and finally, 270 responses are left for further analysis.

The next step is to check for variable inconsistencies. Variable missing data and assessment of normality by “Skewness and Kurtosis” have been done to check the variable discrepancies. The frequency for complete data set is calculated to check the missing values of variables. No missing values are found in this study. Further, the data set is checked for normality. According to Gaskin and Happell (2014), any value of Skewness and Kurtosis which is beyond ± 2 shows non-normality. The non-normality in data indicates an improper distribution of data across the data set. In our case, all the Skewness and Kurtosis values lie within the range of ± 2 ; this indicates normality of data set as shown in Table 8.2.

Table 8.2 Skewness and Kurtosis Statistics

	Valid	Mis sing	Mean	Stand ard Devia tion	Skewne ss	Standard Error of Skewnes s	Kurto sis	Standard Error of Kurtosis	Mini mum	Maxim um
CL	270	0	3.83	0.93	-0.083	0.148	-0.108	0.295	1	7
CS	270	0	3.63	0.93	-0.707	0.148	0.722	0.295	1	7
OQ	270	0	3.75	0.99	-0.769	0.148	0.933	0.295	1	7
IQ	270	0	3.81	0.92	-0.685	0.148	0.378	0.295	1	7

PC Q	270	0	3.53	1.10	-0.466	0.148	-0.809	0.295	1	7
CI Q	270	0	3.50	1.19	-0.868	0.148	0.469	0.295	1	7
RQ	270	0	3.46	1.16	-1.358	0.148	1.603	0.295	1	7

8.3.1 Sample Composition

In this study, the questionnaire has ten demographic questions like name, designation, organization, overall experience, annual turnover of the organization, number of employees in the organization, industry sector to which respondent's organization belongs, services taking from LSPs, and current LSPs, etc. The demographic questions are added deliberately so that the respondents don't feel exhausted while filling the questionnaire. Few of the demographic questions are analyzed to understand the sample composition of the target population.

Out of 270 total relevant responses, the respondents with overall experience of 0-2 years are 11 per cent, 2-5 years are 31 per cent, 5-10 years were 25 per cent and More than 10 years was 33 per cent. The sample composition of annual turnover of respondent's organization is 26 respondents belong to organizations with turnover less than 5 Crores (9.6 per cent), 37 belongs to 5-50 Crores (13.7 per cent), 63 belongs to 51-100 Crores (23.3 per cent) and 144 respondents belong to more than 100 Crores category (53.3 per cent). 50 respondents work in organizations with employee strength of 1-100(19 per cent), 31 respondents work in organizations with 101-500 employees (11 per cent), 55 work in organizations with number of employees lies between 501-1000 (20 per cent) and 134 respondents work for large companies where more than 1000 employees work (50 per cent). The major chunk of samples which represents the target population are experienced people with more than 10 years' experience, more than 50 per cent of the respondents belong to organizations having annual turnover of more than 100 Crores and more than 1000 employees.

In the questionnaire, the different logistics services taken by respondents are asked like transportation, warehousing, documentation, value-added services, and all integrated logistics solutions. The most of the respondents preferred to take all integrated logistics solutions (159 out of 270, that is, 59 per cent), 69 respondents choose for transportation only (26 per cent), 15 respondents choose for warehousing only (5 per cent) and 27 respondents choose for transportation and warehousing both (10 per cent). Most of the organizations are preferred to outsource for all integrated logistics solutions in which LSPs take care of their transportation, warehousing, documentation, and value-added services simultaneously. The respondents belong to various industry verticals and taking services from LSPs. Even though snowball sampling is used but still, in order to generalize results, there is an attempt to collect data from different industries. The various industry sectors from which respondents belong are auto-components (22 per cent), automobile (8 per cent), electronics (9 per cent), FMCG (8 per cent), Consumer durables (7 per cent), Pharmaceuticals (7 per cent), Retail (6 per cent) and telecom (4 per cent). The rest of the respondents (29 per cent) belong to other industry verticals like textiles, publishing, cement, paints, and chemicals etc. The number of respondents corresponds to these sectors are few, so all these sectors are clubbed into others category as shown in Table 8.3 and Figure 8.1.

Table 8.3 Sample Composition

Row Labels	All of the above	Transportation	Transportation, Warehousing	Warehousing	Grand Total
Others	31	28	4	15	78
Less than 5 Crores		5		4	9
5 - 50 Crores	6	8	1	3	18
51-100 Crores	6	5		2	13
More than 100 Crores	19	10	3	6	38
Auto-Components	51	2	6		59
Less than 5 Crores		1			1
5 - 50 Crores		1	1		2
51-100 Crores	36				36
More than 100	15		5		20

Crores					
Automobile	16	4	1		21
Less than 5 Crores	1	1			2
5 - 50 Crores	1	2	1		4
51-100 Crores	1				1
More than 100 Crores	13	1			14
Consumer Durables	12	6	2		20
Less than 5 Crores		2			2
5 - 50 Crores	1				1
51-100 Crores	1				1
More than 100 Crores	10	4	2		16
Electronics	18	3	3	1	25
5 - 50 Crores	3				3
51-100 Crores	6				6
More than 100 Crores	9	3	3	1	16
FMCG	13	7	2		22
Less than 5 Crores	2	2			4
5- 50 Crores	1	3			4
More than 100 Crores	10	2	2		14
Pharmaceuticals	1	13	2	2	18
Less than 5 Crores		1			1
5 - 50 Crores		3	1	1	5
51-100 Crores	1	3			4
More than 100 Crores		6	1	1	8
Retail	8	4	1	2	15
Less than 5 Crores	2	3		1	6
51-100 Crores	1	1			2
More than 100 Crores	5		1	1	7
Telecommunication	9	2	1		12
Less than 5 Crores			1		1
5 - 50 Crores	1				1
More than 100 Crores	8	2			10
Grand Total	159	69	22	20	270

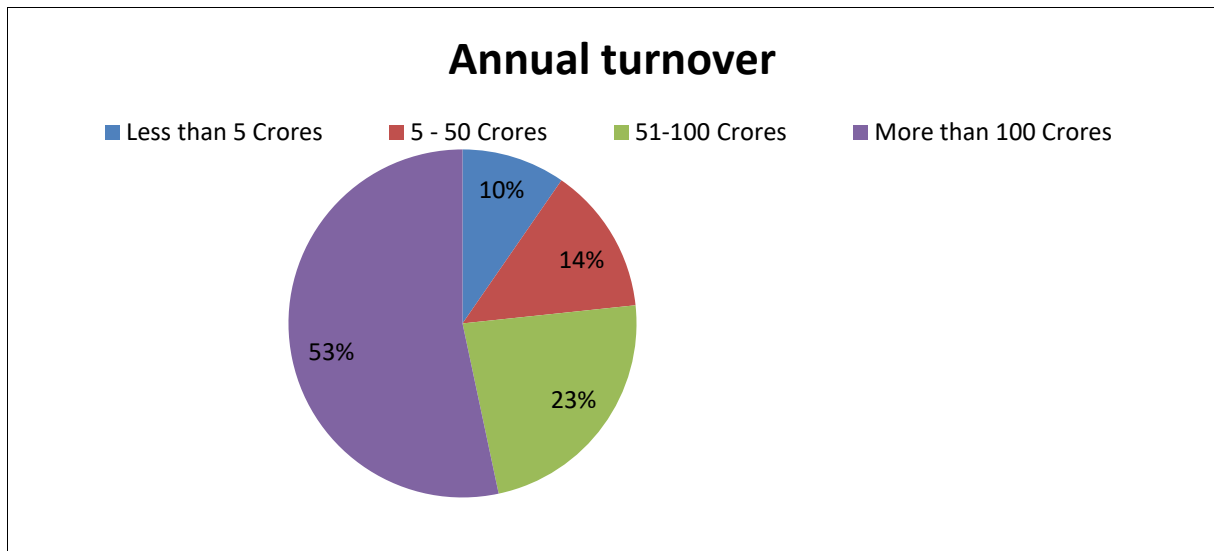


Figure 8.1(a) Graphical Representations of Annual Turnover

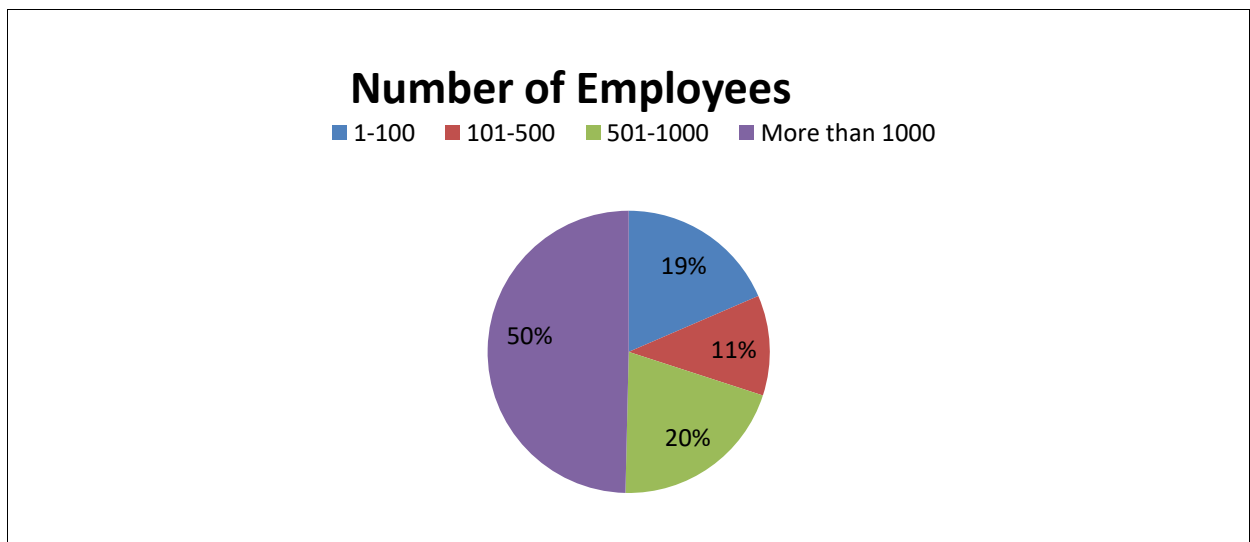


Figure 8.1(b) Graphical Representations of Number of Employees

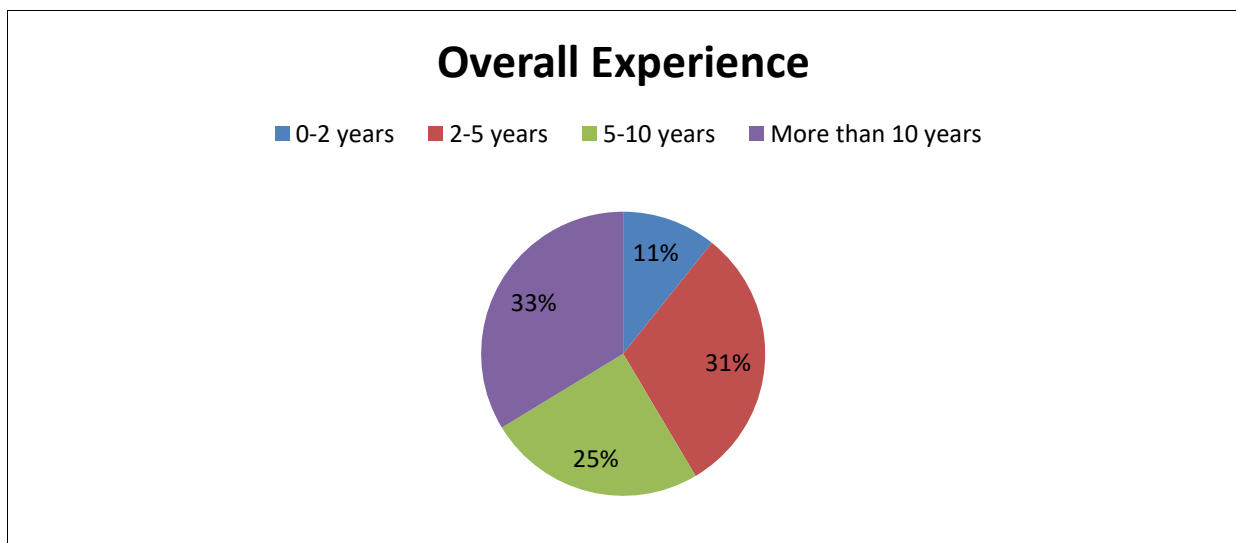


Figure 8.1(c) Graphical Representations of Overall Experience

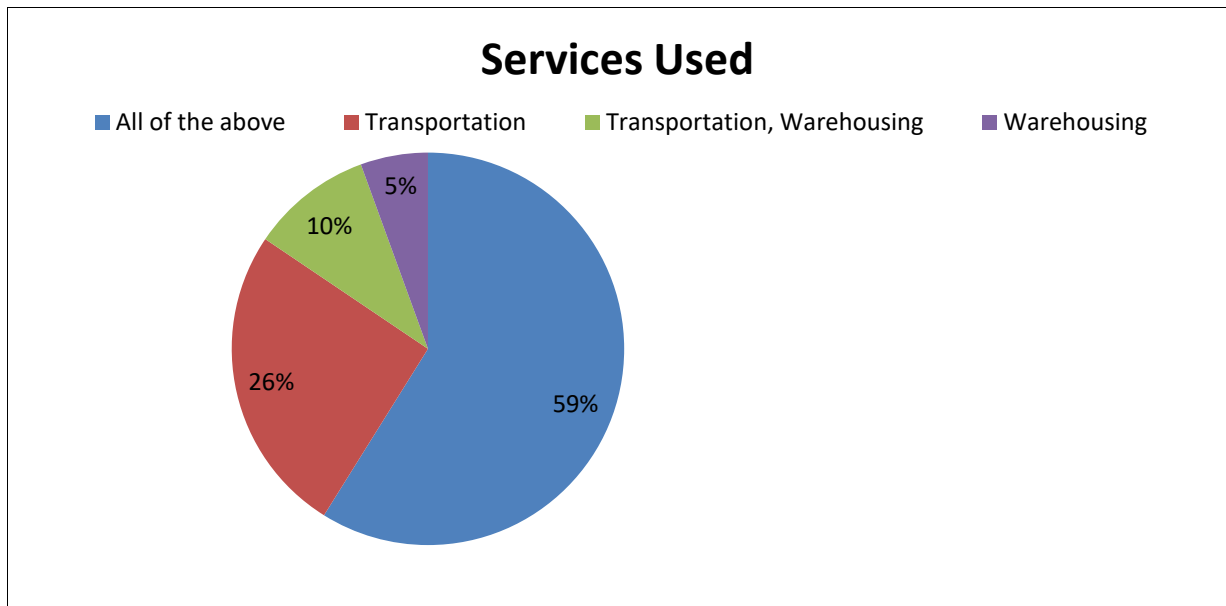


Figure 8.1(d) Graphical Representations of Services Used

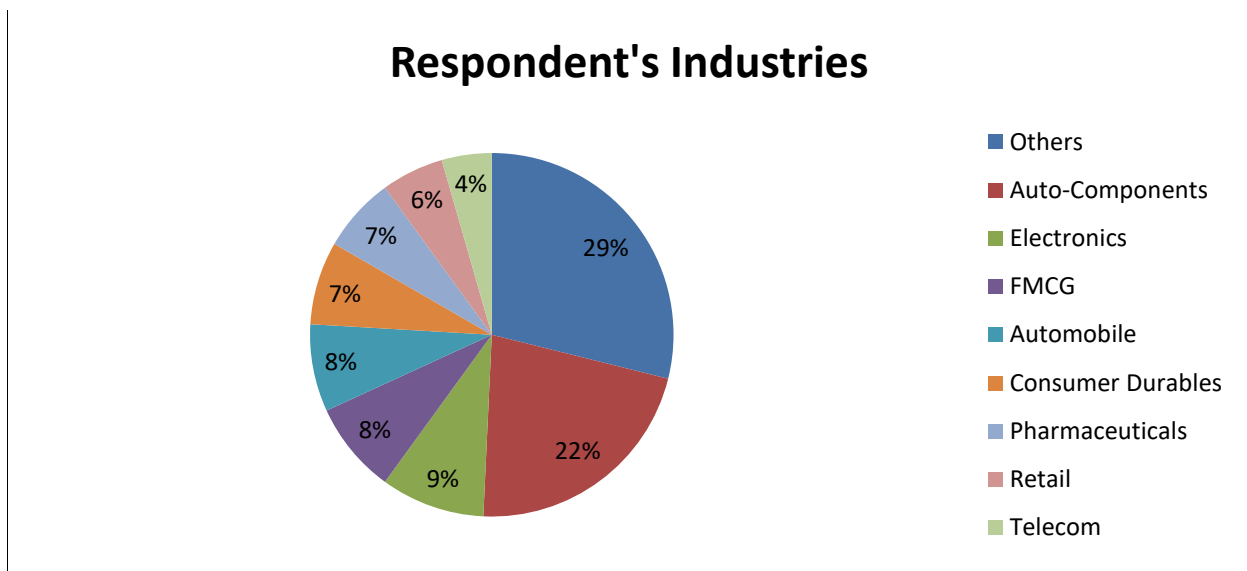


Figure 8.1(e) Graphical Representations of Respondent's Industries

Figure 8.1 Graphical Representations of Demographics Data

8.4 Step 3: Exploratory Factor Analysis-Initial Item Reduction

Exploratory Factor Analysis (EFA) is to be done next to justify the study composition, to eliminate the unnecessary variables and to recognize the principal logistics service quality dimensions (Pallant, 2005). In the present research work, EFA is utilized to develop a scale for service quality of LSPs, to reduce the number of items and to have a better understanding

of the variables. Various authors have a different school of thoughts and commented on the appropriateness of the sample size has to be taken for carrying out EFA. As a thumb rule, Tabachnick and Fidell (2007) suggested to do factor analysis with at least 300 sample responses whereas Hair et al. (1995) have emphasized on sample size should be larger than 100. In contradiction, MacCallum et al. (1999) have envisaged on the communalities values, which should be higher than 0.6, irrespective of the sample size.

The main objective of factor analysis is to extract the independent factors which have less correlation among them. Before extracting factors, prior tests had been conducted to check the suitability of the respondent data for EFA. Kaiser – Meyer – Olkin (KMO) test and Bartlett’s test of Sphericity are the tests which are used to examine the correlation among all items (Bartlett, 1954; Kaiser et al., 1974). KMO test is used to check the sufficiency of a number of observations in the data set. Field (2009) has categorized that KMO value will be considered low if lies between 0.5 to 0.7 and excellent if it is more than 0.90. In this study, KMO value comes to be 0.930 which is more than the suggested value of 0.7. The Bartlett’s test of Sphericity tests the significant correlation among the items. The value of Bartlett’s test of Sphericity is also significant ($p=.000$) for factor analysis as the desired value should be $p<0.05$ as shown in Table 8.4.

Table 8.4: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.930
Bartlett's Test of Sphericity	Approx. Chi-Square	16247.547
	Df	1128
	Sig.	.000

Df means the Degree of freedom

The other important calculation while conducting EFA is to determine factor loadings. The factor loadings are the values which represent the correlation among the items. The items which have high correlation are grouped under one factor. The independent factors have a

different set of items loaded in their respective factors. The researcher can interpret the correlations among items within the factor, only on the basis of factor loadings. Some items have loadings or correlations with more than one factor also.

Factor rotation is the technique used for simplifying the results of factor analysis (Zikmund et al., 2010). Principal Component Analysis (PCA) and Varimax rotation are the widely used methods for factor analysis. PCA is most appropriate method when researcher wanted to make independent factors which are not correlated with other factors whereas Principal Axis Factoring (PAF) is more useful when researcher wanted to understand and identify the common factors among all the factors (Zikmund et al., 2010). Therefore, in our case, PCA is more appropriate method to be used as our interest is to develop independent factors for measuring service quality of LSPs. The researcher employed PCA and Varimax rotation for data analysis and reduction.

8.4.1 Reliability and Validity Test

The reliability and validity test is important to understand the consistency of results.

Reliability Test

Reliability can be defined as “the degree to which a multi-item scale provides error-free and consistent results on repetitive trials”. It basically measures the consistency of the data collected. To have consistency in data, all multi items in the questionnaire defined to measure some predefined construct should have a similar type of responses. Internal consistent reliability can be measured with the help of Cronbach coefficient alpha. Sekaran (2003) suggested that if Cronbach's alpha value lies between 0.6 -0.7 then it will be considered as an acceptable degree of reliability and if its value is greater than 0.7 then it will be considered as a good degree of reliability. In this study, the Cronbach's alpha value is 0.946 for the entire data set, which is greater than 0.7 for a reliable multi-item scale.

Validity Test

According to Saunders (2011), validity can be defined as “the degree to which the data collection method measures accurately what it is intended to measure”. Validity ensures the quality of measurement using a designated scale and assists in achieving the purpose. Different types of validity can be checked to ensure the results obtained from the designated test. Content Validity of a construct helps to select the right items to cover all the aspects of the measurement of a construct. The content validity of the instrument has been ensured by identifying all the service quality dimensions from the literature review. The questionnaire is thoroughly reviewed by industry professionals. An attempt has also been made to collect data from reliable sources to ensure the validity of the study. Construct validity can be explained as “the degree of accuracy by which the construct is correctly measured by its variables” (Chauhan, 2016). To measure construct validity, convergent and discriminant validity has to be empirically calculated, which will be discussed later in this chapter.

The factor analysis of all 48 items is used to develop a logistics service quality framework. The researcher employed the Principal Component Axis and Varimax rotation to determine the correlations among all the items and possible factors (Fabrigar et al., 1999). In an initial rotation, the first table to be assessed is the Communality table. The Communality explains the common variance which is shared by factors with given items. The higher value of communality indicates a higher amount of variance is extracted in the items to give a factor solution. The cut off value of communality is 0.5 for each item as suggested (Hair et al., 2010). In this study, 6 out of 48 items having communality value of less than 0.5 and shown in Table 8.5. As a remedy, Hair et al. (2010) suggested to ignore those problematic items when data reduction is the ultimate purpose or such items can be deleted if they are of less importance to the study.

Table 8.5 Communalities of 48 items

	Initial	Extraction
Shows Consistency in Services	1.000	.417
Availability of Physical Equipment Like Pallets, Trolleys, Forklifts Etc.	1.000	.436
Shows a Positive Attitude While Dealings	1.000	.454
Builds Mutual Relationship and Trust	1.000	.454
Tries out New Ideas Frequently	1.000	.492
We will Continue The Relationship with Our Present Logistics Service Providers as Long as Possible	1.000	.847
We will Outsource More Activities to Our Logistics Service Providers in the Coming Years	1.000	.860
We are Likely to Recommend Our Logistics Service Providers to Other Organizations	1.000	.855
We are Committed to the Relationship with Logistics Service Providers	1.000	.894
We are Satisfied with the Fleet, Facilities and Physical Infrastructure of the Logistics Service Providers	1.000	.880
We are Satisfied with the Management And Employees of the Logistics Service Providers	1.000	.885
We Aae Satisfied with the Processes or Operations of the Logistics Service Providers	1.000	.874
We are Satisfied with the Overall Service Quality of the Logistics Service Providers	1.000	.881
We are Delighted with Our Relationship with the Logistics Service Provider	1.000	.822
Delivers the Promised Services without Failure	1.000	.849
Gives Prompt Services	1.000	.842
Delivers the Right Product to the Right Place	1.000	.882
Delivers Goods without Loss or Damage	1.000	.832
Delivers Goods on Scheduled Date/Time	1.000	.826
Handles Trade Documents Effectively	1.000	.835
Having Sufficient Temporary or Permanent Storage Capacity	1.000	.816
Gives Adequate Importance to Your Inventory Controls	1.000	.804
Information Communicated by the Logistics Service Provider is Adequate	1.000	.747
Information Communicated by the Logistics Service Provider is Accurate	1.000	.808

Information Communicated by the Logistics Service Provider is Timely	1.000	.773
Information Communicated by the Logistics Service Provider is Complete	1.000	.831
Information Communicated by The Logistics Service Provider is Credible	1.000	.792
Application of IT And EDI in Customer Service	1.000	.647
Tracking and Tracing of Shipments	1.000	.616
Makes an Effort to Understand my Situation	1.000	.893
Easily Accessible When Needed	1.000	.880
Maintains Courteous Behavior While Dealing	1.000	.889
Maintains Confidentiality in All Operations	1.000	.498
Handles Queries and Complaints Effectively	1.000	.868
Product Knowledge and Experience of the Logistics Service Provider is Adequate	1.000	.847
Offers Me Services That Satisfy my Specific Needs	1.000	.840
Accommodates My Changing and Urgent Requirements	1.000	.815
Shows Concern Towards the Environment	1.000	.846
Shows Creativity in its Methods of Operations	1.000	.910
Seeks out New Ways to Do Things	1.000	.912
My Logistics Service Provider is Often The First to Initiate with New Services	1.000	.873
Availability of Fleet and Physical Facility	1.000	.923
Fleet and Physical Facility are Modern and Always Function Properly	1.000	.893
Availability of Adequate Workforce	1.000	.916
Geographical Reach and Network Coverage	1.000	.871
Financial Stability	1.000	.908
Adequate, Maintained and Updated Information Technology (IT) Infrastructure	1.000	.863
Manages Reverse Logistics	1.000	.832

Extraction Method: Principal Component Analysis.

After communality, the next process is to understand the rotation component matrix. The researcher has a pre-defined proposed framework as LSQ based on vast literature review as a strong conceptual and theoretical background. As discussed earlier, EFA has been done to test and validate the proposed framework. Many subjective judgments have been made to decide the factors to be extracted from EFA and to decide on the appropriate names of the factors. The factors with Eigen values more than 1.0 are extracted and as a result, 7 factors

are extracted for the proposed framework. As a final process, the factor loadings for each item are received and determine the contribution of each item in establishing the factors.

The factor loadings represent “the correlation among item and the factor” whereas squared loadings indicate “the amount of the item’s total variance accounted”. The factor loadings more than ± 0.6 are considered to be practically significant and depict the strong correlation among item and the corresponding factor. In our case, the factor structure is established but some factor loadings are less than 0.6 as shown in Table 8.5. Those items are the candidate for deletion to make the factor structure more robust.

The cross-loadings of all the items are also checked to test the uni-dimensionality of the factors. The best possible factor structure is developed when a single factor consists of all the items with high factor loadings (Hair et al., 2010). If cross-loadings exist for an item on multiple factors then that item has to be deleted. The difference between two cross-loadings of the same item should be greater than 0.2. In the present study, there is no significant case of cross-loadings in the rotated component matrix.

Once a satisfactory factor structure is established, the labeling of factors is carried out. Labeling means “assigning an appropriate name to the factors on the basis of items included in it”. After examining carefully, the labeling of factors has been done by monitoring the actual items of the factor. In our case, labeling is quite effortless as the items loaded on a particular factor are very close to the originally constructed factors. The seven constructs which are initially taken in study from literature review are “Operational Quality”, “Resources Quality”, “Information Quality”, “Personnel Contact Quality”, “Customization and Innovation Quality”, “Customer Satisfaction”, and “Customer Loyalty”, will remain almost same as the results of EFA are very close to the proposed framework as discussed in Table 8.6 (a) to Table 8.6 (g). The underlying factor structure is discussed below.

Table 8.6(a) Operational Quality

S.No.	Items	Description	Factor Loadings
1	Right	Delivers the right product to the right place	0.903
2	Capacity	Having sufficient temporary or permanent storage capacity	0.871
3	Promised	Delivers the promised services without failure	.868
4	Loss	Delivers goods without loss or damage	.867
5	Doc	Handles trade documents effectively	.864
6	Prompt	Gives prompt services	.855
7	Inventory	Gives adequate importance to your inventory controls	.852
8	Time	Delivers goods on scheduled date/time	.832

Table 8.6(b) Resources Quality

S.No.	Items	Description	Factor Loadings
1	Fleet	Availability of fleet and physical facility	.919
2	Workforce	Availability of adequate workforce	.908
3	Financial	Financial stability	.900
4	Network	Geographical reach and network coverage	.900
5	Modern	Fleet and physical facility are modern and always function properly	.896
6	ITinfra	Adequate, maintained and updated Information Technology (IT) infrastructure	.866
7	Reverse	Manages reverse logistics	.851

Table 8.6(c) Information Quality

S.No.	Items	Description	Factor Loadings
1	Complete	Information communicated by the logistics service provider is complete	.840
2	Timely	Information communicated by the logistics service provider is timely	.814
3	Accurate	Information communicated by the logistics service provider is accurate	.801
4	Adequate	Information communicated by the logistics service provider is adequate	.799
5	Credible	Information communicated by the logistics service provider is credible	.795
6	Tracking	Tracking and tracing of shipments	.767
7	Application	Application of IT and EDI in customer service	.749
8	Equipment	Availability of physical equipment like Pallets, trolleys, forklifts etc.	.548
9	Mutual	Builds mutual relationship and trust	.533

10	Consistency	Shows consistency in services	.522
11	Attitude	Shows a positive attitude while dealings	.509
12	Ideas	Tries out new ideas frequently	.467

Table 8.6(d) Personnel Contact Quality

S.No.	Items	Description	Factor Loadings
1	Confidence	Maintains confidentiality in all operations	.503
2	Effort	Makes an effort to understand my situation	.923
3	Courteous	Maintains courteous behavior while dealing	.923
4	Access	Easily accessible when needed	.918
5	Queries	Handles queries and complaints effectively	.899
6	Experience	Product knowledge and experience of the logistics service provider is adequate	.891

Table 8.6(e) Customization and Innovation Quality

S.No.	Items	Description	Factor Loadings
1	Creativity	Shows creativity in its methods of operations	.936
2	Newways	Seeks out new ways to do things	.933
3	First	My logistics service provider is often the first to initiate with new services	.915
4	environment	Shows concern towards the environment	.901
5	Specific	Offers me services that satisfy my specific needs	.885
6	Changing	Accommodates my changing and urgent requirements	.881

Table 8.6 (f) Customer Satisfaction

S.No.	Items	Description	Factor Loadings
1	Satisoverall	We are satisfied with the overall service quality of the logistics service providers	.774
2	Satisprocess	We are satisfied with the processes or operations of the logistics service providers	.760
3	Satisfleet	We are satisfied with the fleet, facilities and physical infrastructure of the logistics service providers	.758
4	Satismgmt	We are satisfied with the management and employees of the logistics service providers	.754
5	Delight	We are delighted with our relationship with the logistics service provider	.743

Table 8.6 (g) Customer Loyalty

S.No.		Items	Factor Loadings
1	Committed	We are committed to the relationship with	.873

		logistics service providers	
2	Outsource	We will outsource more activities to our logistics service providers in the coming years	.854
3	Recommend	We are likely to recommend our logistics service providers to other organizations	.823
4	Continue	We will continue the relationship with our present logistics service providers as long as possible	.807

In Table 8.6 (c), the construct “Information Quality” consists of 12 items in which 5 items have factor loadings less than 0.6 and the construct “Personnel Contact Quality” consists of 6 items out of which one item “Maintains confidentiality in all operations” has a factor loading less than 0.6. The communality value of the same 6 items is also less than the expected cut-off of 0.5 as shown in Table 8.5. To make the framework more robust, these six items are deleted from the data on the basis of observations made using EFA. The item “Availability of physical equipment like Pallets, trolleys, forklifts etc.” is deleted due to less factor loading and communality value but it also has less importance to the study. In the Indian context, respondents felt that the availability of physical equipment is pre-requisite service quality requirement from LSPs that must be in place if we are taking services from that LSP. The other item "Builds mutual relationship and trust" has a factor loading 0.533 which is less than 0.6, is also deleted. This may be due to the same obvious reason that the customers will develop a relationship with only those LSPs whom they feel trustworthy. “Shows consistency in services” and “Shows positive attitude while dealings” have been also eliminated from the final factor structure and may be of lower importance from respondent’s perspective. The item “Tries out new ideas frequently” and “Maintains confidentiality in all operations” have fewer factor loadings than the desired cutoff which result in the deletion of these items from the proposed framework. Then, further, the revised data is used for CFA to establish the scale validity.

8.4.2 Reliability of the Constructs of the Proposed LSQ Framework

The internal consistency of each item is already analyzed using Cronbach's alpha. According to Whitley (2002), the co-variance among items is found to be strong when Cronbach alpha value is more than 0.70. The constructs whose Cronbach alpha value is less than 0.70 are the candidates for elimination. In our study, all the constructs have Cronbach alpha value which is greater than 0.9 as shown in Table 8.7. Therefore, the researcher will retain all the constructs in the study.

Table 8.7 Cronbach's Alpha Value of Constructs

Constructs	Number of items	Cronbach Alpha
Operational Quality (OQ)	8	0.971
Resources Quality (RQ)	7	0.978
Information Quality (IQ)	7	0.944
Personnel Contact Quality (PCQ)	5	0.972
Customization and Innovation Quality (CIQ)	6	0.970
Customer Satisfaction (CS)	5	0.966
Customer Loyalty (CL)	4	0.952

8.5 Step 4: Confirmatory Factor Analysis

After employing EFA, the next step is to cross-validate the factor structure by using Confirmatory Factor Analysis (CFA) (Byrne et al., 1989; Joreskog and Sorbom, 1989; Pedhazur and Schmelkin, 1991). There is need to check whether the factor structure meeting the desired criteria of reliability and validity before developing and testing a structural model for significant interrelationships (Fornell and Larcker, 1981; Ifinedo, 2006). CFA is a statistical technique which assesses how well the measured items represent the pre-specified construct. CFA is applied after EFA in order to ensure the theoretical pattern of factor loadings of items on the pre-defined constructs are represented in the same manner. The quality of the factor structure is tested by using CFA coupled with construct validity. This technique helps to finalize or reject the prior results obtained from EFA. Hair et al. (2010) have given six step procedures for conducting CFA and SEM analysis.

The initial step is to identify and define the constructs for the measurement model. In our research, all the constructs are already defined and specified after EFA. In the second stage, all the latent constructs must have atleast three measurable items in order to develop the overall measurement model. It is now an established theory that if the construct has less than 3 measurable items then that construct may be not properly defined in the model (Hair et al., 2010). Kline (2004) also suggested that CFA results will be more significant when a number of items per factor are more than 3. In our study, in our measurement model, all seven constructs are having more than three items. In this study, the measurement model has 7 constructs in which 5 constructs are exogenous variables (independent variables) whereas 2 constructs are endogenous variables (dependent variables). The exogenous variables are Operations Quality, Resources Quality, Information Quality, Personnel Contact Quality, and Customization and Innovation Quality, whereas, endogenous variables are Customer Satisfaction and Customer Loyalty. The measurement model made from CFA is shown in Figure 8.2.

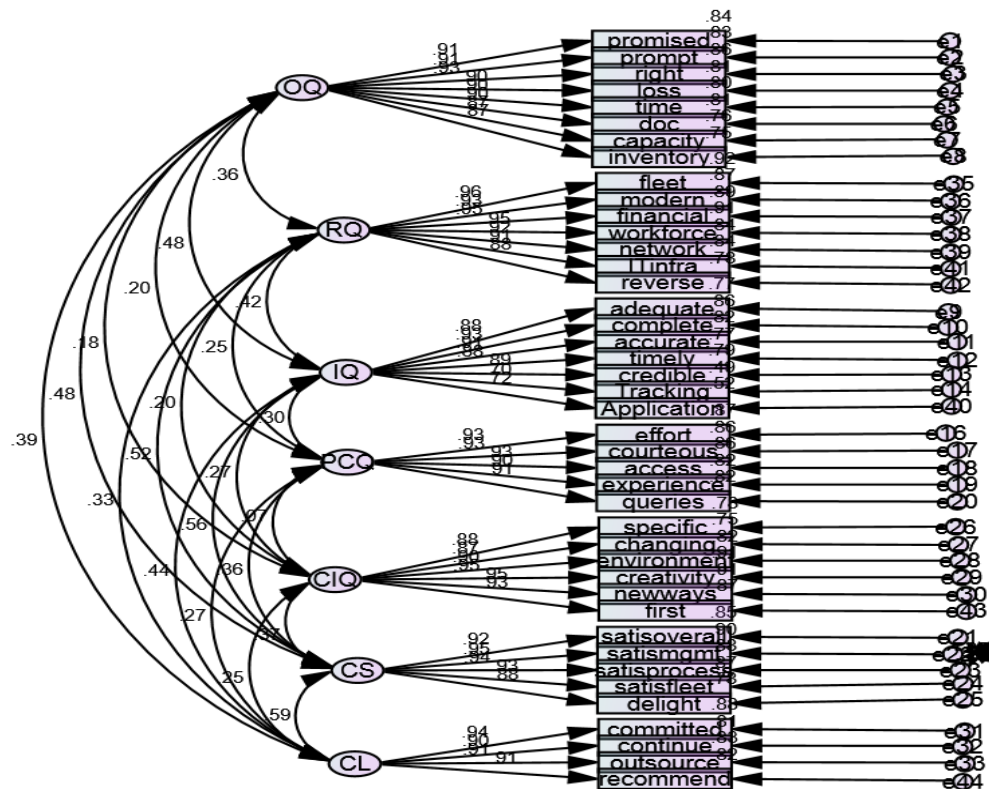


Figure 8.2: Confirmatory Factor Analysis (CFA) of LSQ Framework

OQ-Operational Quality, RQ-Resource Quality, IQ-Information Quality, PCQ-Personnel Contact Quality, CIQ-Customization, and Innovation Quality, CS-Customer Satisfaction, CL-Customer Loyalty

The third stage is to produce and interpret results from the measurement model using CFA. There are standard procedures and rules which has to be applied to any measurement model to get valid results (Hair et al., 2003). In CFA, the convergence of items into a pre-specified construct is checked and the correlations among all the constructs of the measurement model are determined.

The validity of the measurement model is determined at fourth step of the process. The researcher checks for the model fit indices, path estimates, convergent, and discriminant validity. In the present study, all the constructs are identified and subsequent analysis would certify the significance of path analysis.

To establish an item performance, the significant loadings should be greater than 0.5. Therefore, the researcher analyzed the loadings for all the items directly or can check for the significance level of $p < 0.01$. Once the researcher established the final measurement model after deletion of items if required then the next step is to assess construct validity.

The three common conditions to check for construct validity are:

1. **Composite Reliability (CR)** measures “the reliability of the constructs in the measurement model”. Hair et al. (2010) advocated CR estimates the construct consistency which includes the strength and similarity of the construct. The value of CR should be exceeding 0.70 to show good scale of reliability (Fornell and Larcker, 1981; Nunnally and Bernstein, 1994). Table 8.8 represents the CR values of all constructs like CR value of Operational Quality is 0.971, Resource Quality is 0.978, Information Quality is 0.946, Personnel Contact Quality is 0.965, Customization and Innovation Quality is 0.969, Customer satisfaction is 0.967 and customer Loyalty is 0.941. Therefore, in this research, all the CR values are greater than 0.70 and hence we can conclude that all the constructs have good reliability in the measurement model.
2. **Convergent Validity** defines “the degree to which all the items converge to a specific construct or have common variance” (Hair et al., 2010). The standardized factor loadings (regression weights) estimate that all the items are important and representative of their latent construct. The factor loadings of the observed variables must be higher than 0.5. The factor loadings of items are ranging from 0.70 to 0.95.

All the significant factor loadings are more than 0.50. It can be observed that all the items are sufficient and converging to their corresponding constructs. The two more conditions that are $AVE > 0.50$ and $CR > AVE$ also need to satisfy in order to have convergent validity (Xu et al., 2013; Liébana-Cabanillas et al., 2014). Average Variances Extracted (AVE) is calculated for all constructs as a summary indicator of convergence. AVE is calculated as “the total of all squared multiple correlations divided by the number of items”. AVE should be higher than 0.5 to suggest adequate model validity. These values are meeting the criteria and shown in Table 8.8. Therefore, convergent validity of the construct is confirmed for this study.

3. **Discriminant Validity** shows “the extent to which inter-correlation among constructs should be low or in other words, a construct should be truly different from other constructs” (Garg, 2015). Hair et al. (2010) suggested two methods for measuring discriminant validity. First, the correlation among theoretically defined constructs should be low. The different items combined together to make a construct which further meets the common objective of establishing the measurement model (Trochim, 2006). Second, AVE should be higher than the Maximum Shared Variance (MSV) and Average Shared Variance (ASV) to have discriminant validity. MSV is “the square of the maximum correlations within the constructs”. ASV is “the square of the average of correlation coefficients between constructs” in Table 8.8. All the CR, AVE, MSV and ASV values are meeting the desired criteria. Therefore, there is no issue of validity in CFA. The results of discriminant validity are also shown in Table 8.9.

Table 8.8 Reliability and Item Loadings of Measurement Model

S. No.	Construct	Composite Reliability (CR)	Average Variance Extracted (AVE)	Maximum Shared Variance (MSV)	Average Shared Variance (ASV)
1	Operational Quality	0.971	0.807	0.233	0.120
2	Resources Quality	0.978	0.865	0.270	0.119
3	Information Quality	0.946	0.717	0.309	0.169
4	Personnel Contact Quality	0.965	0.847	0.132	0.058
5	Customization and Innovation Quality	0.969	0.840	0.138	0.050
6	Customer Satisfaction	0.967	0.854	0.335	0.228
7	Customer Loyalty	0.941	0.841	0.335	0.140

Table 8.9 Results of Discriminant Validity Test (Fornell-Larcker Criterion)

Constructs	CL	OQ	IQ	PCQ	CS	CI	RS
CL	0.917						
OQ	0.379	0.899					
IQ	0.441	0.483	0.847				
PCQ	0.269	0.196	0.297	0.920			
CS	0.579	0.477	0.556	0.364	0.924		
CI	0.247	0.183	0.270	0.075	0.372	0.916	
RQ	0.329	0.363	0.416	0.246	0.520	0.200	0.930

8.6 Model Fit Summary

The model fit is assessed by many indices to judge the goodness and badness fit of the model. The indices used to measure the goodness of fit are “Comparative Fit Index (CFI)”, “Tucker Lewis Index (TLI)” and “Normed Fit Index (NFI)” etc. whereas badness of fit is usually measured by “Root Mean Square of Error Approximation (RMSEA)” (Hair et al., 2010). In this study, the overall model chi-square is 1674.914 with 796 df (Degree of Freedom). The p-value is also found to be significant for the model fit. The values of χ^2/df (chi-square divided by DF) should not exceed 3 for accepting the model (Hooper et al., 2008). In our case, χ^2/df is 2.104, which satisfies the criteria. Further, as a thumb rule, Hair et al. (2010) suggested that in the study, at least one goodness of fit index must be considered along with chi-square

results to ensure the appropriate model fit. The goodness of fit index is preferred if its value is greater than 0.90 and one badness of fit, RMSEA, is accepted if its value lie in the range of 0 to 0.1.

In Table 8.10, the results of the goodness of fit of the measurement model are discussed. The values of CFI, TLI, and NFI for the measurement model are 0.941, 0.936 and 0.894 respectively. The value of NFI (0.894) is little lower than the threshold limit of 0.90 and almost close to the acceptable limit. The value of RMSEA for the badness of fit is .064. All the values of goodness and badness of model fit lie in the desired range as shown in Table 8.10. Therefore, the measurement model represents an acceptable model fit.

Table 8.10 Model Fit Summary

Model fit Index	χ^2/df	CFI	TLI	NFI	RMSEA
Model	2.104	0.941	0.936	0.894	.064

8.7 Structural Equation Modeling (SEM)

SEM method is found to be most appropriate when both the measurement and structural model tested altogether. Hair et al. (2010) also suggested that analyzing data initially with CFA and establishing the measurement model and then moving for the structural model as per their predefined framework. Theoretically, measurement model act as a base for testing the structural model validity (Anderson and Gerbing, 1992). Basically, the measurement model assesses the correlations among all constructs whereas the structural model is more emphasizing on the relationships as dependent and independent constructs.

Now next will be the fifth step where the structural model is specified. In this case, the measurement model will be accepted without any modification to the items incorporated in the respective constructs. Before establishing a structural model, the specifications as the

endogenous (dependent) or exogenous (independent) constructs have to be done. There is a need to define endogenous and exogenous variables clearly in order to develop a structural model. Endogenous constructs are dependent variables in which one or more arrows are pointing towards them which indicate structural relationships in the path estimation analysis. On the contrary, exogenous variables are independent variables in which all the arrows go out of them and never come towards them. Moreover, for each endogenous variable, an error term is added to quantify the structure that they are not fully explained. In the present research, the first order constructs are assessed in the measurement model by CFA. The reliability and validity conditions of the construct are already met. Each construct has at least 3 items to keep away from recognition issues of constructs (Bollen and Lennox, 1991). In this study, all the 7 constructs are satisfying reliability and validity threshold limits and also each construct has at least 3 items. Out of seven constructs, five exogenous constructs are Operational Quality, Resource Quality, Information Quality, Personnel Contact Quality, and Customization and Innovation Quality whereas two are endogenous constructs are Customer Satisfaction and Customer Loyalty. The relationship has been established to test the proposed model and the impact of exogenous variables on endogenous variables has been assessed with the help of structural model using SEM. The structural model representing the relationship between exogenous and endogenous variables by single-sided arrows is shown in Figure 8.3.

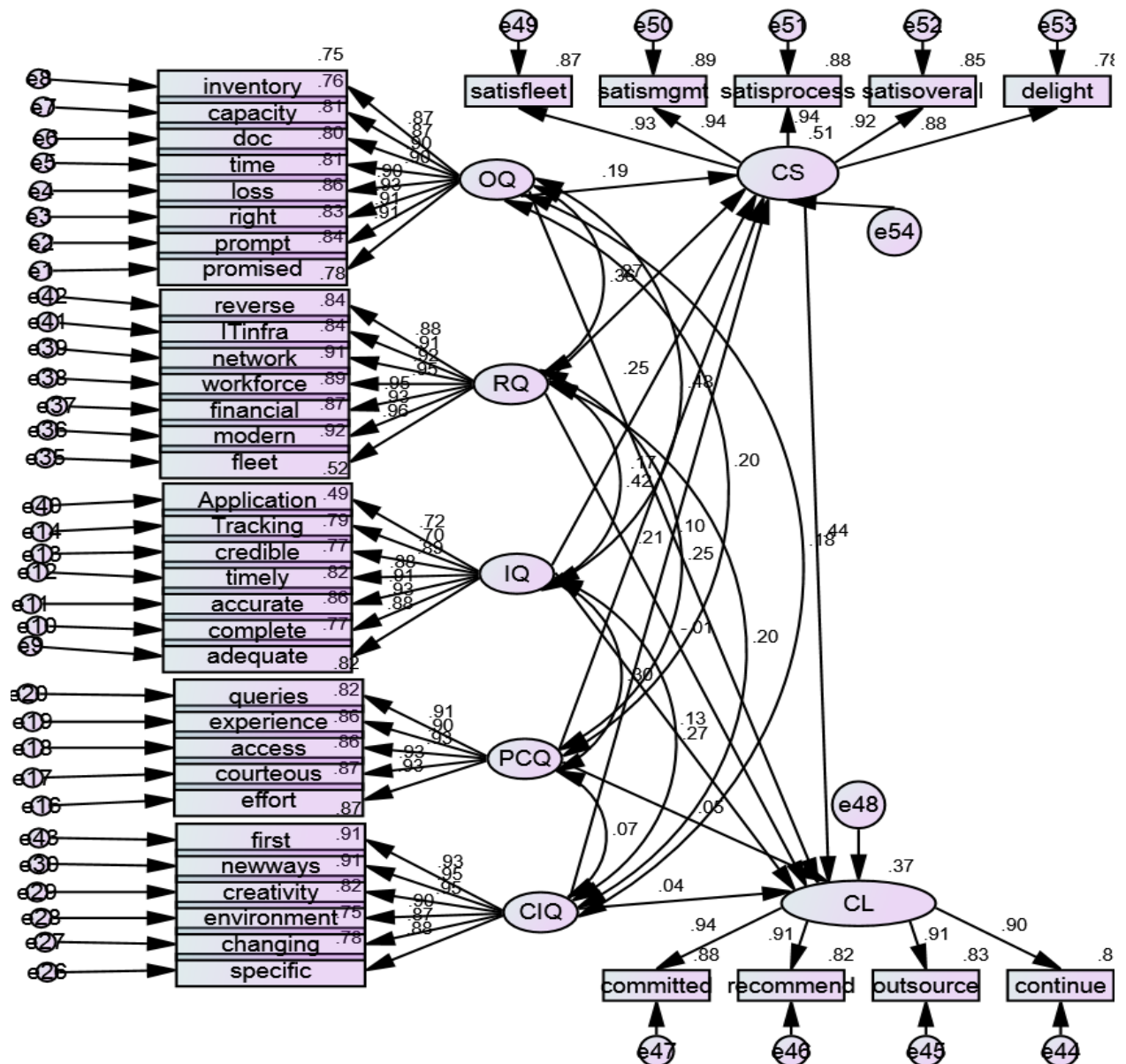


Figure 8.3 Structural Model of LSQ Framework

8.7.1 Specifying the Structural Model

In the structural model (Figure 8.3), the relationship between endogenous and exogenous variables has been established. The impact of five independent variables that are Operational Quality, Resources Quality, Information Quality, Personnel Contact Quality, and Customization and Innovation Quality on Customer Satisfaction has been studied. Then,

further, the impact of all five same constructs along with customer satisfaction has been studied on customer loyalty. In this present study, a framework for logistics service quality is proposed and tested through EFA and CFA and now, the researcher established the structural model for the same. The theoretical concept of this framework is to understand all factors which affect service quality of logistics service providers and impact customer satisfaction and subsequently customer loyalty. As to understand the structural model more clearly, the operational quality of logistics service provider directly makes an impact on the level of customers satisfaction achieved. Along with operations and processes, the resources of the logistics service providers also play a vital role in providing satisfactory services to customers. In the era of digitalization, every customer wants to be updated and informed with the latest information to avoid obstacles in the smooth running of their businesses.

The quality of information provided to the customer from time to time is also very crucial in order to satisfy the customer on this parameter. The behavior, experience, and attitude of the personnel who is dealing with customers are also added value in satisfying customers from overall logistics services. Therefore, personnel contact quality is one of the exogenous variables which make an impact on customer satisfaction, LSPs also provide customized and innovative services to serve the customers with tailor-made logistics solutions. Customization and Innovation Quality is also an imperative factor on which customer satisfaction depends. All these relationships among exogenous and endogenous variables have been established through the structural model.

Further, the vast literature supports the relationship among customer satisfaction and customer loyalty (Stank et al., 2003;Juga et al., 2010). Generally, if a customer is satisfied with the services provided by the service provider then the probability of customer loyalty to the same service provider also increases (Izogo et al., 2015). The relationship between customer satisfaction and customer loyalty will also be checked when customer satisfaction

will behave as an exogenous variable and customer loyalty will behave as an endogenous variable. In this study, in a structural model, the researcher will also test for the impact of all five endogenous variables on customer loyalty directly or indirectly through customer satisfaction. If an indirect relationship between all exogenous variables and customer loyalty exist and there will be a direct relationship among customer satisfaction and customer loyalty then, this will implies that the customer satisfaction is acting as mediating variable. The researcher will come to the conclusion only after establishing and testing these relationships in structural model and followed by hypotheses testing. The structural relationships are identified and analyzed in terms of assessment of hypotheses.

H₀1: Operational quality does not have significant impact on customer satisfaction.

H₁1: Operational quality has significant impact on customer satisfaction.

H₀2: Resource quality does not have significant impact on customer satisfaction.

H₁2: Resource quality has significant impact on customer satisfaction.

H₀3: Information quality does not have significant impact on customer satisfaction.

H₁3: Information quality has significant impact on customer satisfaction.

H₀4: Personnel Contact quality does not have significant impact on customer satisfaction.

H₁4: Personnel Contact quality has significant impact on customer satisfaction.

H₀5: Customization and Innovation quality does not have significant impact on customer satisfaction.

H₁5: Customization and Innovation quality has significant impact on customer satisfaction.

H₀6: Operational quality does not have significant impact on customer loyalty.

H₁6: Operational quality has significant impact on customer loyalty.

H₀7: Resource quality does not have significant impact on customer loyalty.

H₁7: Resource quality has significant impact on customer loyalty.

H₀8: Information quality does not have significant impact on customer loyalty.

H₁8: Information quality has significant impact on customer loyalty.

H₀9: Personnel Contact quality does not have significant impact on customer loyalty.

H₁9: Personnel Contact quality has significant impact on customer loyalty.

H₀10: Customization and Innovation quality does not have significant impact on customer loyalty.

H₁10: Customization and Innovation quality have significant impact on customer loyalty.

H₀11: Customer satisfaction does not have significant impact on customer loyalty.

H₁11: Customer satisfaction has significant impact on customer loyalty.

The structural model will assist in analyzing and testing the proposed hypotheses in the proposed framework. The results of the structural model show that six out of eleven hypotheses i.e. H₁1, H₁2, H₁3, H₁4, H₁5, H₁11 are supported at p<0.05 significance level. Five out of eleven hypotheses are not supported at p-value exceeds 0.05. Table 8.11 represents the p-values for all the constructs and corresponding hypotheses.

Table 8.11 Structural Results

Hypotheses	Estimates (β)	Unstandardized Regression Weights	S.E	CR	p-value	Remarks
H ₁ 1: CS←OQ	.190	.189	.053	3.542	***	Supported
H ₁ 2: CS←RQ	.265	.205	.040	5.101	***	Supported
H ₁ 3: CS←IQ	.248	.269	.063	4.276	***	Supported
H ₁ 4: CS←PCQ	.171	.143	.040	3.533	***	Supported
H ₁ 5: CS←CIQ	.205	.168	.039	4.279	***	Supported
H ₁ 6: CL←OQ	.102	.098	.060	1.639	.101	Not Supported
H ₁ 7: CL←RQ	-.013	-.010	.046	-.213	.831	Not

						Supported
H ₁₈ : CL ← IQ	.127	.135	.072	1.885	.059	Not Supported
H ₁₉ : CL ← PCQ	.053	.043	.046	.944	.345	Not Supported
H ₁₁₀ : CL ← CIQ	.035	.028	.044	.638	.524	Not Supported
H ₁₁₁ : CL ← CS	.443	.432	.074	5.832	***	Supported

Note: ***Significant at $p < 0.005$ and S.E. – Standard Error; C.R. – Estimate/S.E.

The structural relationships among constructs as endogenous and exogenous variables are represented in Figure 8.3. The standard path coefficients (β), unstandardized regression weights, standard error and hypotheses results are discussed in Table 8.11. The relationship established among different constructs in the structural model is tested using hypotheses and discussed in detail below.

8.7.2 Addressing the hypothesis

H₁₁: Operational Quality has Significant Impact on Customer Satisfaction.

The “Operational Quality” construct in the study is defined by delivering the promised services without failure, delivers the right product to the right place, delivers goods without damage, delivers goods on scheduled date and time, gives prompt services, having sufficient capacity and having adequate control on inventory. As in the proposed framework, the theoretical idea is that the operational quality of services provided by LSPs plays a major role in providing satisfactory services to the customer. Operational quality is the unsaid expectation of any customer when they are outsourcing their business to LSP. Empirically, this proposed hypothesis is also tested by using the structural model ($\beta = .190$) and p-value for H₁ is significant as discussed in Table 8.11. This implies that H₁₁ is accepted, which implies operational quality has a significant impact on customer satisfaction. Prakash (2011) have shown a high correlation among responsiveness and assurance with service quality. In the past studies, the results obtained are on the similar lines (Juga et al., 2010; Izogo et al., 2015). On a contrary, the results given by Yeo et al. (2015) are not consistent with our result. But in

the Indian context, the customers give the highest priority to the operational level of services provided by LSPs as they consider this criteria for choosing the best LSP out of the available alternatives.

H₁₂: Resource Quality has Significant Impact on Customer Satisfaction.

The “Resource Quality” construct is defined by the availability of fleet and physical facility, adequate workforce, financial stability, geographical reach, adequate and maintained IT infrastructure, use of modern fleet, and also manages reverse logistics. Resources are basically assets of LSPs which assist them to serve time and assured services to end customers. Adequate and maintained resource quality of LSPs is required to fulfill all expectations of customers and ultimately satisfy them. In the Indian context, due to the high fragmentation of the logistics sector, there is huge variation among small and big logistics providers. The availability and quality of resources of LSPs often use as a line of difference among them. Therefore, the researcher proposed this hypothesis after understanding the importance of resource quality in satisfying customer from logistics services. H₁₂ is accepted as shown in Table 8.11 with $\beta=.265$ and significant p-value. This shows that resource quality has a significant impact on customer satisfaction. The results are also consistent with a few past studies (Prakash, 2011; Izogo and Ogba, 2015).

H₁₃: Information Quality has Significant Impact on Customer Satisfaction.

The “Information Quality” construct is defined by the information communicated by LSP is complete, timely, accurate, adequate and credible. The use of application of IT and EDI and tracking and tracing of shipments are also followed by LSPs in order to provide updated information to the end customers. In today’s highly dynamic and competitive markets, the customer wants to be updated with each and every transaction of their shipments, their exact location and the time of delivery or delay if any. The quality of information provided to

customer from time to time in order to update them with all shipment transactions and order status is very crucial. The quality of information communicated through either offline or online mode helps in satisfying the customer urgent requirements. The result of hypothesis testing from structural model also satisfies the same proposed hypothesis i.e. H₁₃ accepted with $\beta = 0.248$ with a significant value of p as shown in Table 8.11. For this proposed framework, the researcher can say that information quality has a significant impact on customer satisfaction. The results are consistent with past studies (Bienstock et al., 2008; Thai, 2008; Chu and Wang, 2012).

H₁₄: Personnel Contact Quality has significant impact on Customer Satisfaction.

The “Personnel Contact Quality” construct is defined by the effort made by personnel to understand the situation, maintains courteous behavior, maintains confidentiality, easily accessible, handles queries and complaints effectively and have adequate product knowledge and experience. The behavioral aspect of LSP is also very crucial while dealing with customers. The satisfaction of customer from logistics services also accounts for the behavior and attention of personnel of LSP. The quality of personnel contact and their concern about satisfying customer needs can be counted as a significant factor which affects customer satisfaction directly. The results are also satisfying the underlying hypothesis. H₄ is also accepted with $\beta = .171$ and having significant p-value as shown in Table 8.11. This claims the point that personnel contact quality has significant impact on customer satisfaction. The results of this hypothesis is consistent with the past studies (Mentzer et al., 2001; Juga et al., 2010).

H₁₅: Customization and Innovation Quality has Significant Impact on Customer Satisfaction.

The “Customization and Innovation Quality” construct is defined by offering services to satisfy specific and urgent requirements, shows creativity in its methods of operations, shows concern toward the environment, seek out new ways to do things, and initiate new services. LSPs have to fulfill customer's specific or customized requirements to satisfy them and to establish a strong relationship for business continuity. LSPs are adopting new innovative ways to do their processes and also making use of advanced technologies to serve customers with their best of quality services. The customized and innovative services are also considered as one of the significant factors which are responsible for customer satisfaction. H₁₅ is accepted with $\beta=.205$ and having significant p-value. This implies that customization and innovation quality has a significant impact on customer satisfaction (Panayides, 2005; Victorino, 2005).

H₁₆: Operational Quality has Significant Impact on Customer Loyalty.

From past studies, it is observed that no direct relationship exists between operational quality and customer loyalty. In this research work, the level of operational quality directly impacts customer satisfaction as discussed and tested in H₁₁ but the results are not true for H₁₆. This shows that if we increase the level of service quality by providing responsive and assured services, then it will help in enhancing customer satisfaction but not directly impact the future continuity of business. There can be an indirect relationship between operational quality and customer loyalty through customer satisfaction as a mediating variable, which will be checked further. H₁₆ is not accepted with $\beta=.102$ and p-value is 0.101 as shown in Table 8.11.

H₁₇: Resource Quality has Significant Impact on Customer Loyalty.

The researcher proposed this hypothesis to check the impact of resource quality on customer loyalty but this hypothesis is not accepted. This implies that if LSPs invest more in assets like infrastructure, manpower, and network extension, etc. then the quality of services can be improved which in turn can increase the customer satisfaction but not directly influencing the customer loyalty. In the literature, the relationship between customer satisfaction and loyalty is well established by many authors. By considering this as a base, the indirect relationship between resource quality and customer loyalty by taking customer satisfaction as a mediating variable will be tested further in this study. H₁₇ is not accepted as its p-value (0.831) is more than 0.05 as shown in Table 8.11.

H₁₈: Information Quality has Significant Impact on Customer Loyalty.

Timely and updated information about shipments and order processes, undoubtedly, calls for more satisfied customers as analyzed and tested in H₁₃ but information quality has no significant impact on customer loyalty. H₁₈ is not accepted with p-value is .059 as shown in Table 8.11. The more satisfied customers would like to continue with the same service provider in future but in this study, this proposed hypothesis is not found to be significant by implying there is no direct relationship between information quality and customer loyalty. Customer loyalty can have an indirect relationship with information quality through customer satisfaction which has to be checked further.

H₁₉: Personnel Contact Quality has Significant Impact on Customer Loyalty.

The attitude and behavior of the personnel of LSP make a significant impact on customer satisfaction but does not make any impact on customer loyalty. The courteous behavior of LSPs results in more satisfied customers and customers also want to continue and outsource more activities to the same service provider. But the results are contradictory. H₁₉ is not

accepted with p value= 0.345 as shown in Table 8.11. This shows that the personnel contact quality has indirect relationship with customer loyalty. In H₁₄, the relationship between personnel contact quality and customer satisfaction has been already established. Now, there is a need to check the indirect relationship between these two through customer satisfaction as a mediating variable.

H₁₀: Customization and Innovation Quality has Significant Impact on Customer Loyalty.

Sometimes, logistics service providers modify their processes and systems to serve the unique and specific needs of customers. LSPs provide customized and innovative services to satisfy customer needs. Customization and innovation quality shows significant impact on customer satisfaction but not on customer loyalty. It implies an improvement in customized and innovative services does not enhance customer loyalty directly. There may be an indirect relationship between these two through customer satisfaction. Therefore, H₁₀ is not accepted with p-value is 0.524 as shown in Table 8.11.

H₁₁: Customer Satisfaction has Significant Impact on Customer Loyalty.

In the literature, various researchers have already established this relationship (Juga et al., 2010; Rahman, 2011; Izogo and Ogba, 2015). In our case, the hypothesis is also accepted with $\beta = 0.443$ and significant p-value as shown in Table 8.11. This implies that the satisfied customers from logistics service quality would like to continue or outsource more activities to the same service provider. Satisfied customers may also like to recommend the LSPs to their business partners. LSPs can deliver better services to provide more satisfaction to customers which in turn, results in long term commitment of the customers. Therefore, customer satisfaction has significant impact on customer loyalty.

8.7.3 Testing of Customer Satisfaction Construct as a Mediator Variable

Further, the researcher identified the model re-measurement and checked for the mediating effect of customer satisfaction with all exogenous and endogenous variables. A mediating construct in structural equation modeling is one which comes between two other constructs (one is the exogenous construct and other is the endogenous construct) in the structural model (Chauhan, 2016). The mediating effect in the structural model adds more meaningful interpretations in the results. For testing the mediation, the structural relationships among constructs must satisfy the following conditions (Baron and Kenny 1986; Tepper et al., 1996; Sarkis et al., 2010)

- (i) The independent variables must have a significant relationship with the dependent variable in absence of mediator variable
- (ii) The independent variable must have a significant relationship with the mediator variable
- (iii) The mediator variable must have a significant relationship with the dependent variable
- (iv) The effect of the independent variable on the dependent variable must reduce after adding a mediator variable.

First, the direct effect of the endogenous and exogenous variable is checked in absence of mediator variable (Baron and Kenny, 1986). In this case, the direct effect of all exogenous variables (OQ, RQ, IQ, PCQ, and CIQ) on an endogenous variable (customer loyalty) is checked and the effects are captured and noted in Table 8.12 with a column named "Direct without Mediator" as shown in Figure 8.4. The significant relationship with all endogenous variables and customer satisfaction (mediating variable) have been already established and discussed in Table 8.11. Further, Customer Satisfaction (CS) is again added to the structural model and the results of analysis are noted in the third column of Table 8.12 under the

column name “Direct with Mediator” as shown in Figure 8.5. Barron and Kenny (1986) suggested that these analyses outcomes can lead to three results, that is, no mediation, partial mediation, and full mediation.

- If the relationship of the independent variable with the dependent variable becomes insignificant in presence of the mediator variable, then the effects of the independent variable are said to be completely or fully mediated by the mediator.
- If all the conditions met, the relationship of independent variables remains significant with the dependent variable in presence of the mediator, then the effects of the independent variable are said to be "partially" mediated by the mediator.
- If any of the conditions are not satisfied, then there is no mediation.

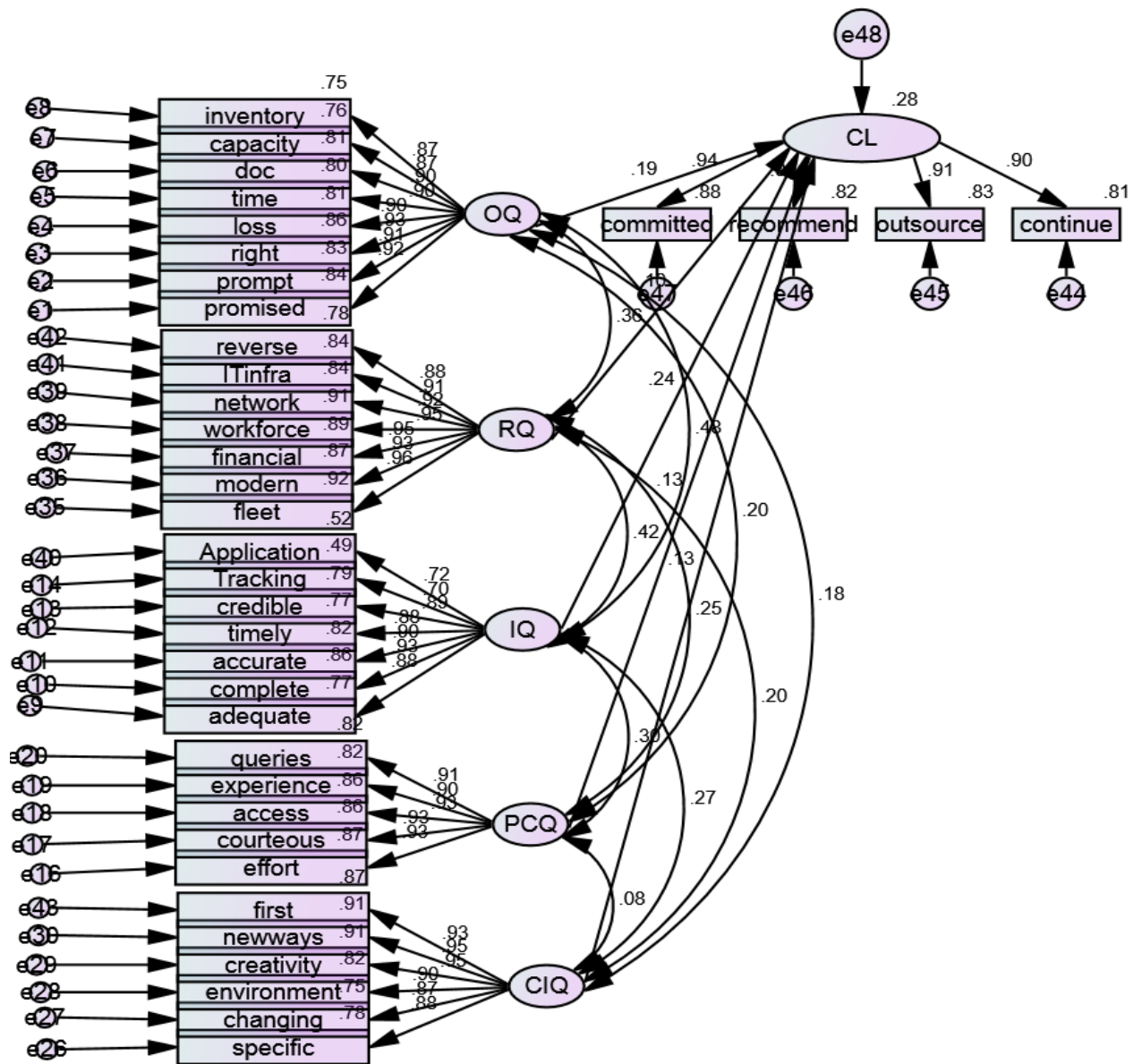


Figure 8.4: Direct Effect without Customer Satisfaction (CS)

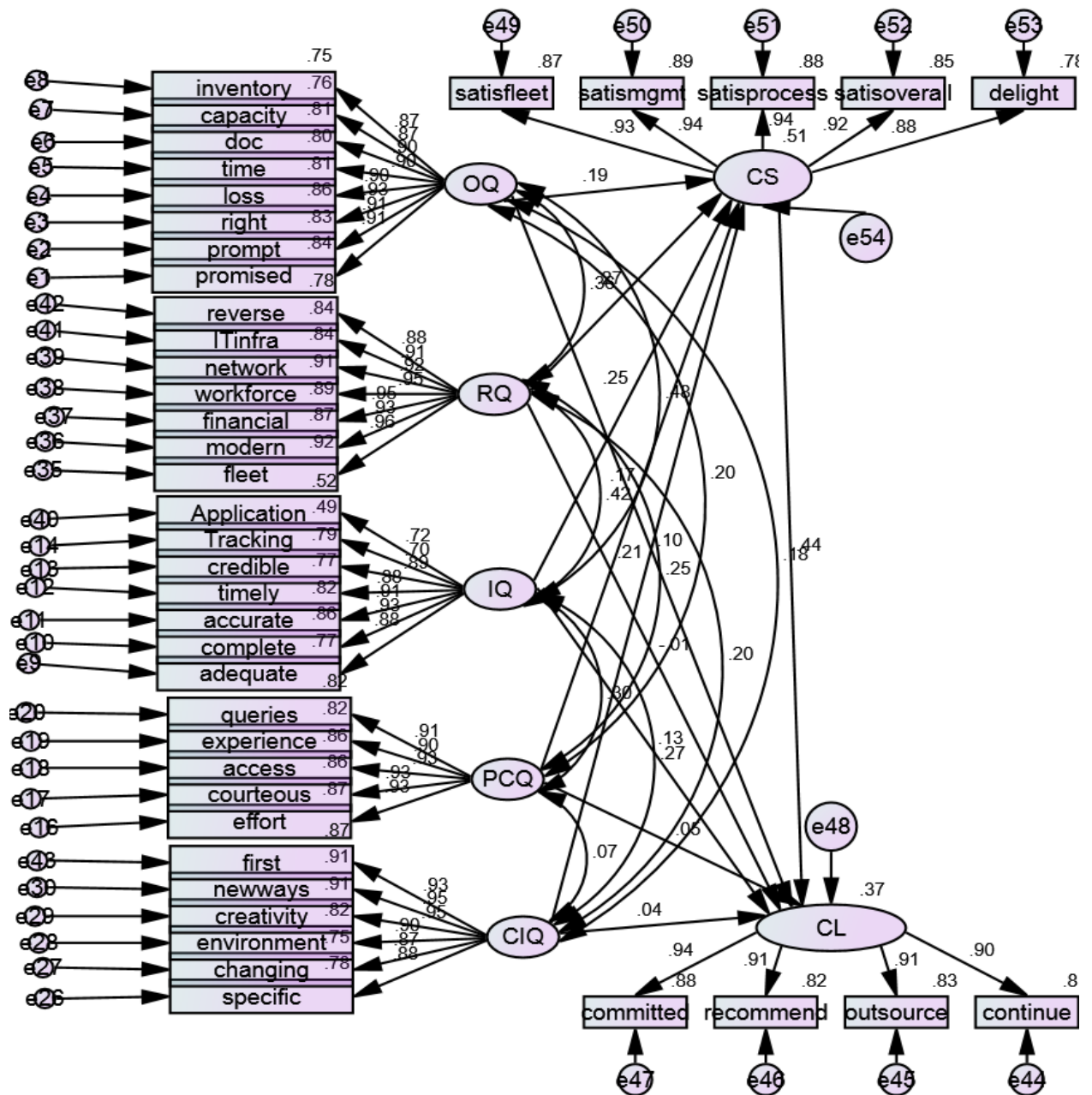


Figure 8.5 Mediating Effect of Customer Satisfaction

Bootstrapping is common method to test the indirect effect of an exogenous variable on the endogenous variable (Bollen and Stine, 1990; Shrout and Bolger, 2002). It is a non-parametric method which requires process to be conducted in repeated iterations like 2000 times. The indirect effect of constructs are computed from each of the samples and discussed in Table 8.12. These can be the following possible cases which can occur (Kenny, 2013).

- No mediation: If indirect effects are not significant and the direct effect of an independent variable on mediator variable is also insignificant, then there is any mediation.
- Indirect Effects: The direct effects are insignificant, that is, the direct effect of exogenous variables on endogenous variable and on mediator are insignificant but indirect effect is significant.
- Full Mediation: The direct effects are significant before adding the mediator variable. After adding the mediator, direct effects are not significant and the indirect effects are significant then there is a case of full mediation.

To test the mediating effect, five hypotheses are developed and assessed:

H₀12: Customer satisfaction (CS) does not mediate the relationship between Operational Quality (OQ) and Customer Loyalty (CL).

H₁12: Customer satisfaction (CS) mediates the relationship between Operational Quality (OQ) and Customer Loyalty (CL).

H₀13: Customer satisfaction (CS) does not mediate the relationship between Resource Quality (RQ) and Customer Loyalty (CL).

H₁13: Customer satisfaction (CS) mediates the relationship between Resource Quality (RQ) and Customer Loyalty (CL).

H₀14: Customer satisfaction (CS) does not mediate the relationship between Information Quality (RQ) and Customer Loyalty (CL).

H₁14: Customer satisfaction (CS) mediates the relationship between Information Quality (IQ) and Customer Loyalty (CL).

H₀15: Customer satisfaction (CS) does not mediate the relationship between Personnel Contact Quality (PCQ) and Customer Loyalty (CL).

H₁15: Customer satisfaction (CS) mediates the relationship between Personnel Contact Quality (PCQ) and Customer Loyalty (CL).

H₀16: Customer satisfaction (CS) does not mediate the relationship between Customization and Innovation Quality (CIQ) and Customer Loyalty (CL).

H₁16: Customer satisfaction (CS) mediates the relationship between Customization and Innovation Quality (CIQ) and Customer Loyalty (CL).

Results are captured for “Direct without Mediator”, “Direct with Mediator”, “Indirect Effects” and noted down in Table 8.12. The indirect effects are calculated by using a bootstrapping mechanism in AMOS 22 by setting 95 per cent confidence level and 2000 number of bootstrap samples have been considered. The effect of no mediation, partial and full mediation is also observed.

Table 8.12 Testing Mediation

Hypotheses	Relationship	Direct Without Mediator	Direct with Mediator	Indirect Effects	Decision
H ₁ 12	OQ -> CS -> CL	0.186 (0.004)	0.102 (0.223)	0.084 (0.004)	Full Mediation
H ₁ 13	RQ -> CS -> CL	0.104 (0.003)	-0.13 (0.826)	0.117 (0.001)	Full Mediation
H ₁ 14	IQ -> CS -> CL	0.236 (0.000)	0.127 (0.124)	0.110 (0.000)	Full Mediation

H ₁ 15	PCQ -> CS -> CL	0.129 (0.027)	0.053 (0.444)	0.076 (0.001)	Full Mediation
H ₁ 16	CIQ -> CS -> CL	0.126 (0.028)	0.035 (0.595)	0.091 (0.001)	Full Mediation

As it can be observed from Table 8.12 that Customer Satisfaction (CS) fully mediates all exogenous constructs (OQ, RQ, IQ, PCQ, and CIQ) and endogenous construct (CL). Numerous re-specifications of the model had been done to best fit the model and checking the impact of the model with different values of standardized regression weights. The different structural models are designed and analyzed to check the mediating effect of customer satisfaction. Firstly, the direct effects of all independent variables (OQ, RQ, IQ, PCQ, and CIQ) and dependent variable (CL) in absence of mediator variable are evaluated and found to be significant for all the cases. Secondly, the direct effects of independent variables on the dependent variable in presence of mediator variable are checked and found to be insignificant. Lastly, the indirect effects by bootstrapping mechanism are also checked of independent variables into the dependent variable and again found to be significant. This makes CS as a full mediator between all independent and dependent variables. This implies that if LSPs improve their service quality in all aspects then it will help in more customer satisfaction and subsequently it affects customer loyalty. The above-stated hypotheses are analyzed and discussed below.

H₁12: This hypothesis is accepted. It implies that Customer Satisfaction (CS) is acting as the full mediator between Operational Quality (OQ) and Customer Loyalty (CL). The direct effect between OQ and CL without a mediator is found to be significant with $\beta=0.186$ with $p\text{-value} = 0.004$. The direct effect between them with a mediator is found to be insignificant. The indirect effect of OQ on CL in presence of CS is found to be significant with a significant $p\text{-value}$ (0.004) as shown in Table 8.12. This shows that improvement in the operational quality of services will lead to more satisfied customers and more satisfied customers will turn into more loyal customers.

H₁₃: It is accepted. It shows that CS is fully mediating between Resource Quality (RQ) and Customer Loyalty (CL). The direct effect between RQ and CL in absence of CS is significant with a significant p-value (0.003). The direct effect between them in presence of mediator is not significant. The indirect results between them are significant with $\beta = 0.117$ and $p = 0.001$ as shown in Table 8.12. This makes CS a full mediator construct between RQ and CL. Addition of more resources to LSPs may increase the satisfaction of customers from logistics services but satisfied customers only would like to continue their businesses with the same LSPs in the future.

H₁₄: This hypothesis is also accepted. The direct effect of Information Quality (IQ) and Customer loyalty (CL) in absence of mediator variable (CS) is found to be significant. The direct effect in absence of mediator of IQ on CL is not significant. To check the presence of a mediator in the structural model the indirect effects are also checked and found to be significant with $\beta = 0.110$ with significant p-value as shown in Table 8.12. Therefore, the researcher can claim that customer satisfaction is a full mediator between IQ and CL. Customer satisfaction can be increased by providing more appropriate, adequate and timely information about logistics services and satisfied customers would like to outsource to the same logistics service provider.

H₁₅: This is accepted. This implies that Customer Satisfaction (CS) fully mediates the Personnel Contact Quality (PCQ) and Customer Loyalty (CL). The direct effects of PCQ on CL in absence of CS is analyzed and found to be significant with $\beta = 0.129$ with significant p value = 0.027 which is less than .05 as shown in Table 8.12. The direct effect between them in presence of mediator is insignificant. The indirect effect of RQ on CL in presence of CS is found to be significant with significant p-value 0.001. Therefore, CS also mediates fully PCQ and CL.

H116: This hypothesis is accepted. This means that customer satisfaction shows full mediation effect between Customization and Innovation quality (CIQ) and Customer Loyalty (CL). The direct effect of CIQ on CL in absence of mediator is coming to be significant whereas the direct effect in presence of mediator variable is coming to be insignificant. The indirect effect of CIQ on CL in presence of mediator is significant with $\beta = 0.091$ with significant p-value 0.001 as shown in Table 8.12. The full mediation effect of Customer satisfaction on CIQ and CL is observed and analyzed. The final proposed LSQ framework has been discussed below as shown in Figure 8.6.

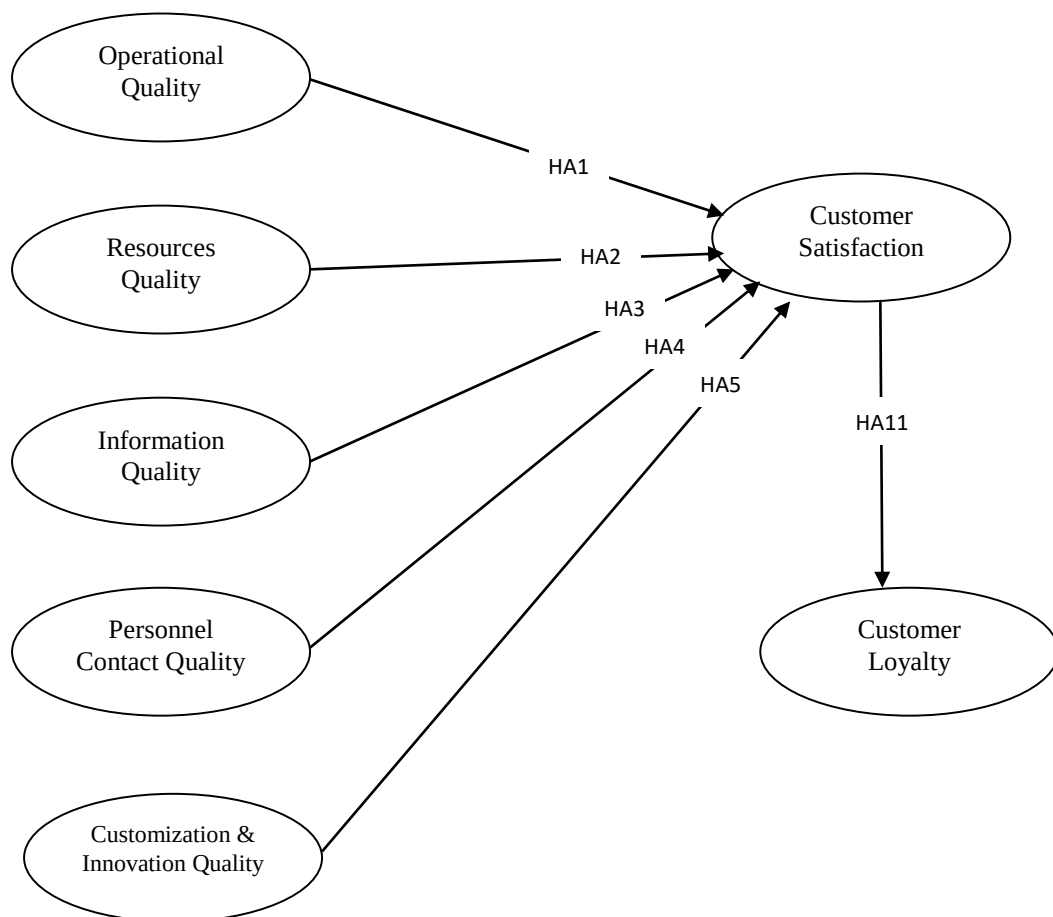


Figure 8.6 Final Proposed LSQ Framework

8.8 Concluding Remarks

In this chapter, the proposed Logistics Service Quality (LSQ) framework is tested and analyzed on the basis of responses obtained through a structured questionnaire. At the initial stage, the pilot testing is conducted with data of 100 respondents and Cronbach alpha value is found to be highly significant. Finally, 270 data points out of 294 are found to be relevant for conducting detailed analysis and testing of the proposed framework by using SPSS 22 and AMOS 22. In this study, the Cronbach alpha value for the entire data set is found to be 0.946 which is greater than the minimum threshold of 0.7. Then, EFA has been used to reduce data initially and to eliminate less important items from the study. On the basis of EFA, 5 items out of 48 items are omitted due to their less value of communality (<0.5) and low factor loadings (<0.6). The outcome of EFA results into the development of seven constructs namely Operational Quality (OQ), Resource Quality (RQ), Information Quality (IQ), Personnel Contact Quality (PCQ) and Customization and Innovation Quality (CIQ), Customer Satisfaction (CS) and Customer Loyalty (CL). After EFA, CFA test is applied to confirm the proposed framework. In CFA, the values of CR, AVE, ASV, and MSV had been found and all the values are coming significant and meeting their desired criteria. The CFA provides a measurement model of logistics service quality as the value of goodness of fit lies within the acceptable range. Further, this measurement model is converted into a structural model by using SEM and the structural relationship among all constructs as dependent and independent variables has been established. The hypotheses developed for the structural model is tested and analyzed on the basis of the significant p-value. The results are supporting the mediating effect of customer satisfaction. In the next chapter, the conclusions retrieved from the research work along with limitations and recommendations of the research work have been discussed in detail.

Chapter 9

Conclusions and Future Directions

9.1 Introduction

In present competitive and dynamic market conditions, organizations are competing for positioning themselves in the market, grabbing market share and for becoming the preferred choice of customers. The robust supply chain and logistics practices can serve as a competitive advantage for the organizations. In the era of digitalization and e-commerce businesses, the support on logistics practices can become the key to success for all organizations. Logistics service providers (LSPs) provide supports in logistics function to the various industries for the reason of better service quality, cost reduction, and quick delivery. There are many issues which affect the delivery of quality services of LSPs to the end customers. Therefore, this research work aimed at identification of all the service quality issues which affects the service quality of LSPs in the Indian context. In this study, multiple research tools like case study approach, multi-criteria decision-making tools, survey method and development of frameworks are applied.

An in-depth review of literature and opinion of experts was carried out to understand the select service quality issues and challenges related to Indian logistics service providers. The perusal of literature indicated that few of the service quality issues require more attention of academicians and researchers, specifically in the Indian context. The research work identified these service quality issues as best practices being followed, challenges faced by Indian LSPs, selection framework of best LSP based on its service quality and proposing and validating a logistics service quality framework for testing hypotheses.

In this study, the focus is to understand the factors which affect the service quality of LSPs. Therefore, it is required to understand and identify all those factors related to

service quality. Initially, a comprehensive review of literature has been done to understand the service quality issues of LSPs which can affect the customer satisfaction and customer loyalty. As mostly studies have been conducted in developed countries, the researcher preferred to follow the case study method to understand the operations of Indian LSPs. This gives an immense opportunity to get familiarized with the resources, processes and best practices followed by Indian LSPs closely. The personal visits to the offices of LSPs and in-depth case analysis of three Indian logistics service providers provide valuable insights and give appropriate direction to the research work. These insights helped in fulfilling the first objective of the research work. The challenges faced by LSPs have also been listed through review of literature and expert opinion and further, analyzed using TISM.

After familiarizing with the operations of LSPs, the focus of the study is towards the identification of factors which impact the selection of LSP by its customer organizations. A 5C's framework is proposed for the selection of best LSP and then analyzed by using Fuzzy AHP and Fuzzy TOPSIS approach. This analysis assists in identifying the important factors responsible for the selection and consequently, the selection of best LSP out of all available alternatives considered for the study. There is a huge scope to propose a service quality framework for Indian LSPs. To achieve the third objective, a Logistics Service Quality (LSQ) framework has been proposed after the detailed review of past studies and taking inputs from experts. The data is collected by survey method from the customers of LSPs and then further analyzed by using statistical methods like Structural Equation Modeling. In this chapter, the major findings of the research have been depicted in form of synthesis of work done in Figure 9.1. The contributions of the research work along with the implications of the study have been discussed in next section. The

limitations of the study and scope of extension of this research work is also elaborated in this chapter.

9.2 Syntheses of the Work Done

The research work is aiming at identifying the logistics service quality issues which affect the customer satisfaction and loyalty. The present study has adopted both theoretical and empirical methods to achieve the objectives of the study. The syntheses of work done are shown in Figure 9.1.

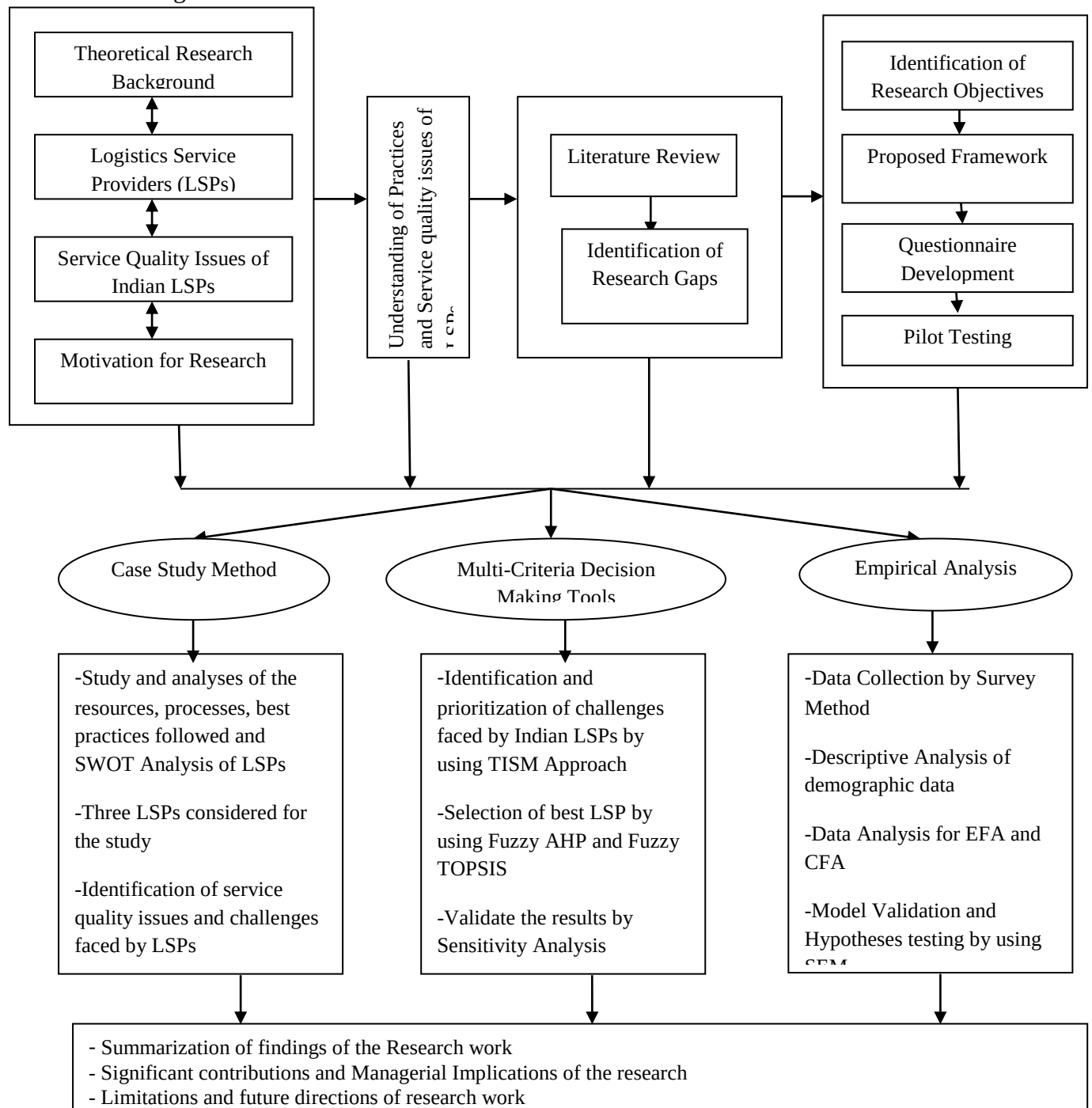


Figure 9.1 Syntheses of the Research Work Done in the Study

A summary of the research work done is as follows:

- The motivation to carry out the present research came through increased growth of digitalization and e-commerce business; there is ample opportunity for LSPs to expand their businesses to fulfill dynamic market demands. Limited literature was found on Indian logistics service providers and their service quality issues. Therefore, this worked as a motivation to explore the present research work in this field.
- A detailed literature review analysis has been done to understand the practices and service quality issues of Indian logistics service providers. Methodology for the literature review is elaborated in detail in Chapter 2 and explored various service quality issues including best practices, challenges, and critical success factors for Indian LSPs. The research gaps are identified on the basis of an in-depth review of the literature.
- Based on the research gaps, objectives for the study are established.
- A systematic approach is followed to meet all objectives of the research work and to reach the findings and conclusions of the study along with the validation of results. For achieving objective 1, the case study method is utilized for understanding and analyzing the best practices of Indian logistics service providers. Total Interpretive Structural Modeling is used to establish the contextual relationship among various challenges faced by Indian LSPs. For meeting objective 2 which implies the selection of logistics service providers among all the available alternatives, MCDM models had been applied. Further, the Sensitivity analysis is used to check the robustness of the output, received from MCDM techniques. Lastly, for objective 3, the survey method is used to validate the results for the proposed framework on logistics service quality and also to test the research hypotheses.

- In this study, case study method is applied along with the survey method for understanding the select service quality issues of an Indian LSPs. The case study method is adopted to get familiarize with actual practices of LSPs. Three Indian logistic service providers are chosen for the study and an in-depth analysis has been done on the basis of observations made during visits and meetings with middle and senior management at LSPs organizations. The observations are made on the resources available, logistics operations and best practices followed by all the three case companies. The SWOT analysis of case organizations is also conducted to understand the strengths of LSPs along with their weaknesses, opportunities and threats.
- The challenges faced by Indian LSPs in delivering service excellence are identified from the literature review and expert opinion. Ten challenges are identified and clubbed into different clusters by using TISM methodology for an in-depth understanding of the nature and impact of each challenge on LSPs services. From the study, the identified challenges are prioritized. The challenges are categorized as autonomous, dependent, linkage and independent variables. The driving power and dependence power are also found for these challenges and the TISM structural model is also developed.
- Selection of an appropriate LSP is an important service quality issue for the customer organizations in order to ensure efficient and cost-effective supply chain. A 5C's framework is proposed to select the best LSP based on service quality, with a real-life case illustration. A hybrid multi-criteria approach is used to evaluate and select the best logistics provider. Fuzzy AHP is used to find the initial relative weights of shortlisted criteria and then Fuzzy TOPSIS is used to find out the final rankings of all

available alternatives of LSPs. Sensitivity analysis is also done to validate the robustness of the proposed framework.

- To expand the research work for a broader perspective, a theoretical Logistics Service Quality (LSQ) framework is developed for measuring customer satisfaction from the service quality of Indian logistics service providers. The constructs and the corresponding items of the framework are taken from the literature review and expert opinion. To test and validate the proposed framework, the data is collected from the customers, who are taking services from logistics service providers through a structured questionnaire. The data is collected against all the constructs and items considered for this proposed framework. The results are obtained and checked for ensuring reliability, validity and other related quality parameters for the research. The pilot testing of the questionnaire is also done to examine the preliminary questionnaire for relevance and content validity.
- The demographic data of respondents is analyzed using descriptive analysis. Cronbach's alpha value is determined to ensure the internal consistency of each construct. Then, Exploratory Factor Analysis technique (EFA) has been used to reduce data initially and to eliminate less important items from the study. After EFA, Confirmatory factor analysis (CFA) test is applied to confirm the proposed framework. Further, this measurement model is converted into the structural model by using SEM and the structural relationship among all constructs as dependent and independent variables has been established.
- Hypotheses are developed to investigate the relationships among the service quality constructs, customer satisfaction, and customer loyalty. Hypotheses are developed for identifying the impact of service quality constructs of LSPs on customer satisfaction and customer loyalty. Hypotheses are also developed for testing the mediating effect

of customer satisfaction construct on other exogenous constructs in the structural model.

9.3 Summary of the findings of the Study

In the perusal of the syntheses of the work done, the major findings of the research work are enumerated as follows.

9.3.1 Findings from the Case Based Studies

Eisenhedart (1989) suggested the case study approach which helps in understanding LSPs processes, their best practices, their service quality issues and the challenges faced by them. Case research methodology gives the opportunity to think out of the box and allow the researcher to remove the restrictions of following rigid constraints of questionnaires and models. It was required to get familiarized with the overall operations of LSPs to proceed in the research work. A systematic approach is developed which involves selection of case study, visit to case organization for data and information collection, data analysis and dissemination of information for productive outcomes. The best way to understand the various logistics service quality issues is to visit the Indian logistics companies and to meet senior and medium management over there to get insights about their processes.

The data is collected after having many discussions with middle and senior management of the selected companies. The questions related to their assets, processes and best practices are discussed to capture major issues related to service quality of LSPs. The collected data is analyzed and findings of the case study are discussed to understand the actual practices of Indian LSPs.

The findings revealed that Indian LSPs are now offering a single window solution to all logistics issues of customer organizations. Although, the Indian logistics sector is

highly fragmented still, well-established LSPs are strengthened with a large number of fleets, state-of-art warehouses, wide distribution network, dedicated and efficient workforce and adoption of the latest IT solutions. The major weaknesses of LSPs are high attrition rate at low-level management, non-availability of skilled manpower and less concern towards creating brand awareness to increase visibility in the market. However, many initiatives have been taken by LSPs to overcome these weaknesses. This includes enhancing employability by starting up their own education institutes where supply chain and logistics related short term courses along with practical training are executed. LSPs are also providing a comfortable and healthy working environment by providing residential and mess services at all the warehouses to retain their employees especially the low-level ones. The LSPs can further improve in terms of adoption of global logistics practices, expansion of their businesses to global markets and being more sensitized towards society and the environment.

Various best practices are followed by LSPs in order to enhance business excellence and better customer satisfaction. The best practices of three Indian LSPs have been observed and analyzed to generalize for all well-established LSPs. Nowadays, the LSPs are very actively working towards resource optimization by conserving natural resources. Power generation by solar panels, rainwater harvesting to recycle water and conversion from paperwork to paperless are a few practices which are followed by them. The wide support of technology helps LSPs in updating the status of the shipment to the customer from time to time. The automation in logistics results in better route planning and also makes document handling easy. LSPs manage their customers' inventory by monitoring their stock regularly and replenish to ensure sufficient stock availability at their warehouses. LSPs are ready to redefine their business processes and convert them into tailor-made solutions as per the specific

customer requirements. LSPs also contribute towards the welfare of society and environment by using reusable and recyclable packaging materials, planting trees and making use of certified vehicles which decreases carbon emission by reducing consumption of fuel. The case study method has provided various insights about the current processes of Indian LSPs which they are following to serve their customers in a better way.

9.3.2 Findings from the Multi-Criteria Decision-Making (MCDM) Analysis

The research found that the selection of appropriate LSP is very important for the customer. A hybrid multi-criteria approach is used to evaluate and select the best logistics provider. Fuzzy AHP is used to find the initial relative weights of shortlisted service quality criteria which affect the selection of LSPs. It has been observed from the study that the main criteria for LSP selection are Competence (0.27), Communication (0.25), Commitment (0.20), Coordination & Collaboration (0.14) and Creativity & Customization (0.13). Findings revealed that LSPs need to adopt more innovative and creative ways to deliver their services. They can also improve the quality of information provided to the customers and can facilitate better query handling solutions. A strong relationship with supply chain partners and mutual trust is also required to fulfil commitments to customers.

Further, Fuzzy TOPSIS is used to find out the final rankings of all available alternatives of LSPs. The expert opinion has been marked for all available alternatives for each criterion. The closeness coefficient values are calculated. Based on these values, the ranking of alternatives in descending order is PQR Ltd. (0.9864), XYZ Ltd. (0.9862) and ABC Ltd. (0.9833). The higher the closeness coefficient, the better is the rank. The results indicated that PQR Ltd. is considered to be the best LSP with the highest closeness coefficient. The findings are further validated with the help of

sensitivity analysis. The decision-making methods assisted in prioritizing the criteria which is preferred by customers while selecting their LSP. The proposed framework is tested and analysed by taking a real life-case illustration..

9.3.3 Findings from the Empirical Analysis

This research work is focused on the service quality issues of Indian logistics service providers. The study proposed a Logistics Service Quality (LSQ) framework for Indian LSPs. The framework is well rooted in literature and examined by Indian experts.

The data is collected through a structured questionnaire by survey method. At the initial stage, the pilot testing is conducted with data of 100 respondents and Cronbach alpha value (0.948) is found to be highly significant. Finally, 270 fully filled questionnaires out of 294 responses are found to be relevant for conducting detailed analysis and testing of the proposed framework by using SPSS 22 and AMOS 22. The reliability test for the entire data set is found to be 0.956 which is greater than the minimum threshold of 0.7. Then, EFA has been used to reduce data initially and to eliminate less important items from the study. Five items out of forty eight items are omitted due to their less value of communality (<0.5) and low factor loadings (<0.6) based on EFA. Findings of EFA results into the development of seven constructs namely Operational Quality (OQ), Resource Quality (RQ), Information Quality (IQ), Personnel Contact Quality (PCQ) and Customization and Innovation Quality (CIQ), Customer Satisfaction (CS) and Customer Loyalty (CL).

Following EFA, CFA test is applied to confirm the proposed framework. In CFA, the values of Composite Reliability (CR), Average Variance Extracted (AVE), Average Shared Variance (ASV) and Maximum Shared Variance (MSV) have been found and all the values are found to be significant and meeting the desired criteria. The CFA provides a measurement model of LSQ on the basis of goodness of model fit. Further,

this measurement model is converted into the structural model by using Structural Equation Modeling (SEM) and the structural relationship among all constructs as dependent and independent variables has been established.

Hypotheses testing revealed that constructs such as operational quality, resource quality, information quality, personnel contact quality, and customization and innovation quality greatly influences customer satisfaction. All the constructs were found to be supported at the $p < 0.05$ significance level. It is also found that the constructs operational quality, resource quality, information quality, personnel contact quality, and customization and innovation quality are not having a significant impact on customer loyalty. The hypotheses tested for checking the impact of customer satisfaction on customer loyalty is also supported with the significant p-value. Then, the mediating effect of customer satisfaction in the structural model is tested. The results of hypotheses are supporting the mediating effect of customer satisfaction.

9.4 Significant Contributions and Managerial Implications of the Research Work

The research work comprises of the fulfillment of various objectives which are identified on the basis of research gap. The achievement of the objectives of the research work can assist both budding and well established LSPs as well as customer organizations. The present research is well rooted in literature. As similar types of studies are scarce in the Indian context, the framework in this study is developed with the help of inputs of Indian experts. Therefore, the results obtained for the framework are statistically valid and can be generalized for all Indian LSPs as well as customer organizations.

A comprehensive literature review on select service quality issues of logistics service providers has been carried out that can be serving as an adequate base for other

contemporary researchers. The research gaps are identified from the vast literature review in the study and the research work is conducted to fulfill these research gaps. These research gaps can be utilized by researchers and practitioners for further research in this area. In the era of Make in India initiatives of the Indian government along with globalization, the present market in India offers immense opportunities for logistics service providers. The upcoming opportunities in retail online and e-commerce businesses will enhance the business scope of LSPs and can enrich their service capabilities to meet up the market expectations. This makes the contribution of our present study more relevant and beneficial. The research work can be very beneficial for LSPs to understand current trends, processes and to understand the expectations of customers. The proposed framework for LSP selection can be used by customers.

9.4.1 Research Implications for the LSPs

The research makes a significant contribution in terms of augmenting the gap related to limited studies available in the Indian context. The logistics service providers may utilize these suggested findings and can implement in their business processes.

- The budding LSPs can have in-depth insights on operations, processes and best practices being followed by well-established Indian LSPs. They may adopt and implement similar practices in their respective business processes.
- The challenges faced by Indian LSPs have also been discussed after taking inputs from industry experts. The prioritization and relationship among challenges have also been mentioned in the study. LSPs may find anticipated solutions to rectify the identified challenges beforehand.
- Logistics providers can develop strategies to improve their performance by understanding their strengths and weaknesses and can become globally competitive.

- LSPs can be benefited by understanding the clear expectations of customer organizations and the fulfillment of their expectations for better future opportunities.
- Logistics service providers can also understand the general parameters on which generally their services are evaluated and they can improve on lacking areas for more satisfaction of their customers.
- LSPs can recognize those service quality dimensions which are more important to serve the specific requirements of the customer and can provide quick and customized solutions in a cost-effective manner.
- The proposed framework is tested and validated statistically. The Logistics Service Quality (LSQ) model is specifically developed for Indian LSPs. So, the LSPs can adopt and implement this model for providing better service quality and hence, have more satisfied and retained customers.

9.4.2 Research Implications for the Customer Organizations

The organization which takes services from LSPs have to make critical decisions of selection of appropriate LSP and continuity of business with the same or new LSP. The present research work can help customer organizations to take better decisions in terms of selection, evaluation, and defining expectations from the LSPs.

- The study can help customer organizations to understand the important parameters which are required to select an LSP. Moreover, the prioritization of selection parameters as brought out in the study, can suggest choosing the appropriate LSP from the available alternatives.
- Three case studies of different well-established Indian LSPs have been discussed in the research work. The organizations can easily understand all processes and best practices offered by LSPs in current market scenario. Accordingly, they can expect a similar type of services from their respective LSPs.

- The challenges which are faced by LSPs may also become the reason for failures of the customer organization. Therefore, the awareness of challenges to the organizations may assist them in taking timely preventive actions.
- Customer organizations can better understand about the performance parameters of LSPs while evaluating their service providers and the same parameters can help during the selection of LSPs in the future.
- The organizations can define their clear expectations to the LSPs after understanding and adopting the LSQ model. As the LSQ model have been developed only after taking inputs from Indian customer organizations on their expectations from Indian LSPs.

9.5 Select Recommendations Based on the Research Work

On the basis of detailed analysis on research work, the potential areas for improvement in logistics sector has been recognized. Even though, the issues and challenges may differ from organization to organization, summarization of key recommendations may guide practitioners for future actions. Based on this research work, the following recommendations for the Indian logistics industry are proposed.

- The Government of India is working towards infrastructural development in order to fulfill the increased need for robust supply chain solutions. But still, the planned projects are far away from the actual requirements. There is a need to give more attention to infrastructural issues to reduce the gap between plan and reality. Good infrastructure is essential for efficient logistic sector in India. The government of India may have some studies for benchmarking of Indian infrastructure with the best in the world.
- The requirement of skilled manpower in the field of logistics at various levels is huge but there are fewer institutions which provide the skill development courses

in the logistics sector. More institutes need be opened to provide better learning opportunities in the field of logistics in order to enhance the skill set and availability of required manpower.

- The Indian Government has already launched Sagarmala project through which the entire coastal line of India is connected for movement of goods through waterways. This is an appreciating step in order to enhance transportation by waterways. But still, there is a huge scope in improving connectivity of seaports to hinterlands.
- The logistics sector in India is highly fragmented. The Indian logistics sector is a blend of small and large logistics service providers. The LSPs who own less than 5 trucks and no warehouse at all is also considered as a service provider though they only serve a small and specific set of customers. The Government must define the minimum threshold that one must follow to be considered as a logistics service provider. This will help in improvement and better recognition of the logistics industry in the country.
- Fast-tracking, RFID, bar-coding, WMS software, E-way billing, and tracking and tracing through GPS are the latest technologies which are in use by LSPs. Although the digitalization and automation are being adopted in logistics management, still the entire implementation and timely up-gradation of these tools for advancement is a big challenge. Adoption of IT technologies has been done by large service providers. There is, however, a need of adoption and implementation of the same by small logistics players.
- The Government should ensure the easy availability of warehouses across the nation. Every year, a large stock of agricultural products and other goods are wasted due to improper storage spaces. The shortage or wastage of goods reflects

upon mismanagement of inventories. Therefore, the Indian Government need to offer subsidized land or incentives so that service providers are encouraged to procure land for warehouses.

9.6 Limitations and Future Scope of the Research Work

Every research work has its own strengths and limitations. This study has also got some limitations. The limitations of the research work along with future directions are mentioned as follows.

- The major limitation of the study is that the entire research work is focused on the Indian logistics sector, and therefore there is a limited scope of generalization of findings for the other countries and sectors.
- Various methods like case study approach, MCDM techniques and empirical analysis have been applied for data analysis of selected service quality issues. The research work may be further extended for other issues like sustainable practices, reverse logistics, automation in logistics.
- As one of the objectives of the research work is to understand the best practices of Indian LSPs, the case studies were conducted for the well-established LSPs. However, In India, the logistics sector is a blend of small and large logistics players. Therefore, more case studies may be developed for middle or small scale LSPs to have more clarity on actual conditions of Indian LSPs.
- In the present research work, the relationship between challenges faced by LSP is established by using TISM methodology but the results are not checked and validated statistically. To make it statistically valid, a linear structural relationship approach can be further used as a future scope of the research work.

- The model developed for selecting the best logistics service provider is based on inputs taken from three experts who are taking services from logistics service providers. More experts from different industry verticals can be included in the study to generalize the results in the Indian context.
- The hierarchical 5C's model developed for selecting the best LSPs. Model can be validated empirically. The construct validation and empirical testing of the proposed model can be done by SEM as the future scope of the study. This framework can be further modified in context to sustainability and corporate social responsibilities measures depending upon different scenario and market requirements.
- In the survey method, the data collection is very difficult as the respondents are the employees of Indian organizations working in specific department. Most of the respondents belonged to B2B (Business to Business) market segments. The respondents were supposed to give feedback about the service quality provided by LSPs to their respective organizations. Despite considerable efforts put by the researcher in collecting data, the small sample size and low response rate are limitations to the study. Although the measurement models are found to be statistically fit by SEM, the present study can be attempted with a larger sample size and can be tested for better significance and acceptance of the results.
- Hypotheses are developed and tested to understand the association of independent constructs with dependent constructs. More issues related to sustainable practices and technologies can be added to the study and their association with customer satisfaction and loyalty can be tested as an extension of current research work.

9.7 Concluding Remarks

The research work reported in the thesis may be considered as an attempt to address the challenges and issues specific to the service quality of LSPs in the Indian context. The research work was carried out on Indian logistics sector during the emergence of “Make in India”, “Digital India”, “Implementation of GST”, e-retail in emerging business environment, etc. This increases the dependence of businesses on LSPs. The role of LSPs is increased to a big extent in terms of providing all logistics solutions as a single window service. The objectives achieved in the study can assist the researchers and practitioners to understand the current practices, challenges, and service quality issues of Indian LSPs. In the present study, the resources, processes and best practices followed by LSPs are discussed with the help of case study method. The multi-criteria decision-making tools are used to prioritize the parameters for the selection of best LSP. The LSQ framework is proposed and statistically tested to identify the service quality dimensions of Indian LSPs responsible for satisfying and retaining customers. The significant contributions and research implications for both LSPs and customer organizations are also enumerated in the thesis. A few recommendations for the improvement of the Indian logistics sector performance have been also made. The limitations of the present study along with the future scope of research work have been mentioned. This study is expected to be useful to LSPs, customer organizations, academicians, and researchers in terms of understanding, adopting and implementing the learning based on outcomes of the study. As it cannot be considered end of this research work, future studies may be carried out in business environment of industry 4.0 and circular economy.

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Annexure I

Questionnaire

Kindly provide your inputs on the level of satisfaction from the services delivered by Logistics Services Providers to your organization. This survey will approximately take 5 minutes.

Part-A

1. Name (optional).....
2. Name of the Organization
3. Designation.....
4. E-mail ID:.....
5. Overall Experience
 - a. 0-2 years ☐
 - b. 2-5 years ☐
 - c. 5-10 years ☐
 - d. More than 10 years ☐
6. Annual Turnover of your organization
 - a. Less than 5 Crores ☐
 - b. 5-50 Crores ☐
 - c. 50-100 Crores ☐
 - d. 100 Crores & more ☐
7. Number of Employees in your organization
 - a. 1-100 ☐
 - b. 101-500 ☐
 - c. 501-1000 ☐
 - d. More than 1000 ☐
8. Please tick only one sector which suits best to your organization-

a. Agriculturei. FMCG	☐		☐
b. Automobile	☐	j. Paints & Chemicals	☐
c. Auto-components	☐	pharmaceuticals	☐
d. Cement	☐	l. Power Industry	☐
e. Consumer Durables	☐	m. Retail	☐
f. Construction	☐	n. Telecom	☐
g. Electricals	☐	o. Textiles	☐
h. Electronics	☐	p. Any other	☐

(Please specify).....
9. Please tick the services your organization is taking from Logistics Services Providers-

a. Transportation	☐
b. Warehousing	☐
c. Packaging	☐
d. Documentation	☐
e. Value Added Services	☐
f. All of the above	☐

Part-B

Based on your recent experiences, please rate (v)the level of satisfactionfrom your logistics service providers on the following service quality issues on the given scale of 1 to 5.

1	2	3	4	5
Extremely Dissatisfied	Dissatisfied	Neutral	Satisfied	Extremely Satisfied

Level of Satisfaction from your logistics service providers	1	2	3	4	5
1. Delivers the promised services without failure					
2. Gives prompt service					
3. Delivers the right product to the right place					
4. Delivers goods without loss or damage					
5. Delivers goods on scheduled date/time					
6. Shows consistency in services					
7. Handles trade documents effectively					
8. Having sufficient temporary or permanent storage capacity					
9. Gives adequate importance to your inventory controls					
10. Availability of fleet and physical facility					
11. Fleet and physical facility are modern and always function properly					
12. Availability of physical equipment's like Pallets, trolleys, forklifts etc.					
13. Availability of adequate workforce					
14. Geographical reach and network coverage					

15. Financial stability					
16. Adequate, maintained and updated IT infrastructure					
17. Manages reverse logistics					
18. Information communicated by logistics service provider is adequate					
19. Information communicated by logistics service providers is accurate					
20. Information communicated by logistics service providers is timely					
21. Information communicated by logistics service providers is complete					
22. Information communicated by logistics service providers is reliable					
23. Application of IT and EDI in customer service					
24. Tracking and tracing of shipments					
25. Makes an effort to understand my situation					
26. Easily accessible when needed					
27. Shows positive attitude while dealing					
28. Maintains courteous behavior while dealing					
29. Maintains confidentiality in all operations					
30. Handles queries and complaints effectively					
31. The product knowledge and experience of logistics service provider is adequate					
32. Builds mutual relationship and trust					
33. Offers me services that satisfy my specific needs					
34. Accommodates my changing or urgent requirements					

35. Shows concern towards environment					
36. Shows creativity in its methods of operations					
37. Tries out new ideas frequently					
38. Seeks out new ways to do things					
39. My logistics service provider is often the first to initiate with new services					

Kindly rate the following statements related to the customer satisfaction from logistics service providers on the given scale of 1 to 5.

1	2	3	4	5
Extremely Dissatisfied	Dissatisfied	Neutral	Satisfied	Extremely Satisfied

Customer Satisfaction & Loyalty	1	2	3	4	5
40. We are satisfied with the fleet, facilities and other physical infrastructures of the logistics service provider					
41. We are satisfied with the management and employees of the logistics service provider					
42. We are satisfied with the processes or operations of the logistics service providers					
43. We are satisfied with the overall service quality of logistics service provider					
44. We are delighted with our relationship with the logistics service provider					
45. We will continue the relationship with our present logistics service providers as long as possible					
46. We will outsource more activities to our logistics service providers in the coming years					

47. We are likely to recommend our logistics service providers to other organizations					
48. We are committed to the relationship with logistics service providers					

Name your current logistics service providers

.....

.....

Thanks for your valuable time and support.

Annexure II



OM LOGISTICS LTD.
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130, Punjabi Bagh, (T.C.), Ring Road, New Delhi – 110035 Ph. : 011-25970200, 28316500 Fax : 011-28316533 / 34
E-mail : omgroup@omlogistics.co.in Website : www.omlogistics.co.in

Dear Ms. Anchal Gupta
Research Scholar
Delhi Technological University

This is with reference to your application seeking permission to write a case study on our organization.

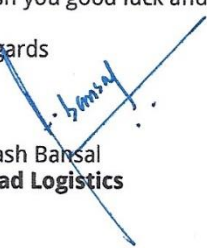
It gives us great pleasure to learn that you are perusing research in the area of Service Quality Issues of Indian Logistics Service Providers and to study its impact, you have chosen to study us.

We shall be happy to contribute to your research work and hereby accord our consent and confirm of not having any objection regarding this study conducted.

Further, should you wish to seek any details about us, please feel free to contact.

Wish you good luck and success for your research

Regards


Akash Bansal
Head Logistics

Express and Logistics Services with Safety, Security & Sincerity

Annexure III

Service Quality Dimensions for Logistics Providers from Literature Review

S.No	Dimensions	Relevance to LSPs	Author	Measurement Aspect
1.	Reliability	Ability to perform the promised service without failure	Jothimani et al. (2014), Juga et al. (2010), Dabholkar et al. (2000), Franceschini et al. (2000), , Ghobadian (1994), Parasuraman et al. (1985, 1988	Qualitative and Quantitative
2.	Responsiveness	Ability to respond faster to customers in delivering goods	Jothimani et al. (2014), Yeung et al. (2012), Philip and Hazlett (1997), Ghobadian (1994), Farmer (1988), Parasuraman et al.(1985,1988),	Qualitative and Quantitative
3.	Accuracy	Ability to deliver the right product to the right place and at right time.	Yeung et al.(2012), Stank et al.(2003), Mentzer et al.(2001), Franceschini et al.(2000),	Quantitative
4.	Process Flexibility	Ability to change in processes as per customer requirements	Jothimani et al.(2014), Huo et al.(2008), Dabholkar et al. (2000), Franceschini et al.(2000), Farmer (1988), Gronroos(1988)	Qualitative
5.	Cost optimization	The cost paid to LSPs for their services	Jothimani et al.(2014), Juntunen et al.(2014), Yeung et al.(2012), Huo et al.(2008), Stank et al.(2003),	Quantitative
6.	Assurance	Ability to Deliver goods without damage	Markovic(2006), Stank et al.(2003), Mentzer et al.(2001), Philip and Hazlett(1997), Vandamme et al.(1993), Parasuraman et al.(1985, 1988)	Qualitative
7.	Response Time	Ability to respond back to customers for their queries	Juga et al.(2010), Janda et al.(2002), Ghobadian (1994), Gronroos (1988), Parasuraman et al. (1985)	Qualitative
8.	Mutual Trust and Relationship	Understanding and trust among business partners for successful transactions	Ravi et al. (2015), Forslund(2012), Nain et al.(2010)	Qualitative

9.	Credibility	Answerable to customers for any act	Ghobadian(1994), Parasuraman et al.(1985)	Qualitative
10.	Skilled Manpower	Equipped with adequate number of trained personnel	Juga et al.(2010), Hamdan et al.(2008)	Qualitative and Quantitative
11.	Infrastructure	Adequate number of fleet and facility available to LSPs	Hamdan et al.(2008), Farmer(1988)	Qualitative and Quantitative
12.	Capacity	Ability to handle volume business of customers	Juga et al.(2010), Farmer(1988)	Qualitative and Quantitative
13.	Network/geographical coverage	Wide area coverage i.e. domestic and global	Kayakutlu et al.(2011), Wong et al.(2010)	Quantitative
14.	Corporate Image/Reputation	Image of LSPs in market place	Juntunen et al.(2014), Lam and Zhang(1999), Gronroos(1988)	Qualitative
15	Empathy	Ability to understand problem as own issue and take appropriate steps to resolve	Philip and Hazlett(1997), Saleh and Ryan(1991), Parasuraman et al.(1988)	Qualitative
16	Technology Adoption	Ability to upgrade services with latest tools and technologies	Gronroos(1988), Evangelista et al. (2015)	Qualitative
17	Safety	Ability to deliver products safely	Ghobadian et al.(1994)	Qualitative and Quantitative
18	IT Support	Equipped with latest technologies and software's	Juga et al.(2010), Hamdan et al.(2008)	Qualitative
19	Communication	Capability of informing and updating customers for all movements	Farmer(1988), Ghobadian(1994), Parasuraman et al.(1985)	Qualitative
20	Trustworthiness	Faith on LSPs services	Gronroos(1988)	Qualitative
21	Courtesy	Respect, comfort level, politeness and friendliness shown to customers	Ghobadian(1994), Parasuraman et al.(1985)	Qualitative

22	Consistency	Symmetry in deliverables and overall performance	Huo et al.(2008)	Qualitative and Quantitative
23	Integrated Logistics Management	Coordinating and integrating all logistics activities among different channel partners	Huang et al. (2014), Jiang et al.(2014), Sakun (2011), Tezuka (2011), Jayaram et al.(2010), Faisal et al.(2006)	Qualitative and Quantitative
24	Creativity	Ability to fulfill unexpected and unusual consumer needs	Yeung et al.(2012), Busse and Wallenburg, (2011)	Qualitative
25	Customization	Ability to modify services to cater individual needs	Yeung et al.(2012), Ghobadian(1994)	Qualitative
26	Innovation Capability	Serving customers with creative and customized services	Busse and Wallenburg, (2011), Huo et al.(2008), Farmer(1988)	Qualitative
27	Resource Optimization	Ability to optimize the available scarce resources with clients	Kaynak et al.(2014), Sahay et al.(2006), Ellinger et al.(1997), Parasuraman et al.(1985)	Qualitative and Quantitative
28	Politeness	Behavioral aspect of LSPs when dealing with customers	Farmer(1988)	Qualitative
29	Information Quality	Frequency and quality of content provided to customer	Janda et al.(2002), Mentzer et al.(2001)	Qualitative and quantitative
30	Personnel Contact Quality	All behavioral aspects like politeness, courtesy, respect shown to customer while dealing	Juga et al.(2010), Mentzer et al.(2001), Dabholkar et al.(1996), Vandamme and Leunis(1993)	Qualitative
31	Tangibles	Appearance of physical facilities, equipment and personnel	Philip and Hazlett (1997), Ghobadian (1994), Knuston et al.(1990), Parasuraman et al. (1985, 1988)	Qualitative
32	Completeness	Number of full orders completed on time	Franceschini et al.(2000)	Qualitative
33	Competence	Those qualities/assets/strengths of LSPs which	Huo et al.(2008), Stank et al. (2003), Ghobadian (1994), Parasuraman et al.(1985)	Qualitative and

		helps them to differentiate from others		Quantitative
34	Timely Delivery	Ability to deliver goods on time	Yeung et al.(2012), Juga et al.(2010), Huo et al.(2008), Mentzer et al.(2001), Farmer(1988)	Quantitative
35	Handling Complaints	Ability to handle complaints effectively	Mentzer et al. (1999, 2001), Farmer(1988),	Qualitative

Annexure IV

Data Analysis using TOPSIS

Table I: Aggregated Normalized and Weighted Fuzzy Matrix for ABC

ABC																																																							
Weights	.088	.088	.088	.073	.073	.073	.041	.041	.041	.055	.055	.055	.064	.064	.064	.077	.077	.077	.036	.036	.036	.041	.041	0	.041	.051	.051	.051	.051	0.104	0.104	0.104	.097	.097	.097	.065	.065	0.065	.007	.007	.007	.055	.055	.055	.047	.047	.047	.065	.065	.065	.033	.033	.033		
		REL			RES			ASS			INF			MAN			NTW			CAP			COST				IT			IQ				RT			FLEX			INN			TECH			ILM			MTR			RO			
Aggregate	3.00	6.33	11	1.00	5.67	9.00	5.00	7.67	11.00	3.00	5.67	9.00	5	8.33	11.00	5.00	7.67	11.00	5.00	7.67	11.00	5.00	7.67	11.00	3.00	7.00	11.00	3.00	6.33	9.00	1.00	5.00	9.00	1.00	5.00	9.00	1.00	5.00	9.00	1.00	5.00	9.00	1.00	5.00	9.00	1.00	5.00	9.00	1.00	5.00	9.00	1.00	5.00	9.00	1.00
Normalized	0.09	0.16	.33	0.11	0.18	1.00	0.09	0.13	0.20	0.11	0.18	0.33	.09	0.12	0.20	0.09	0.13	0.20	0.09	0.13	0.20	0.09	0.13	0.20	0.09	0.14	0.33	0.11	0.16	0.33	0.11	0.20	1.00	0.11	0.20	1.00	0.11	0.20	1.00	0.11	0.20	1.00	0.11	0.20	1.00	0.11	0.20	1.00	0.16	0.33	0.09	0.14	0.33		
Weighted	.01	0.01	.03	0.01	0.01	0.07	0.00	0.01	0.01	0.01	0.01	0.02	.01	0.01	0.01	0.01	0.01	0.02	0.00	0.00	0.01	0.00	0.01	0.01	0.01	0.00	0.01	0.02	0.01	0.02	0.03	0.01	0.02	0.10	0.01	0.01	0.07	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.00	0.00	0.01		
A*(sqrt)	0.02			0.04		0.01		0.01			.01		0.01			0.01		0.01			0.01			0.01		0.01		0.02		0.06			0.04		0.00		0.01			0.01			0.01			0.01			0.01						
A-(sqrt)	0.98			0.97		0.99		0.99			0.99		0.99			0.99		0.99			0.99			0.99		0.99		0.98		0.96			0.97		1.00		0.99			0.99			0.99			0.99			0.99						

Table II: Aggregated Normalized and Weighted fuzzy matrix for PQR

PQR																																																			
	PQR																																																		
Weights	.088	.088	.088	.073	.073	.073	.041	.041	.041	.055	.055	.055	.064	.064	.064	.077	.077	.077	.036	.036	.036	.041	0	.041	.051	.051	.051	.0104	.0104	.0104	.097	.097	.097	.065	.065	.065	.007	.007	.007	.055	.055	.055	.047	.047	.047	.065	.065	.065	.033	.033	.033
		REL			RES			ASS			INF			MAN			NTW			CAP			COST			IT			IQ			RT			FLEX			INN			TECH			ILM			MTR			RO	
Aggregate	5.000	7.667	11.000	3.000	7.000	11.000	5.000	7.667	11.000	1.000	6.333	11.000	5.000	7.000	9.000	5.000	7.667	11.000	5.000	8.333	11.000	7.000	9.000	11.000	3.000	7.667	11.000	3.000	6.333	9.000	3.000	7.000	11.000	1.000	6.333	11.000	1.000	5.667	9.000	3.000	6.333	9.000	5.000	8.333	11.000	5.000	8.333	11.000	3.000	7.000	11.000
Normalized	0.091	0.130	0.200	0.091	0.143	0.333	0.091	0.130	0.200	0.091	0.158	1.000	0.111	0.143	0.200	0.091	0.130	0.200	0.091	0.120	0.200	0.091	0.111	0.143	0.091	0.130	0.333	0.111	0.158	0.333	0.091	0.143	0.333	0.091	0.158	1.000	0.111	0.176	1.000	0.111	0.158	0.333	0.091	0.120	0.200	0.091	0.120	0.200	0.091	0.143	0.333
Weighted	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	
A*(sqrt)	0.01			0.02			0.01			0.03			0.01			0.01			0.01			0.00			0.01			0.02			0.02			0.04			0.00			0.01			0.01			0.01			0.01		
A-(sqrt)	0.99			0.99			0.99			0.98			0.99			0.99			1.00			1.00			0.99			0.98			0.98			0.97			1.00			0.99			0.99			0.99			0.99		

Table III: Aggregated Normalized and Weighted fuzzy matrix for XYZ

XYZ																																																				
Weights	.088	.088	.088	.073	.073	.073	.041	.041	.041	.055	.055	.055	.064	.064	.064	.077	.077	.077	.036	.036	.036	.041	.041	0	.041	.051	.051	.051	.104	.104	.104	.097	.097	.097	.065	.065	.065	.007	.007	.007	.055	.055	.055	.047	.047	.047	.065	.065	.065	.033	.033	.033
		REL			RES			ASS			INF			MAN			NTW			CAP			COST			IT			IQ			RT			FLEX			INN			TECH			ILM			MTR			RO		
Aggregate	3	7	11	3	7	11	3	7	11	3	6.33	9	5	7.67	11	3	7	11	3	7.7	11.0	5.0	7.0	9.0	3.0	6.3	9.0	3.0	6.3	9	3	7	11	1	4.33	7.00	1.00	5.00	9.00	3.00	5.67	9.00	5.00	7.67	11.00	3.00	6.33	9	5	7	9	
Normalized	0.09	0.14	0.33	0.09	0.14	0.33	0.09	0.14	0.33	0.11	0.16	0.33	0.09	0.13	0.20	0.09	0.14	0.33	0.09	0.13	0.33	0.11	0.14	0.20	0.11	0.16	0.33	0.11	0.16	0.33	0.09	0.14	0.33	0.14	0.23	1.00	0.11	0.20	1	0.11	0.18	0.33	0.09	0.13	0.20	0.11	0.16	0.33	0.11	0.14	0.20	
Weighted	0.01	0.01	0.03	0.01	0.01	0.02	0.00	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.03	0.00	0.00	0.01	0.00	0.01	0.01	0.01	0.01	0.02	0.01	0.02	0.03	0.01	0.01	0.03	0.01	0.02	0.07	0.00	0.00	0.01	0.01	0.01	0.02	0.00	0.01	0.01	0.02	0.00	0.00	0.01			
A*(sqrt)	0.02			0.02			0.01			0.01			0.01			0.02			0.01			0.01			0.01			0.02			0.02			0.04			0.00			0.01			0.01			0.01			0.01			
A-(sqrt)	0.98			0.99			0.99			0.99			0.99			0.99			0.99			0.99			0.99			0.98			0.98			0.97			1.00			0.99			0.99			0.99			1.00			

Annexure V

List of Publications from the Research Work

(i) List of Papers Published in International Journals

1. Gupta, A., Singh, R. K., &Suri, P. K. (2020). **Prioritizing Best Practices for Logistics Service Providers.** In *Transforming Organizations Through Flexible Systems Management* (pp. 257-275). Springer, Singapore.
2. Gupta, A., Singh, R. K., &Suri, P. K. (2018). **Analysis of Challenges Faced by Indian Logistics Service Providers.** *Operations and Supply Chain Management-An International Journal*, 11(4), 214-225.
3. Gupta, A., Singh, R. K., &Suri, P. K. (2018). **Prioritizing Critical Success Factors for Sustainable Service Quality Management by Logistics Service Providers.** *Vision*, 22(3), 295-305.
4. Gupta, A., Singh, R. K., &Suri, P. K. (2018). **Sustainable Service Quality Management by Logistics Service Providers: An Indian Perspective.** *Global Business Review*, 19(3_suppl), S130-S150.
5. Gupta, A., Singh, R. K., &Suri, P. K. (2017). **Prioritizing the factors for analyzing service quality of 3PL: AHP approach.** *Asia-Pacific Journal of Management Research and Innovation*, 13(1-2), 34-42.
6. Gupta, A., Singh, R. K., &Suri, P. K. (2015). **Study of Best Practices and Challenges for Logistics Providers in India.** *International Journal of Advance Research and Innovation*, 3(1), 397-403.

(ii) **List of Papers Presented/ Published in Conferences**

1. Presented a paper titled “Analytics based decision making framework for selection of logistics service provider in International Conference on Business Analytics and Operations Research, CARAMS, Department of Statistics, Manipal, Karnataka on June 14-16, 2019.
2. Presented a paper titled “**Ranking of Best Practices of Logistics Service Providers by using Fuzzy AHP**” in GLOGIFT Conference at DSM, DTU on 11-13 December, 2017.
3. Presented a paper titled “**Modeling the Barriers of Indian Logistics Service Providers: ISM Approach**” for 7th International Conference on Restructuring of the Global Economy, 3-4th July 2017, University of Oxford, UK.
 - Published a paper titled “**Modeling the Barriers of Indian Logistics Service Providers: ISM Approach**” in the proceedings titled The Business and Management Review, Volume 9, Number 1, pp. 373-384, July 2017.
4. Presented and abstract published of a paper titled “**Study of Best Practices and challenges for Logistics Providers in India**” at International Conference of Advance Research and Innovation (ICARI 2015) at Delhi State Centre, Institution of Engineers (India) on 31st January, 2015.