EVALUATION OF SERVICE QUALITY PRACTICES IN INDIAN AIRLINES BY DEVELOPING 'FliQual'

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MANAGEMENT

By

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DECLARATION

I, SUBAS CHANDRA MAHAPATRA, hereby declare that this thesis entitled, "Evaluation of Service Quality Practices in Indian Airlines by Developing Fliqual" submitted by me under the guidance and supervision of Prof. B. RAJA SHEKHAR is a bonafide research work which is also free from plagiarism. I also declare that it has not been submitted previously in part or in full to this University or any other University or Institution for the award of any degree or diploma. I hereby agree that my thesis can be deposited in Shodganga/INFLIBNET.

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Signature of the Supervisor
(Prof. B. RAJA SHEKHAR)

Dean of the School

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ABSTRACT

To experiencing quality services has become a fundamental right of customers, as it otherwise poses threats to the sustainability of service provider in this dynamic market. This intriguing pervasiveness of service industry placed the researcher, to provide earnest and comprehensive research findings by worth pursuit and continuous effort. The service industry solely contributes over 70-90 % (80 percent work force) and above 50% (40 percent work force) of GDP in developed and developing world respectively. So it attracts the researcher to clinically and analytically examine the aspects and features of the services. Again the Airline, the sole gateway in world accession, high growth prospects to serve passengers in dynamic and sharp competitive service market is making the tasks of analysis more important in its service ingredients. An overarching purpose to study this, to explore a common passengers' question whether quality service is his right, needs or desires. Initiating from basic to essential, to hedonic pleasure, business to luxurious leisure, air passenger has experienced his outcomes, about highly satisfactory or desert one. Though the organizations have endeavored to deliver best service quality, the question arises why not all service providers have succeeded in doing so.

Because service quality is highly subjective, it implies lack of clarity, ambiguity with divergent views on its valid psychometric measures for passenger service quality, it had needed the study. Hence, it is an attempt to develop and validate the tool to evaluate service quality from passenger perspective. Due to subjective characters and vagueness, fuzzy approach was used to compare the earlier results.

This research, has initiated through accumulation of knowledge base on an airline, and its services. The primary objective of this thesis is to investigate the relationship between airline service quality, passenger loyalty, punctuality and other service factors like pre-post airport service and safety & security related service of Indian airlines. The objective of the study was: (1) to categorize passenger service quality dimensions and its attribute to construct 'FliQual' measures; (2) to develop 'Fliqual' predictive model by identifying factors and their significant contribution; (3) to confirm the identified factors, by developing 'FliQual' measurement model; (4) to test the relationship between passenger service quality and loyalty, punctuality, safety and security service and pre-post airport

service; and finally (5) to find the interval of passenger service quality level using fuzzy approach.

This study has based on an empirical investigation and used both qualitative and quantitative approaches. Total 1137 valid responses were collected from air passengers using purposive sampling method in three airports of the three cities such as Hyderabad, Vizag and Bhubaneswar. Basing on psychometric scale development process, the progress was conceptualized, constructed, refined and tested the multi-item scale 'FliQual'. This scale was confirmed using confirmatory factor analysis, hence it results with 16 items, five dimensional 'FliQual' measurement model and subsequently the predictive model also tested with good fit indices. This resultant dimension has satisfied different psychometric properties with high reliability and validity. A total 15 hypotheses were proposed in this study and examined using multiple regression analysis for first five hypotheses and structural equation modeling for the remaining hypotheses. Out of them, total three hypotheses were not supported due to the passengers' necessities about the different service dimensions.

The key findings of the study emphasize that overall passenger service quality is highly related to loyalty, punctuality, pre-post airport services. Thus, service quality is contributing to the passenger loyalty. Furthermore the indirect impact of service quality through punctuality and pre-post airport services on loyalty supported. Again, the relationship between extracted factors are unclear, hence the fuzzy approach is used to find their respective importantnce. This study provides and empirical assessment of the relationship between attributes towards the dimensions and the importance of each dimension to the overall service quality in airlines. The limitation of the research is explained and the potential for future research in the sector are suggested like extending this study to the other sectors, conducting comparative study across airports and airlines to standardized 'F'liQual'.

BRIEF CONTENTS

Description	Page No.
Title Page	i
Declaration	ii
Certificate	iii
Acknowledge	iv
Brief Contents	vii
Contents	viii
List of Tables	xii
List of Figures	xvi
Abbreviations	xviii
Abstract	xx
CHAPTER 1: INTRODUCTION	01-28
CHAPTER 2: LITERATURE REVIEW	29-71
CHAPTER 3: RESEARCH METHODOLOGY	72-95
CHAPTER 4: DATA ANALYSIS	96-194
Section I: Development of 'Fliqual' Predictive Model	116-137
Section II: Development of 'FliQual' Measurement Model	138-162
Section III: Development of Structural Models	163-184
Section IV: Confirmation of 'FliQual' on Fuzzy Approach	185-194
CHAPTER 5: SUMMARY AND CONCLUSION	195-212
REFERENCES	213-234
APPENDICES	a-f

CONTENTS

		Description	Page No.
	CHAPTER- I	**INTRODUCTION**	**01-28**
1.1		Introduction	02
1.2		Transport and Its Brief History	03
1.3		Classification of Transportation	04
	1.3.1	Air Transport	05
1.4		Subsectors of Transport	06
1.5		Importance of Transportation	06
1.6		Functions of Transportation	07
1.7		Indian Scenario of Transportation	08
1.8		Economic Impact of Transportation	09
1.9		Challenges	10
1.10		Key Government Strategies	10
1.11		Aviation Industry	11
	1.11.1	Classification of Aviation Industry	12
	1.11.2	Key Drivers for Aviation Sector	15
	1.11.3	Aviation in Developing Countries	16
1.12		Indian Airlines	18
1.13		Need to Change for Indian Airlines	20
1.14		Service Quality	21
1.15		Passenger Loyalty	21
1.16		Punctuality	22
1.17		Safety and Security Services	22
1.18		Pre-post Airport Services	22
1.19		Relations among Service Quality, Loyalty, and Punctuality	23
1.14		Airlines as Service Value Chain	23
1.15		Justification of the Study	25
1. 16		Research Process	25
1.17		Structure of the Thesis	27

CHAPTER- II		**LITERATURE REVIEW**	**29-71**
2.1		Introduction	30
2.2		Services	31
	2.2.1	Types of Services	32
2.3		Structure of the Service Sector	33
2.4		Quality	34
2.5		Poor Quality and Its Impact	36
2.6		Service Quality	36
2.7		Service Quality Management	37
2.8		Services in Public Transport	39
2.9		Services for Air Passengers	45
2.10		Airport Services	53
2.11		Service Quality Dimensions in Airline Services	55
2.12		Customer Loyalty	56
2. 13		Punctuality	57
2. 14		Safety and Security Services	58
2.15		Pre-post Airport Services	58
2.16		Relationship Between Service Quality and Loyalty	59
2.17		Relationship between Service Quality and Punctuality	60
2.18		Relationship between Service Quality and Safety and Security Services	60
2.19		Relationship between Service Quality and Pre-post Airport Services	60
2.20		Relationship between Service Quality and Loyalty and Punctuality	61
2.21		SERVQUAL	62
	2.21.1	Key Dimensions of SERVQUAL	62
	2.21.2	Service Quality Gaps	62
2.22		Critics of Service Quality Models	64
2.23		Models on Airlines	66
	2.23.1	Hub-and-Spoke Network	66
	2.23.2	Utility-Based Model	66

	2.23.3	Passenger Traffic Demand Model (PTD Model)	67
2.24		Various Competing Models	67
2.25		Research Gap	70
2.26		Conclusion	71
CHAPTER- III		**RESEARCH METHODOLOGY**	**72-95**
3.1		Introduction	73
3.2		Statement of the Problem	74
3.3		Significance of the Study	75
3.4		Research Questions	76
3.5		Research Objectives	77
3.6		Research Hypotheses	78
3.7		Research Design and Methodology	80
	3.7.1	Research Design	80
	3.7.2	Research Method	81
3.8		Data Collection Tool	81
3.9		Reliability and Validity Estimation	82
3.10		Sampling Strategy	82
	3.10.1	Why Purposive Sampling?	83
	3.10.2	Determining Sample Size	83
	3.10.3	Perceived Target Population	84
	3.10.4	Working Population	84
	3.10.5	Sampling Method	84
	3.10.6	Sample size	85
	3.10.7	Sample Discarded Procedure	86
	3.10.8	Sample Justification	87
3.11		Data Analysis and Interpretation	88
	3.11.1	Exploratory Factor Analysis (EFA)	89
	3.11.2	Confirmatory Factor Analysis (CFA)	89
	3.11.3	Various Fit Indices	90
3.12		Validity of Measurement	91
3.13		Multigroup Analysis	91

3.14		Structural Equation Modeling (SEM)	92
3.15		Fuzzy Numbers	92
3.16		Defuzzification	94
3.17		Fuzzy Delphi Method	95
3.18		Conclusion	95
CHAPTER- IV		**DATA ANALYSIS**	**96-194**
4.1		Introduction	97
4.2		Development of 'FliQual'	100
	4.2.1	Standardized of Measure	103
	4.2.2	Construct of Framework and Definition	104
	4.2.3	Generating Sample of Variables (Initial Item Pool)	104
	4.2.4 A	Deductive Approach of Variable Generation	105
	4.2.4 A (I)	Perceived Service Quality	106
	4.2.4A (II)	Punctuality	106
	4.2.4 A (III)	Safety and Security Services	106
	4.2.4 A (IV)	Loyalty Services	107
	4.2.4 A (V)	Pre-post Airport Services	107
	4.2 4. B	Inductive Attribute Generation	108
	4.2.5	Items Review	109
	4.2.6	Questionnaire Development	110
	4.2.7	Pilot Testing	111
	4.2.8	Instrument Purification	113
	4.2.9	Conclusion	115
	Section 1	**Development of FliQual Predictive Model**	**116-137**
4.3		Introduction	116
	4.3.1	Survey for Data Collection	116
	4.3.2	Preliminary Observation of Data	118
	4.3.3	Descriptive Analysis	118
	4.3.4	Sample Adequacy	119
	4.3.5	Inter-Item Correlation	120

	4.3.6.1	Inclusiveness of Items(through Individual KMO values)	120
	4.3.6.2	Inclusiveness of Items (through correlation values)	121
	4.3.7	Exploratory Factor Analysis	121
	4.3.8	Number of Factors to Extract	121
	4.3.8 (I)	Kaiser's Criterion	122
	4.3.8 (II)	Catell's Scree Criterion	123
	4.3.8 (III)	Prior Criterion	123
	4.3.9	Method for Factor Extraction	124
	4.3.10	Method of Rotation	126
	4.3.11	Interpretation of Factor Matrix	126
	4.3.12	Extracted Factors	127
	4.3.13	Reliability of 'FliQual' Predictive Model	128
	4.3.14	Validity of 'FliQual'	130
	4.3.15	Multiple Regression Analysis	132
	4.3.16	Importance of the Factors	134
	4.3.17	Results of Hypotheses Testing	134
	4.3.18	Conclusion	137
	Section 2	**Development Of 'Fliqual' Measurement Model**	**138-162**
4.4		Introduction	138
	4.4.1	Preliminary Observation of the Data	139
	4.4.1 (I)	Estimation of Normality	139
	4.4.1 (II)	Linearity Test	140
	4.4.1 (III)	Identification of Outlier	140
	4.4.1 (IV)	Homoscedasticity of Variables	140
	4.4.2	'FliQual' Measurement Model	142
	4.4.2.1	CFA for Availability and Accessible Service (ASF1)	142
	4.4.2.2	CFA for Staff Service (ASF2)	143
	4.4.2.3	CFA for Employees' Courteous (CTF3)	144
	4.4.2.4	CFA for Food and Beverage Services (FBF4)	146
	4.4.2.5	CFA for Updated Technical Services (UTF4)	147

4.4.3	'FliQual' First Order Measurement Model	147
4.4.4	Comparative Study on 'FliQual' Predictive and Measurement Model	150
4.4.5	Various Proposed 'FliQual' Models and Their Comparison	151
4.4.6	Reliability and Validity of 'FliQual' Model	155
4.4.6.1	Reliability of 'FliQual' model	155
4.4.6.2	Face Validity and Convergent Validity	155
4.4.6.3	Discriminant Validity	157
4.4.6.4	Nomological Validity	158
4.4.6.5	Criterion Validity	159
4.4.7	Replication and Generalization of 'FliQual' Model	159
4.4.7.1	Loose Cross Validation	160
4.4.7.2	Tight Cross Validation	161
4.4.8	Conclusion	162
Section 3	**Development Of 'Fliqual' Structural Model**	**163-184**
4.5. 1	Confirmatory Factor Analysis of Latent Constructs	163
4.5.1.1	CFA of Passengers' LOYAL	163
4.5.1.2	CFA of Punctual Services (PUNS)	164
4.5.1.3	CFA of Pre-post Airport Services (PPAS)	166
4.5.1.4	CFA of Safety and Security Services (SSSR)	167
4.5.2	Measurement Model of Latent Constructs	168
4.5.3	Validity and Reliability of the Measurement Model of Latent Constructs	171
4.5.4	Multicollinearity Test	171
4.5.5	Identification of Competing Structural Model	172
4.5.6	Competing Models Review	174
4.5.7	Selection of Best Competing Model	177
4.5.8	The Research Model (M5)	178
4.5.9	Total Effect of APPSQ, PUNS on Passenger LOYAL	180
4.5.10	Results of Hypothesis Testing	181
4.5.11	Conclusion	184

	Section 4	**Confirmation of 'FliQual' with Fuzzy Approach**	**185-194**
	4.6.1	Introduction	185
	4.6.2	Fuzzy Algebraic Operation	186
	4.6.3	Fuzzy Delphi Process	186
	4.6.4	Steps Followed in the Fuzzy Process	187
	4.6.5	Expert Consultations	188
	4.6.6	Membership Functions	192
	4.6.7	Conclusion	194
CHAPTER- V		**SUMMARY AND CONCLUSION**	**195-212**
5.1		Introduction	196
5.2		Research Findings	198
5.3		Implications of the Study	201
	5.3.1	Theoretical Implications	201
	5.3.2	Managerial Implications	203
	5.3.3	Methodological Implications	205
5.4		Research Contribution	205
	5.4.1	Contribution to Academic Theory	206
	5.4.2	Contribution to Indian Airlines	206
5.5		Research Limitations	207
	5.5.1	Theoretical Limitations	207
	5.5.2	Methodological Limitations	208
5.6		Conclusion	209
5.7		Scope for Future Research	210
REFERENCES			**213-234**
APPENDICES		Appendix A: Questionnaire for the Airline Passenger	a-d
		Appendix B: List of Publications	e

LIST OF TABLES

Table No.	Description of the Table	Page No.
1.1	Transport Wise Share in India's GDP	08
1.2	Aircraft Producers	12
1.3	World's Top 11 Aviation Countries by Seats	15
1.4	Some Facts on World Aviation Sector	16
1.5	Asian Overview: top 12 Airline Markets	17
1.6	Evolution of Indian Aviation Industry	18
2.1	Difference between Goods and Services	32
2.2	Quality Gurus' & Their Contribution	34
2.3	Manufacturing vs. Service Organizations	35
2.4	Summary Service Quality Models	40
2.5	Summary of Selected Empirical studies on Public Transportation	42
2.6	Summary of Selected Empirical Studies of Service Quality in Airlines	50
2.7	Studies of Service Quality Dimensions in Airlines	52
2.8	Differences between Low Cost Carriers and Regular Carriers	55
2.9	Definition Service Quality Dimensions in Airlines	56
2.10	Pitfalls of SERVQUAL Instrument	65
3.1	Research design Vs. Research Methods	81
3.2	Sampling and Data Collection Methods	85
3.3	Sample Categorization	86
3.4	Sample Distribution	86
4.1	Purpose of Pilot Testing	112
4.2	Limitation of Pilot Study	113
4.3	Demographic Profile of Respondents	117
4.4	Descriptive Statistics of Demographics	118
4.5	Results of KMO and Bartlett's Test	120
4.5(I)	Total Variance Explained	122
4.6	Communalities of the Factors	125
4.7	Final Extracted Factors	128
4.8	Correlations between the Five Factors and the Criteria	132
4.9	Model Summary: Effect of Six Factors on Service Quality	133
4.10	ANOVA: Effect of Six Factors on Service Quality	133
4.11	Relative Importance of the Dimensions	134
4.12	Results of Hypotheses (Based on Dimension) Testing	136
4.13	Test of Homogeneity of Variance	141
4. 14	CFA Results of Availability and Accessible service	143

4.15	Fit Indices of Staff Services	144
4.16	CFA Results of Staff Services	144
4.17	Fit Indices of Employee Courteousness	145
4.18	CFA Results of Employee Courteousness	146
4.19	Model Fit Summary of First order CFA for 'FliQual'	148
4.20	Comparison in Factor Loadings for 'FliQual'	150
4.21	Comparison of Fit Statistics for 'FliQual'	154
4. 22	Convergent Validity of 'FliQual'	156
4.23	Discriminant Validity of 1st order 'FliQual' Model	157
4.24	Discriminant Validity in Terms of MSV, ASV & AVE	158
4. 25	Construct Correlations with Significance Level for Nomological Validity	159
4. 26	Reliability and validity of Model I, II and III	159
4.27	Fit Indices of various demographic profiles	161
4.28	Measurement Invariance for Males vs. Females	162
4.29	CFA Results of passenger's LOYAL	164
4.30	Fit Indices of passenger's LOYAL	164
4.31	CFA results of Punctual Services	165
4.32	Fit Indices of Punctual Services	165
4.33	CFA results of Pre-post services	166
4.34	Fit Indices of Pre-post services	167
4.35	CFA results of Safety and security Services	168
4.36	Fit Indices of Safety and security Services	168
4.37	Model Fit Summary of Measurement Model of Latent Constructs	170
4.38	Results of Measurement Model of Latent Constructs	170
4.39	Reliability and Validity of the Measurement model	171
4.40	Correlation Matrix of Independent Variables	172
4.41	Fit Statistics for 'FliQual' Structural Models	178
4.42	Parsimony Fit Statistics	178
4.43	Results for Structural Research Model	179
4.44	Indirect Hypothesized Relationships	180
4.45	Results of Hypotheses Testing	183
4.46	Conversion of Likert's Point to Fuzzy Form	188
4.47	Triangular Fuzzy Number and Rank of Factors	189
4.48	First Responses of Experts	190
4.49	Deviation in First Responses	190
4.50	Second Responses of Experts	191
4.51	Deviation in Second Responses	191

LIST OF FIGURES

Figure No.	Description of the Figure	Page No.
1.1	Sector wise Changes in World Economy	03
1.2	Different Medium of Transport	04
1.3	Global Evolution of Transport Services for Passengers	05
1.4	World Air Travel and GDP Growth, 1971 - 2010	09
1.5	Classification of Aviation Industry	13
1.6	Worldwide Airline Financial Results, 2012	14
1.7	Indian Domestic Market Share by Airline FY13	19
1.8	India's Domestic & International Airline Passenger, FY01-11	19
1. 9	Aviation Industry Value Chain	23
1.10	Flow of Passengers Services in Airlines	24
1.11	Structure of the Thesis	26
2.1	Conceptual Model of Service Quality	63
2.5	Direct Model (M1)	68
2.6	Indirect Model	68
2.7	Indirect Model (M3)	68
2.8	Research Model (M4)	68
2.9	Research Model (M5)	69
3.1	Order of Research Activities	74
3.2	Predictive Model (M 1)	79
3.3	Theoretical Model (M 2)	79
3.4	Sample Categorization	83
3.5	International Passenger Handled by Indian Airports FY2011	84
3.6	Triangular Fuzzy Number 'A'	93
3.7	Trapezoidal Fuzzy Number	93
4.1	Classification of Data Analysis	99
4.2	Stages for Scale Development	102
4.3	Deductive Reasoning	105
4.4	Inductive Reasoning	108
4.7	Scree Plot	123

4.8	Component Plot in Rotated Space	124
4.9	Types of Validity	130
4.10	CFA of Availability and Accessible service	142
4.11	CFA for Staff services (ASF1)	144
4.12	CFA for Employees' Courteous (CTF3)	145
4.13	CFA Model for Food and Beverages Services (FBF4)	146
4.14	CFA Model for Updated Technical Services (UTF5)	147
4.15	First Order Hypothesized Model for 'FliQual'	148
4.16	First Order Measurement Model for 'Fliqual'	149
4.17	First Order Measurement Model with Single Factor for 'Fliqual' (MI)	152
4.18	'FliQual' 2nd-Order CFA Model (MII)	153
4.19	'FliQual' 3rd-Order CFA Model (MIII)	153
4.20	CFA model for passengers' LOYAL	164
4.21	CFA model for Punctual Services	165
4.22	CFA model for Pre-post Airport Services	166
4.23	CFA model for Safety and security Services	167
4.24	Measurement Model for Latent Constructs (Unstandardized Estimation)	169
4.25	Measurement Model for Latent Constructs (Standardized Estimation)	169
4.26	Competing Models	173
4.27	Direct Path Model (M1)	174
4.28	Indirect Path Model	175
4.29	First Research Model (M4)	176
4.30	Second Research Model (M5)	177
4.31	Responses Triangular Fuzzy Average	192
4.32	Closeness between Two Responses	192

ABBREVIATIONS

AAI	Airport Authority Of India
ACI	Airports Council International
AD	Anno Domini
AEA	Association Of European Airlines
AGFI	Adjusted Goodness of Fit Index
AHP	Analytical Hierarchy Process
AIR	All India Rank
AL	Airline
AMOS	Analysis of Moment Structures
APA	American Psychological Association
APPSQ	Air Passenger Perceived Service Quality
APS	Airport Services
APTA	American Public Transportation Association
ARS	Airline Services
ASF	Availability And Accessibility
ASI	Aeronautical Systems, Inc.
ASK	Available Seat Kilometers
ASV	Average Variance Extracted
ATAG	Air Transport Action Group
ATCR	Air Travel Consumer Report
ATF	Aviation Turbine Fuels
AVE	Average Variance Extracted
BK	Booking Facilities
CAGR	Compound Annual Growth Rate
CAPA	Center For Asia Pacific Aviation
CE	Civil Enclave
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index

CISF	Central Industrial Security Force
COA	Center of Area
CR	Construct Reliability
CR	Critical Ratio
CT	Courteousness Employees
CUSS	Common Use Self-Service Technology
CUTE	Common User Terminal Equipment
D	Domestic
DOTS	Department of Transportation
EFA	Exploratory Factor Analysis
EFS	Employee Form Services
FA	Factor Analysis
FB	Food and Beverages
FDI	Foreign Direct Investment
FDT	Fuzzy Delphi Technique
FGD	Focus Group Discussion
FliQual	Flight Quality
FQ	Functional Quality
FRT rail	Freight Rail
FY	Financial Year
GA	General Aviation
GDP	Gross Domestic Product
GFI	Goodness of Fit Index
GMR	G M Rao Group of Companies
GOF	Goodness of Fit Index
HDM	Height of Defuzzification Method
I	International
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization

IFI	Incremental Fit Indices
IT	Information Technology
KMO	Kaiser-Meyer-Olkin
L/ D	Landing Or Departure
LCC	Low Cost Carrier
LDV	Light Duty Vehicle
LI	Limited International
LISREL	Linear Structural Relations
LOYAL	Loyalty
LTS	Loyalty Services
M I	First Order Measurement model
M II	Second Order Measurement model
M III	Third Order Measurement Model
M1	Direct Path Model
M2	First Indirect Path Model
M3	Second Indirect Path Model
M4	First Research Model
M5	Second Research Model
MATLAB	Matrix Laboratory
MCA	Ministry Of Civil Aviation
MMT	Million Metric Ton
MOM	Mean of Maximum
MPH	Miles Per Hour
MRO	Maintenance, Repair And Overhaul
MSV	Maximum Shared Variance
NFI	Normed Fit Index
Obs	Observation
OECD	Organization For Economic Cooperation And Development
OLS	Ordinary Least Squares Regression

PAX rail	Passenger Rail
PCA	Principal Component Analysis
PGFI	Parsimony Goodness-Of –Fit Index
PNFI	Parsimony Normed Fit Index
PPAS	Pre and Post Airport Services
PR	Parsimony Ratio
PTD	Passenger Traffic Demand
PUNS	Punctuality
RFI	Relative Fit Index
RMSEA	Route Mean Square Error of Approximation
ROA	Return On Assets
ROS	Return On Sales
RPK	Revenue Passengers Kilometers
SA	Self-Administered Questionnaire
SD	Standard Deviation
SEM	Structural Equation Modeling
SERVQUAL	Service Quality
SPSS	Statistical Package For Social Science
SS	Staff Services
SSSR	Safety and Security Services
TFN	Triangular Fuzzy Number
TLI	Trucker Lewis Index
TOPSIS	Technique for Order Preference by Similarity to Ideal Solution
TQ	Technical Quality
UAV	Unmanned Aerial Vehicles
UT	Updated Technical Services
VIF	Variance Inflation Facto
WHO	World Health Organization

CHAPTER I

INTRODUCTION

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INTRODUCTION

1.1 Introduction

Transport and communication system enthralls a critical role in the economic progress and improvement of a society in a nation. A state cannot develop without an effective transportation system. Effective transportation is an indispensable part of harmless, clean and reasonable facilities towards developing a country. The system should be quick, safe, and secure to mobilize people and goods throughout the country and overseas. From a social point of view, public transportation is the only means of conveyance for the poor. From an urban perspective, this transit is more efficient than individual vehicles in view of the road uses and the energy they used to consume. Hence an efficient public transportation system can raise a quality life, connect rural to city, city to another city and even from one country to another. Thus, it creates the huge employment and boost competitiveness in the long run.

The term "Transport" has been derived from the Latin words, trans (i.e. "across") and portare (is "to carry"). Assessments of the APTA (American Public Transportation Association) that for every single dollar invested in public transport, produce more to four dollars in return. Again, APTA, 2011 also stated that in main urban areas, persons on typical save $9,656 annually after using public transport system to replace own vehicle.

Effective public transit such as Singapore, Hong Kong and Seoul, are acknowledged globally for their outstanding achievement in public transit systems. Again, smaller cities viz. Curitiba in Brazil and Lyon in France have appreciated public transit facilities systems. Newly, León in Mexico, Lagos in Nigeria, Ahmedabad in India, and even Pereira in Colombia have also advanced in their transportation systems.

International trade liberalization, and globalization system have significantly encouraged for investment in the transportation industry (Lee and Vivarelli, 2008).The new trend of the economy makes structural changes in fiscal as well as monetary policy of a country. The most projecting ones are digitized, deregulation or privatization, globalization, shifting demographics, altering industry mix, meeting wave, and commoditization of processes, and the growing importance of evolving economies (Lee and Lee, 2002).

In India, its rank is 15th in the services output and it affords employment to around 23% of the total workforce in the country. Different services of this sector are such as construction, transportation, trade, hospitality, health & tourism, telecommunication, personal services, insurance, food and beverages, financing etc. Hence the service sector contributes the most to the GDP of India about 53.8% in 2005 whereas it was 15% in 1950.

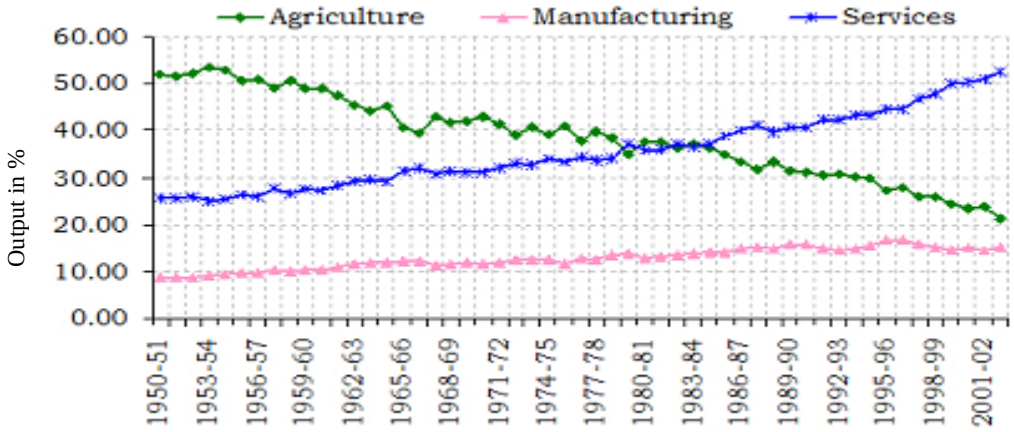

Figure 1.1 Sector wise Changes in World Economy

Source. Das (2008) in India, Science & Technology

It is important that airport infrastructure produces in anticipation of the swelling needs of the industry. As it is a capital-intensive industry, there is a noticeable need for standpoint planning with a vision for the coming 20 years and to congregate the resources of the public and private sectors, both foreign and domestic as well.

1.2 Transport and Its Brief History

It is the movement of people, animals and possessions to different places. Ways and means of transportation like air, rail, road, water, pipeline, space and cable etc. This sector can be separated in infrastructure, automobiles and operations. Transport is vital because it chains, trade among people that turn forms civilizations. The history of transportation evolved with the development of human culture. In the entire of human history the lone practice of transportation except walk was used to pet animals or minor vessels.

According to Oxford dictionary, transport is a *'means of carrying people or goods from one location to another.'* Again Merriam-Webster's dictionary has given a complete

description of transportation as a *'means of conveyance or travel from one place to another and a public transport of passengers or belongings specifically in profitable initiative.*

As the progress of trade and roads is widened for the purpose of putting up animal transportation, then to traverse, a frame used to drag loads, had developed. The Roman was substantial fair roads to spread as well as preserve their empire and to Humans' first way of transportation were walking and swimming. Inventions like the wheel and lug assisted make animal transport more effective with the including to vehicles. Again the water passage, with propelled and sailed vessels, days back to stage age-old were the only competent mode to transport for long distances before the Industrial Revolution.

1.3 Classification of Transportation

The means and ways of transportation can be divided with the means, the vehicle is used, the power used by human and stations which make convenient to move. Though these are three modes, in modern age another medium of transportation plays an important role.

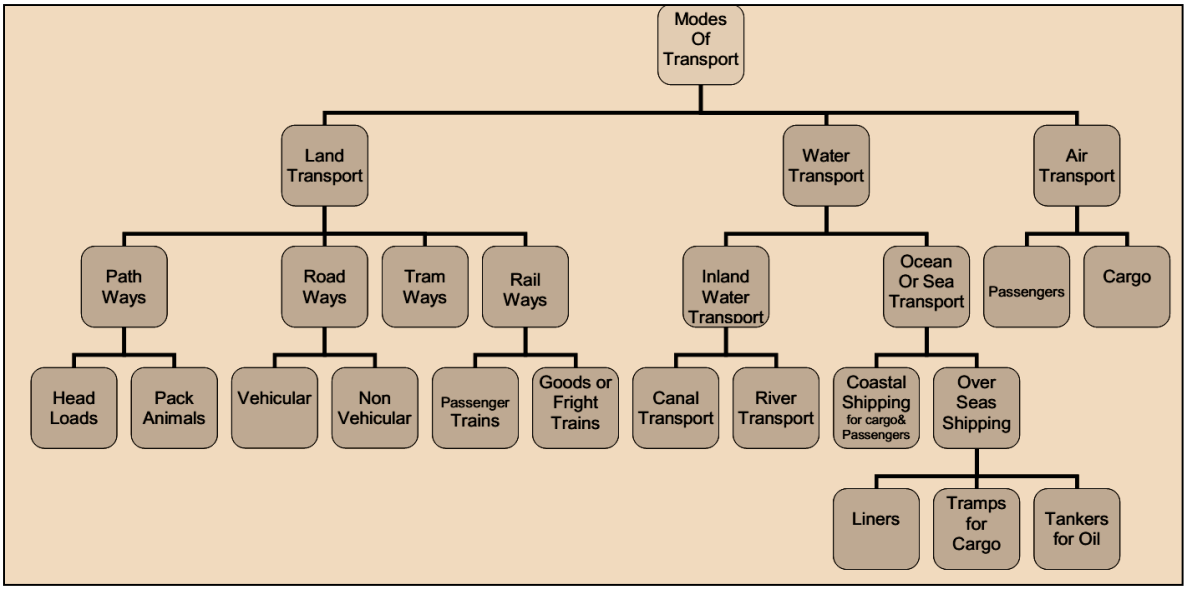

Figure 1.2 Different Medium of Transport
Source. Trivedi S. M, Sodhganga (2009)

Broadly, transportation can be categorized into the following types: Road transportation, Water transportation, Air transportation and Space transport.

1.3.1 Air Transport

The subsequent march in transport looked not into the land, or oceans, but the open sky. Though numerous people had played with the concept of flight, but the first unrelenting, controlled flight appeared on December 17, 1903, at Kitty Hawk, North Carolina. The creators of the flying machine were two Orville and Wilbur Wright brothers, as cycle makers. They invented a bicycle pushed device that later it developed into jet-propelled aircraft. Now it becomes a world-wide massive transfer. It is known as aero plane. It makes easier to travel long distances in a very little while.

The benchmark inventions in air transport are given below:

1. Leonardo da Vinci - 1st to extremely theorize for flying machines - over 100 sketches that shown his theories on flight – 1492 AD
2. The Montgolfier brothers invented, originally hot air balloons – 1783 AD
3. The Wright Brothers invented and flew the 1st engine airplane – 1903 AD
4. First helicopter – though it was failed – 1907 AD

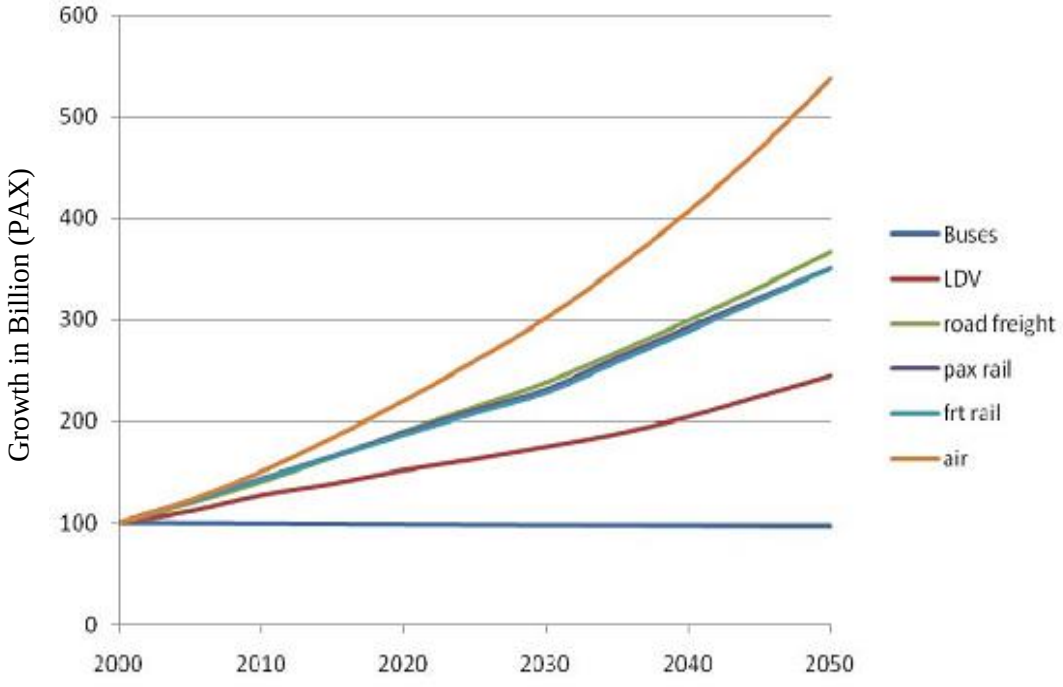

Figure 1.3 Global Evolution of Transport Services for Passengers

Source: OECD, 2010; *Note.* 2000-2050, *Note*. PAX= passenger; LDV= Light Duty vehicle

1.4 Subsectors of Transport

The transport industry consists of seven key subsectors such as followed.

Aviation: It comprises aircraft, air traffic control systems, as well as around 450 airports, 19,000 additional airports, heliports, and landing strips.

Highway Infrastructure and Motor Carrier: It incorporates around 4 million miles of roadway, nearly 600,000 bridges, and approximately 400 tunnels in 35 countries. **Maritime Transport Structure:** involves around 95,000 miles of coastline, 361 ports, and 25,000 miles of waterways, 3.4 million square miles of the Exclusive Economic Zone.

Massive Transport and Passenger Rail: It is serviced by buses, train (like passenger rail, heavy rail and light rail, long-distance rail), and other, fewer collective kinds of service (cable cars, inclined planes, funiculars)

Freight Rail: involves seven main carriers, hundreds of minor railroads, over 140,000 miles of lively railroad, 1.3 million freight cars, and 20,000 locomotives.

1.5 Importance of Transportation

A country cannot develop without development of its transportation facilities. It mobilizes resources, movement of human beings, raises the effectiveness of expertise, and helps to do the right work on right time. A developed transportation decreases regionalism with the simplifying creation of businesses in retrograde parts, as the backward area is brought nearer to developed with the support of effective transport and sending materials to the backward industrial area and selling the products of industries in diverse location.

- Transportation supports to offer economic opportunities to a society as well as a nation.
- It creates business routes as a primary structure of distribution and transaction which can be expanded by lengthy distances.
- Transportation facilities contribute to resolve the difficulties of joblessness in village by sending remaining work force to the industries and it achieves the requirements of the sector.

- Diverse machines and materials are supplied by roads, buses, trains, and planes to units. It displays that transportation of country's impacts in financial advance of a state at numerous way.
- Transportation is observed as a solid support to protect the individuals from the complications of war, natural catastrophes and other difficulties. Transfer of military apparatus, soldiers and other apparatus through established transport system during war.

1.6 Functions of Transportation

It has a variety of functions related to time, place and others. Out of these, we are to going to consider a few of them.

- It generates **time** utility: It helps transport raw materials, semi manufactured and finished goods to their respective places in time before either perished or shutdown of the unit.
- It creates **place** utility: Due to, of feasible climate and large geographical region, manufacture compels to produce his product out of the market. This different variety of transportations bridges the gap between the producer and consumer.
- Transport reliefs for **stabilization** of price. It significantly impacts to stabilize of the prices of a number of merchandises by shipping goods from excess to shortage areas.
- It empowers the consumers to relish **the benefits** of availability of products, which are not produced locally. It escalates the standard of life, becoming as essential issue with additional development of the market.
- It recognizes **competition,** results decreases prices. So prices are abridged because the services offered by transport for large-scale production.
- Transport surges **mobility of** labor and money, makes people migrate to another place for employment
- It **connects** one country too many countries and vice versa. Due to of this human mobilization is possible; hence experts are availed whenever it needed (Sodhganga, 2009).

1.7 Indian Scenario of Transportation

Indian transportation flow is solely accountable for the physical communication of inhabitants of the homeland. Transportation of India has improved enormously by bringing together the latest automobiles in the marketplace. Buses carry around 90 percent of transportation in India. The Indian transportation system is incomplete without the services of busses in excess of roots all over the nation. All levels of people use bus facilities. Speedy economic progress has implied air travel more reasonable in India. Air India's flag carrier with 135 aircrafts plays key linking to India with the globe. Numerous other foreign carrier link Indian cities with other major cities of the world. Indigo, Jet Air Ways, Spice jet, Kingfisher, and air India are the record prevalent brands in domestic air market share.

Table: 1.1

Transport wise share in India's GDP

Sector	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
	In % of GDP									
Transportation	6.0	6.2	6.3	6.7	6.7	6.7	6.7	6.6	6.5	6.5
Rail	1.2	1.2	1.2	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Road Transport	3.9	4.1	4.3	4.8	4.8	4.8	4.7	4.8	4,7	4.7
Water Transport	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Air Transport	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	o.3
Services	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.3

Source: Central Statistical Organization, 2012

Note: All share in GDP are inclusive and Services incidental to transport

Railways: Indian Railways is the biggest rail route to have one management. It carries about 19.9 million passengers and 2.4 million tons of freight of a day in 2009-10 and is one of the biggest employers. Railways acts a principal role in ferrying passengers and cargo through India's massive regions. But most of the corridor has volume restraint requiring capacity improvement tactics.

Aviation: We have 125 airports, with 11 international level. Indian airports managed about 96 million travelers and 1.5 million tons of cargo by 2006-2007, with growth 31.4 percent in passenger and 10.6percent cargo over preceding time.

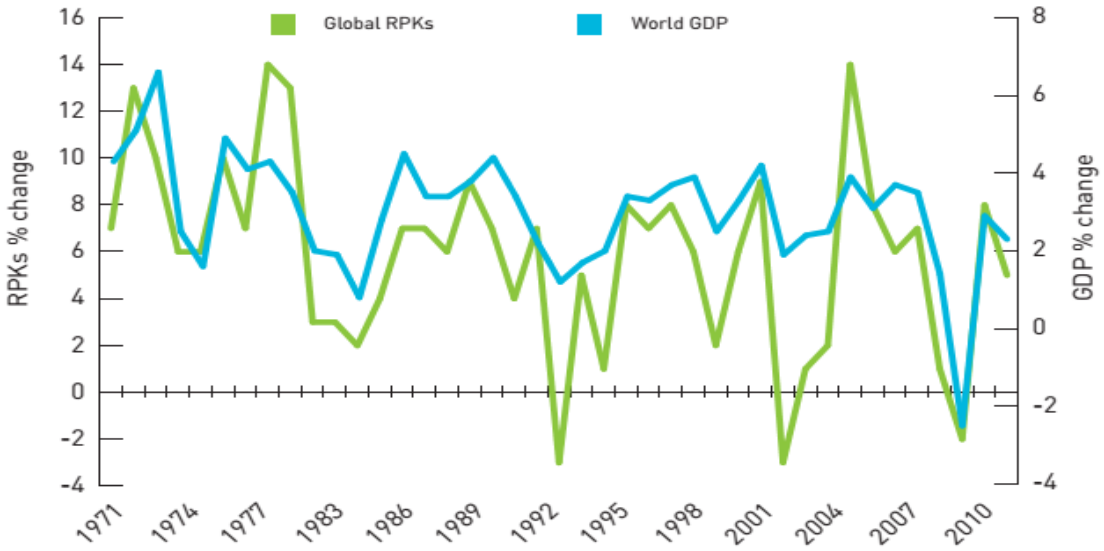

Figure 1.4 World Air Travel and GDP Growth, 1971 - 2010

Source. IATA, 2012; *Note*. IATA= International Air Transport Association; RPK= Revenue Passengers Kilometers;

Interestingly, increases in passengers as well as cargo this year implied worries for the airports. Passengers were estimated to cross 100 million and cargo 3.6 million tons by 2014.The infrastructure is better in the southern part.

1.8 Economic Impact of Transportation

The transport sector is an essential constituent of the economy and has played a vital role in progress and prosperity of people. If transport is well-organized, it delivers economic and social prosperity and welfares that in positive multiplier effects like improved availability of markets, employment and extra investments. But when transport systems are scarce in volume or consistency, it incurs economic cost like reduced or missed the various prospects. Hence, effective transportation reduces cost, incompetent incur cost.

Direct Impact: It is known as induced result. The consequence of convenience variations where transportation provides employment, adds value, bigger business and supports to save time and costs.

Indirect Impact: About the implication of financial impact, where the price of goods, or services decreases and their variety rises. Indirect value added and employments are the result of local acquisitions by companies directly depended on transportation procedure.

Related Impact: Results of economic accomplishments and businesses are partially depend on effective transport of the passengers and freight. Mobility is one of the fundamental and significant motion for the basic necessity movement. Economics, with more mobility will make improved chances than those with scarce one. Reduce movement hinders growth while greater mobility is a catalytic agent for development.

1.9 Challenges

There are a few major challenges the sector has been facing since last few decades that are given below.

1. Lack of infrastructure and Indians roads are choked and of poor condition.
2. The railways are facing severe capacity constraints.
3. Integration of IT is steady.
4. Airport infrastructure is strained and air parking fees and AT fuels increase in an exponentially.
5. Challenges by new and foreign entrants, and lack of skilled manpower.
6. Ports are congested and incompetent and publics' unnecessary antagonist for expansion.
7. Political complacent, inconvenient laws and regulations and Cultural dissimilarities

1.10 Key Government Strategies

In 12^{th} Five Year Plan (2012-17), it categorizes different shortfalls in transport sector like scarce roads or highways, timeworn technology, saturated routes and slow railways, shortage berths and connectivity at ports and insufficient runways, aircraft handling capability, parking space and terminal building at airports. So the objective of the Government is to modernize, enlarge, and assimilate the country's transport system. Recently, the Government made extensive efforts to overcome the sector's pitfalls and to improve its transport bodies such as:

i) Accumulating funds for transport for next 5 Year Plans.
ii) Leveraging road expansion in the North East Region to provide all day connectivity to all state capitals and district headquarters.
iii) Funding for expansion and maintenance of roads, tracks
iv) Enlightening rural entree by launching landmark projects

v) Reducing the monopolies of railways by attracting private participant to rail corridor.

vi) Allowing the foreign participant through FDI and other ways to increase transport related infrastructures.

Airlines: Airline is the 2nd fastest mode of transport, next to rocket. Commercial jets can fly at 955 kilometers per hour (593 mph), single-engine aircraft 555 kilometers per hour (345 mph). Aviation is cable to rapidly transport people and cargo for a long journey, but experience high prices and fuel used; for short journeys or in inaccessible places helicopters can be used. As of April 28, 2009 *The Guardian* records that, "the WHO estimations that up to 500,000 passengers are on planes at any moment."

1.11 Aviation Industry

The aviation sector is usually characterized by persistent changes in its structure as well as markets. The era of liberalization of markets, technological importance, knowledge base competition, and formation of different business models are the insufficient examples to scourge the active progress of air transportation till date. Though there are numerous fields of development which specifies to aviation industry development is not only influenced by the industry players themselves but also by its structures and institutional environments' effectiveness.

Aviation means *the design, development, production, operation, and use of aircraft, especially heavier-than-air aircraft.* "Aviation" was devised by French writer and former naval officer *Gabriel La Landelle* in 1863, from the verb "avier" (means *flying*), and derived from the Latin word "*avis*" (*bird*) and the suffix "-*ation*".

The modern age of aviation started when the first came out of the concept of 'human lighter-than-air flight' in 1783, in a hot air balloon designed by the *Montgolfier* brothers. The applicability of balloons was limited as they could only travel in the direction of wind. It was instantly conferred that a steerable, or dirigible, balloon is required.

Table: 1.2

Worldwide Aircraft Producers

Name of Manufacturer	Base country
Airbus	Europe
Boeing	USA
Bombardier	Canada
Embraer	Brazil
United Aircraft Corporation	Russia

Source. IATA, 2014, IATA= International Air Transport Association

The Wright brothers were the first to fly with power and controlled aircraft. That means, previous flights were gliders (i.e. control but having no power) or free flight (i.e. power but have not control), but the Wright brothers combined to both, and set the new standard in aviation account. After this aircraft started to transport people and cargo with new designs which grows faster and larger with extra reliable. The Wright brothers took up their first passenger, *Charles Furnas*, one of their mechanics, in 1908. There are five main producers of civil transport aircraft that are mentioned above.

1.11.1 Classification of Aviation Industry

The aviation sector is of two types, first one is civil aviation (or no-military) and second military related aviation. Details are given in the following figure. Civil aviation consists of all non-military aviation, which is both private and commercial related flights. In this world most of the countries are part of the International Civil Aviation Organization (ICAO) with the aim to work together in establishing common standards and recommended practices for civil aviation with this agency.

In common sense, **civil aviation** included the two major types of flights like:

1. Scheduled air transport
2. General aviation (GA)

During *scheduled* air transportation, which comprises passenger and cargo flights that operating on scheduled routes only. Whereas, general aviation includes all the other civil flights like private as well as commercial flights. Some of the countries make their regulatory difference based upon aircraft are flown for hire such as:

- Commercial aviation- like all flying for hire, (e.g. scheduled airlines)

- Private aviation- pilots flying for their own purposes

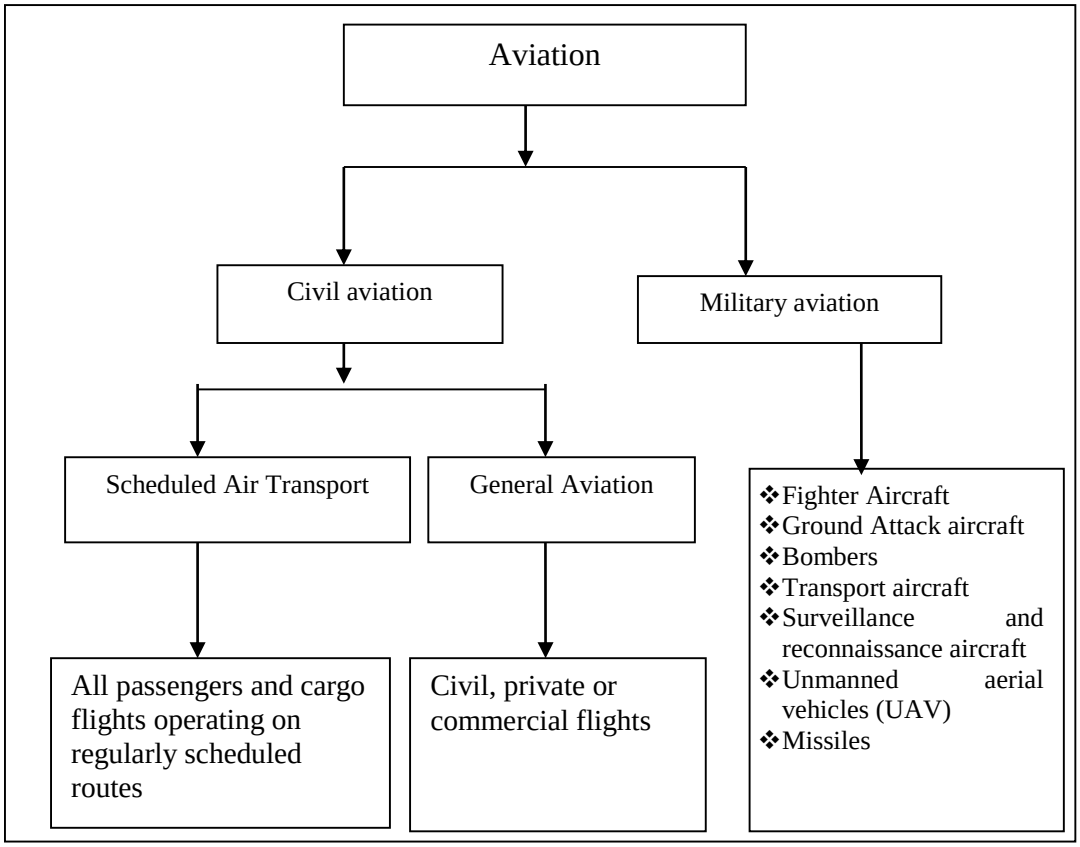

Figure 1.5 Classification of Aviation Industry

- At this convention, the focal address was that the signed countries should together effort to blend and standardize the use of airspace for safety, efficiency and regularity of air transport (ICAO report). All the 188 participating countries have a civil aviation authority to take care and watchdog about the following areas.
- *General aviation*: It is a civil aviation of non-scheduled air transport operations for remuneration or hire basis. It involves non-scheduled civil flying, private and commercial. This includes business flights, charter, private aviation, flight training, ballooning, parachuting, gliding, hang gliding, etc.
- Each country regulates their aviation sector in different ways, usually aviation comes with different regulations subjected about private or commercial and the type of equipment involved. Most of the countries have own state authorities to oversee

all their civil aviation activities sticking to standardized codes of the International Civil Aviation Organization (ICAO).

According to Marketline's guide about the global Airlines Industry, estimates about world airline industry may reach at about of $713.6 billion that is a 42.2% increase since 2010. Volume wise the sector projected to top about 3 billion passengers by 2015, up from 28.4% since 2010. But the domestic is a major section of the world airline industry, which accounting as 64% of the industry's total volume (Business vibes).

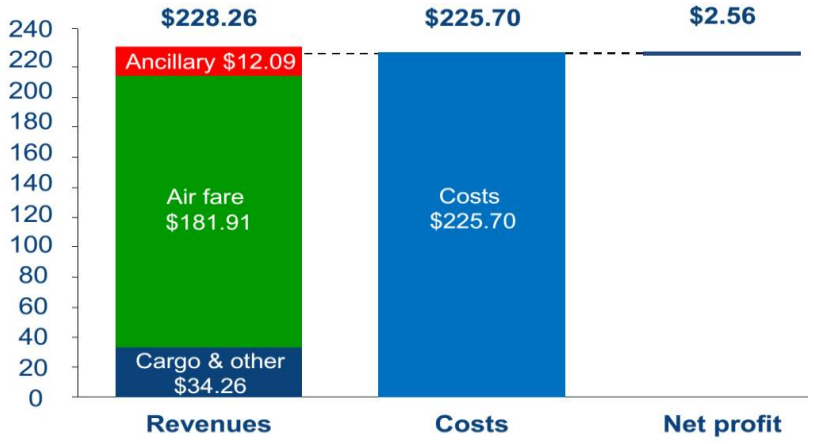

Figure 1.6 Worldwide Airlines Financial Results, 2012
Sources. Global Commercial Airline Industry Outlook, June 2013 -IATA

Hence, the cost of fuels is the main reason of minimizing profit due to of which, every dollar increased in oil price. But the airlines expressed with additional $1.6. In his estimation, 50% of the industry's fuel requirement is circumvented at 2010 price levels.

The area has seen a firm rise in LCC diffusion rates. The four largest domestic markets in Southeast Asia-Malaysia, Indonesia, Thailand, and Philippines, have LCC spreading rates beyond 50%. The Philippines has world's maximum domestic LCC dissemination rate among medium and large size countries – 80% in 2012, that's' probably to surge about 85% by 2013.

Again aviation sector is overcome by an array of complications to progress, with strong state isolationism leads to a lack of desire to relax air services, high taxes and charges, a meager safety record restricting from mature aircraft, fragile finances and unsatisfactory regulatory supervision, undeveloped infrastructure across the region and a lack of

proficiency and wide-spread exploitation. These above makes challenging for airlines to withstand and with existing fares, which are well above the world range to decrease and smooth for the access into LCC.

Table 1.3

World's Top 11 Aviation Countries by Seats

Rank	Country	Seats (Millions)	Available Seat Kilometers (Billions)	GDP (Billions)	Population (millions)
1	United States of America	18.237	19.397	16198	317.3
2	China	10.441	16.155	9038.7	1360.3
3	UK	4.809	11.682	2532.1	63.5
4	Germany	4.543	9.144	3373.3	81.6
5	Japan	4.4109	8.852	5997.3	127.3
6	Spain and Canary islands	3.373	6.188	1311.1	46.5
7	France	3.147	7.045	2565.6	63.7
8	Brazil	2.971	4.921	2503.9	198
9	Italy	2.832	3.9601	1953.8	61.1
10	India	2.726	4.992	2117.3	1239.3
11	Indonesia	2.461	3.124	1006.9	248

Source: CAPA, 2013; Note. CAPA= Center for Asia Pacific Aviation

1.11.2 Key Drivers for Aviation Sector

There are many factors emerged after world liberalization, which contribute more to change the face and pace of the industry. Though they are different in impact to shift from existing position, to competition world sill some of are highly vulnerable. These are discussed below.

- *Passenger*: Load factor of the industry is expected to average 80.3%, which is recorded the highest. But passenger capacity is likely to increase to 4.3%, that means it is below the 5.3% projected growth in demand.
- *Cargo*: It has continued to undergo the effect of the weak attitude in developed countries. Freight volumes are likely to be stationary at 52.1 million tones. It is only 2% contraction to expect in 2014 as the capacity remains more exciting than in passenger market.

- *Economic growth:* GDP is projected to nurture 2.2% the year, it is only slightly above the 2.1% growth in 2012 and 4% growth condensed into 2006.

Table 1.4

Some Facts on World Aviation Sector

56 million	56 million employees around the world in aviation and allied sector. 8.36 million employees work directly this industry.
2.8 billion	In 2011, above 2.8 billion passengers were travelled in airlines over the world.
1,715 airlines	1,715 airlines, 23,000 aircraft with 3,750 airports in several million kms, 160 air navigation service providers.
Three and a half times	It contributed to the world economy approximately 3.5 times up than other employments
19th in the world	If aviation as a country, its rank is 19th in the world in GDP, through $539 billion of GDP/year.
$1 trillion($10^{12}$)	2026, the sector might be $1 trillion support to the world GDP
676 million tons	Flights formed 676 million tons of CO2 in 2011 in Globe. But, humans produced above 34 billion tons of CO2
2%	The world aviation industry produces about 2% of human-form CO_2
	Target on Climate Sustainable
1.5%	Improve fuel efficiency by 1.5% annually in 2015 - 2020
50%	By 2050, net aviation carbon emissions will be half

Source: ATAG, 2012; *Note*. Air Transport Action Group; GDP =gross domestic product

1.11.3 Aviation in Developing Countries

The aviation community in the world has become a globalized one. Due to variation in financial and technological efficiency among the developed and developing countries have potentially created some gaps. So the members of the Airports Council International (ACI), have presented a series of associations between developed and developing-country's airports, to improve safety, security and competence through the worldwide airports. In emerging countries, air transport provides 35.9 million employments and $490 billion towards GDP. It generates 1,570,177 million income in passenger kilometers with 9,295 aircraft in service from 951 airlines around 861,550 674 passengers.

In ***Asia-pacific*** section air transportation supports 24.1 million occupations and $470 billion in GDP. Total employment formed directly through air transport is valued at 2.3 million in 2010. Around 540,000 individuals (24 percent of the total) employed for airlines or allied means (e.g. as a flight crew, check-in staff, maintenance crew, reservations and head office staff). Passengers are anticipated to almost triple in Asia-Pacific from 779.6 million in 2010 to over 2.2 billion in 2030. This contribution to GDP will rise by 6.1percent annually about the coming 20 years assisting to generate supplementary 1.3 million employments through the area by 2030.

Table 1.5

Asian Overview: Top 10Markets

Country	Seats per week (Millions)	ASK per week (Billions)	GDP (USD millions)	Population (in millions)
China	8.902	13.749	6988470	1348.1
Japan	3.783	7.614	5855383	127.9
India	2.752	5.022	1843382	1206.9
Indonesia	1.866	2.502	834335	240.5
South Korea	1.639	3.561	1163847	49.0
Thailand	1.579	4.235	339396	64.3
Hong Kong	1.348	4.529	246941	7.2
Malaysia	1.288	2.475	247565	28.7
Singapore	1.256	4.312	266498	5.3
Taiwan	0.954	1.641	504612	23.4

Source: CAPA cited in Innovata and IMF, 2014. *Note.* CAPA= Center for Asia Pacific Aviation, ASK= Available seat kilometers

In Asia it is expected for more growth in low cost carrier (LCC), which will be the future in this sector. As LCC infiltration rates are above the world average of 26 percent in six of the 12 main Asian markets – Singapore (26 percent), Thailand (27percent), India (38percent), and Malaysia (48percent). According to CAPA survey, there will be 2/3 of middle class family progress will be in Asia, while global middle class to raise from 1.8bn to 4.9bn by 20130. It is also expected the same in Indonesia. But there are some challenges in the Asian market in air transport such as,

- Infrastructure: New runways, terminals and airports are required to preserve active the growth.
- Liberalization: it could not materialize fast enough
- Strong competition and possible congestion
- Global economic slowdown and rising petroleum prices

1.12 Indian Airlines

Aviation is an infrastructure sector that has played very important role in facilitating the growth of the economy in India. A healthy civil aviation system is the key to the unbroken flow of investment and tourism, with substantial multiple effects through the economy. The sector is not only to transport passenger and goods, but also it generates huge employment generation.

In FY2012 India's GDP was projected to be approximately US$1.8 trillion, the 9th largest in the world, having grown at a 5 year multiple annual growth rate (CAGR) of 8.3%.

Table: 1.6

Evolution of Indian Aviation Industry

Year	Major Milestones
Before, 1953	Existence of Nine Airlines
1953	Nationalization of all private airlines
1997	4 out of 6 operators shut down;
2001	Aviation Turbine Fuel (ATF) prices decontrolled
2005	Kingfisher, Spice Jet, Indigo, Go Air, Paramount started operations
2007	Industry combines; Jet acquired Sahara; Kingfisher acquired Air Deccan
2012	Government allows direct ATF imports, FDI proposal for allowing foreign carriers up to 49% stake under consideration
2014	Demand for 74% FDI

Source: ICRA Research, 2013

On a purchasing power parity basis, the Indian economy is the 4th largest in the world. Despite a slowdown in FY12 to below 7% GDP growth and with weakness continuing into

FY13, India is widely expected to resume 8-9% growth rates through the remainder of the decade.

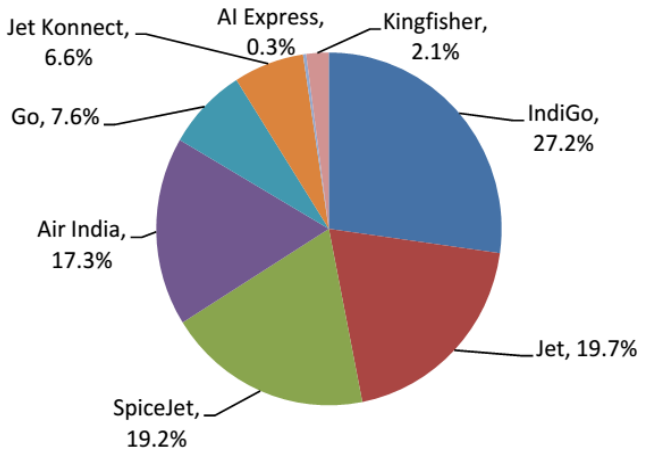

Figure 1.7 Indian Domestic Market Share by Airline FY13

Source. CAPA, Airports Authority of India, 2013

According to a survey reported by Shine-info of HT media Ltd, India's travel market is assessed to produce 18% from 2014 to reach $23.2 billion, which is more than last years's11%. The Indian hospitality sector contributes more than 8-9% to the country's GDP.

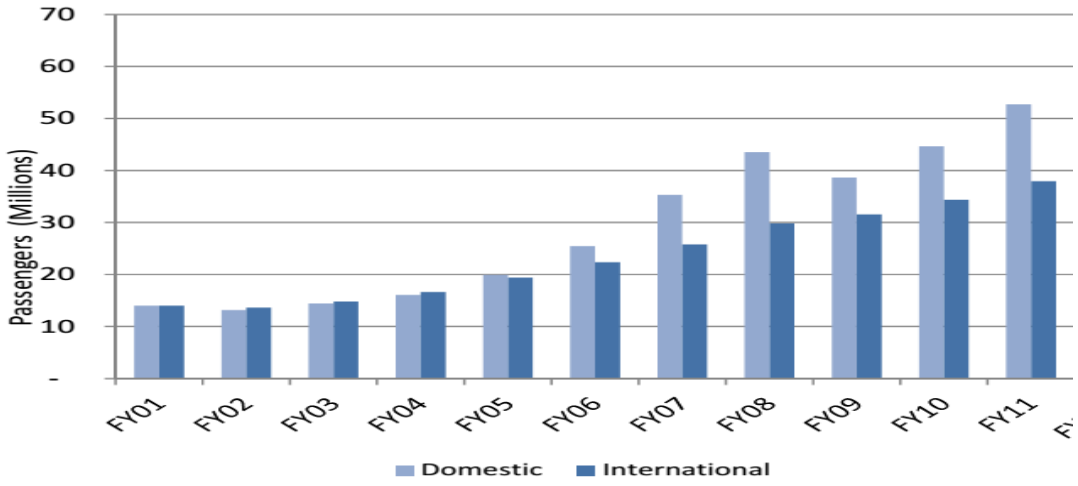

Figure 1.8 India's Domestic & International Airline Passenger, FY-01 to FY-11

Source. CAPA, AAI 2013; AAI= Airport Authority of India

The Indian Aviation Industry has observed an impressive growth in the last decade. Nowadays, India is the 9th largest civil aviation marketplace in the world and ranks 4th in

domestic passenger movements with a market worth of US $12bn. As per AAI, passenger treatment capacity has risen two-fold from 72 million in FY2006 to 143 million in FY2011, and in freight flow has risen from 1.5 million MT in FY2006 to 2.3 million MT (MMT) in FY-2011.

In air transport CAPA reported about India that passenger traffic has grown more than 3-fold from 42-million airport passengers in FY2001 to 143 million in FY 2011, which is a compound growth rate 13% per annum. International passenger traffic has been driven by both strong outbound demands reflecting growing income levels in India, as well as by inbound demand associated with expanding business and trade links and India's growing profile as a tourism destination.

Indian nationals account for about two-thirds of traffic at Indian airports, with foreign nationals representing one-third. The growth in foreign arrivals has been sustained since 2004, apart from an absolute reduction in 2009 due to the weak economic situation in key inbound US and European markets and in the aftermath of the Mumbai terrorist attacks.

1.13 Need to Change for Indian Airlines

India is one of the fast growing economies of the world with an average GDP growth of over 8.9 percent in past five years. For India to endure its economic growth story, it has to toughen its infrastructure sector and in particular, critically improve its transportation infrastructure. Aviation sector in India has been transformed from an over regulated and under managed sector to a more exposed, liberal and investment friendly sector since 2004. Adoption of global standards has made aviation a safer way to travel.

Passenger growth: Generally it is observed that the air transportation growth at twice the rate of GDP growth. The international passenger growth has been growing at CAGR of over 14 percent and domestic growth has been an inspiring 22 percent for last 6 years.

Cargo growth: India has already enacted open sky frame work for cargo. Hub is being developed in Nagpur by the Ministry and also planned to build committed cargo airports all over the country to cater to the cumulative demand in air cargo traffic.

1.14 Service Quality

Almost all the country's service sector has been dominating before the other two sectors, such as manufacturing and agriculture. So the size of the service sector is increasing around the world such as both developed and developing states. In India, it is the 15^{th} rank in service output and it provides about 25 percent of the total workforce in the country. This sector contributes the most to the GDP about 56% (CSO report, 2014) in India. In the notion of dynamic world, many changes occurred like digitized enabled service universal level IT etc. It is well known for the success and vitality of the service sector is the essence in measuring economy' progress in terms of quality and sustainability of business.

Evaluating the service quality is one of the greatest challenges for every organization in these days, due to its complexity. To ensure about total quality, every organization has to define and manage service quality as the service becomes a powerful competitive weapon and only form of differentiation. A service is an organized system of labor and material that used to meet the needs of the customer. It is a series of activities, designed to enhance the level of customer satisfaction (Turban et al. 2002). Quality is a perceptual, conditional, and somewhat subjective attribute and may be understood differently by different people. Quality is ability to satisfy stated needs and it is free of deficiencies (American Society for Quality). Measurement of service quality in the case of airlines needs a different approach as it involved high fare, limited duration, rare repetition and undue political infiltration. Significant contribution has been made by a number of researchers from different discipline on airline service quality. One of the studies revealed that service quality received a great deal of interest as a strategic factor for increasing profit and market share (Bolton, Lemon & Verhoef, 2004). There are various services of airlines categorized with airport, airlines and pre and post airport services.

1.15 Passenger Loyalty

It is the act of permanent positioning in customer's mind setup about a particular brand. When an existing customer used to buy or experience from the particular organization, even if the price is increased, then this customer as a loyal customer (Tellis, 1988). A loyal customer increases his purchase, over the period of time and their readiness to pay premiums for the additional services (Reichheld & Deane, 2004). Again, it is the 10 times

cost to bring a new customer than to retain the existing customer. According to a report, if the organization has customer and employee loyalty at the center stage, then it implied to lower 15 percent in average costs and 2. 2 times the growth rate. For the airlines, a loyal passenger will fly frequently, refer to peers, ready to pay more fare for extra services, tolerate for delay if any in departure.

1.16 Punctuality

Punctuality is the soul of business. It is both a psychological and behavioral human mind state. It refers to the proportion of flight delays by more than 15 minutes. It is an airline scheduling, pre-departure delays and also in-flight delays (Reichmuth, 2005). Punctuality is an important indicator in case of the passengers' choice of airline. Poor punctuality incurs cost for the passenger, airport and airline also. For the airline, punctuality is the primary factor to look into, because the sector stands on the base of punctuality, speed journey and hindrance to the ground.

1.17 Safety and Security Services

Post 9/11 era makes this services a basic requirement for the airline passenger. In this service a procedure should prevail to protect outside and inside of the aircraft threats. An effective safety measure and high security arrangement for flight journey is a basic requirement for not only passengers' but also to the employee and crew members. It has significant impact towards the overall airline passenger service quality. In this study, the researcher has studied this dimension with the three more variables, which make sense towards the safety measure.

1.18 Pre-post Airport Services

These services play an active role in influencing the passenger's decision making process when they undergo reservation for the further trip after experiencing with the earlier flying. These services will maintain customer touch point between the organization and customer for the longer period of time. This positive relations with the passengers make a great sense of affiliation as well as pleasure to the passenger hence, it makes as a loyal passenger and increases sells volume profitable.

1.19 Relations among Service Quality, Loyalty, and Punctuality

All the above three factors are the antecedent of passenger satisfaction (Oliver, 1997). Higher customer satisfaction makes them loyal and is retained for frequent business, frequent flying and act as brand initiator for the organization. Hence the customer becomes valuable and chance for the service provider to maintain long term relations. Again, punctuality implies a higher level of service quality, and with a higher level of service quality convert the customer more loyal towards the organization. Hence the passenger would be less prone to shift from the existing brand. Therefore, it is a competitive advantage for the organization (Fornell 1992 and Oliver, 1997). Hence it is a positive relation between these three factors.

1.20 Airlines as Service Value Chain

Managing and measuring service quality is the elemental challenge in the management domain because of its unique characteristic, such as heterogeneity, intangibility, perishability, inseparability and immense human participation in service delivery procedure.

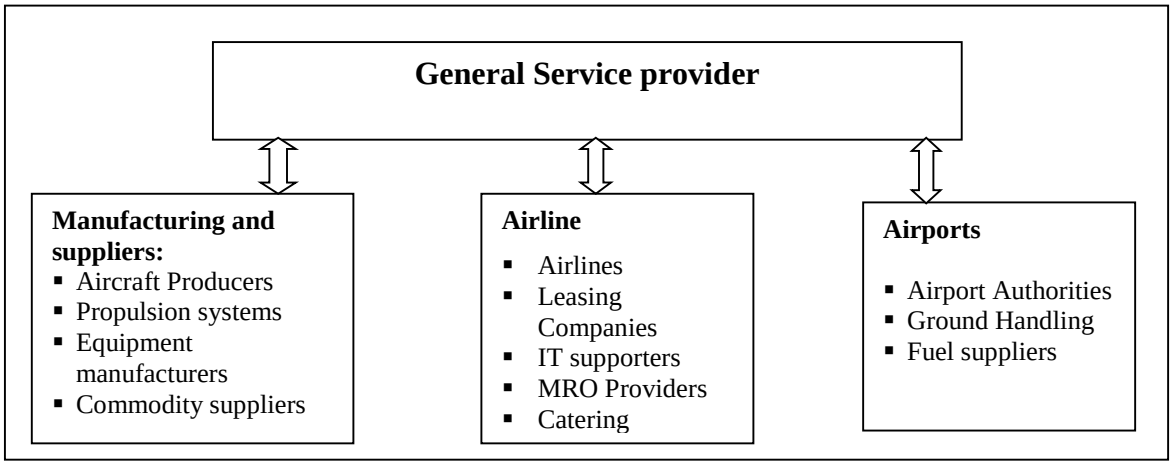

Figure 1. 9 Aviation Industry Value Chain
Source: Wittmer and Bieger, 2011

Delivering higher value and guaranteeing customer satisfaction needs to have strategic requirements of the service provider. The following figure represents service flow in airlines.

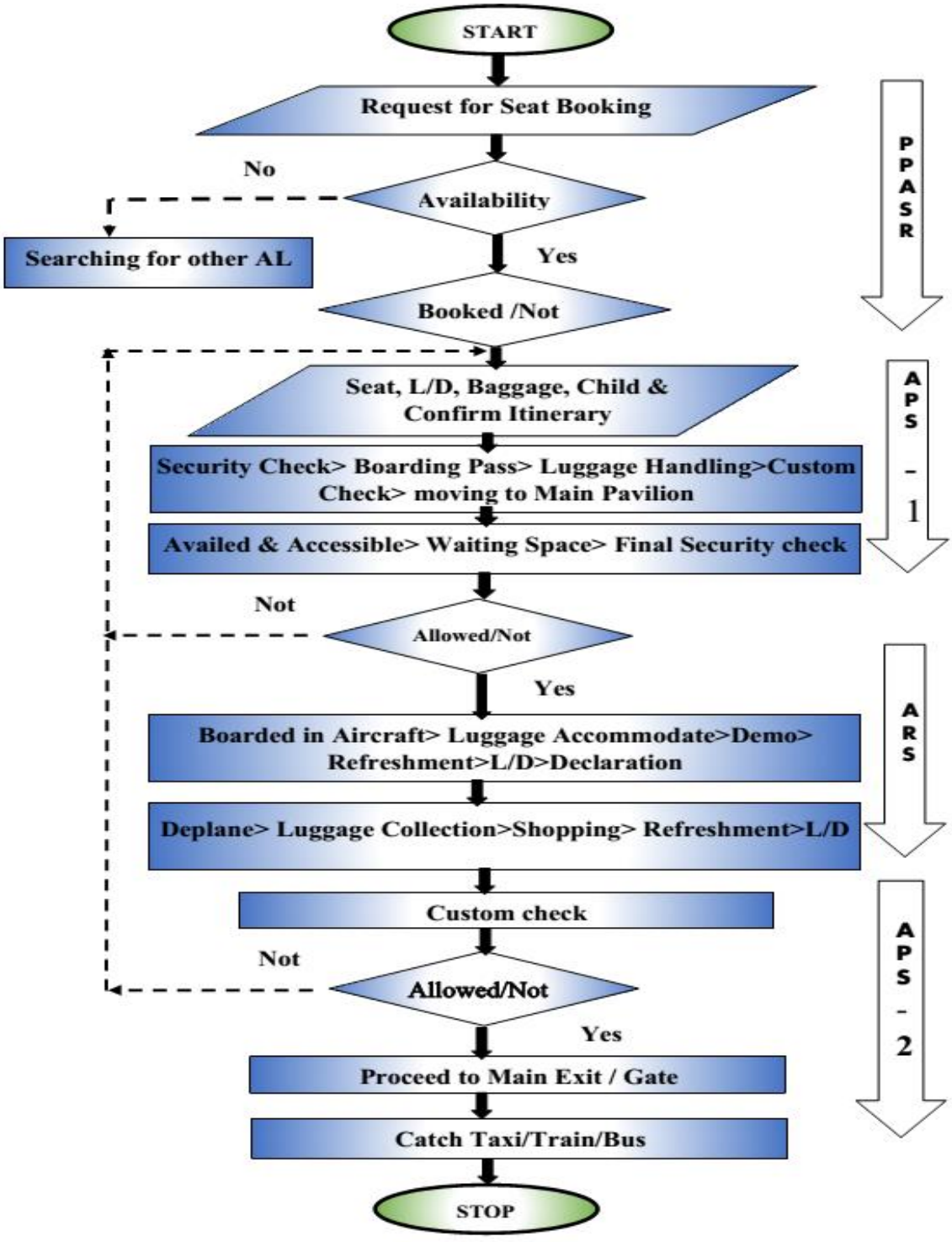

Figure 1.10 Flow of Passengers Service in Airlines

Note. AL= Airline; L/D = Landing or Departure; PPASR= Passengers' perceived airline services; ARS= Airline services; APS= Airport services.

Airlines is a service sector that offers high speed transportation services. Airlines and airports are the two core subsectors in the business. Airlines offer the real transportation service while airports provide the ground services to manage its movements. Aviation merchants accumulate aircrafts offered to customers. The service chain in the airline that provides an outline for overall supply chain and industry competitive arrangements. Concerning the overall service providers, the airline is considered by monopolies for air traffic control services. The aircraft manufacturing issues form an oligopolistic configuration about small and medium aircrafts (Wittmer and Bieger, 2011**)**. Services in airlines started form to search airline to reserve a seat till passenger reached in his destination.

1.21 Justification of the Study

This study is significant in many ways. It has potential to improve the tool through which service quality for airline passengers' can be measured and improve from the existing level to gain competitive advantage. Hence the retained passenger will have potential to make profit for the airlines in different ways. The suggested and empirically tested instrument will be a useful tool to predict loyalty and satisfaction of the passengers'. This service quality indicators may useful tool to refer by airline authorities, basically to policy makers of the government, as base device.

1. 22 Research Process

For this study, extensive review of service quality for airlines was directed from the original literature on service quality only. Further the study reviewed the literature on various concepts such as punctuality, loyalty safety and security and pre-post journey effect on overall service quality. This reviewed facilitated to identify the research gaps for perceived service quality assessment in Indian Airlines. For the smooth, streamlined of the study, a specific framework was formulated based on identifying research gaps from the earlier literature. So various service quality indicators were used to frame, certain procedure to study the passengers' perceptions about service quality in airlines. Again the empirically extracted factors were considered further as the prerequisites to study the concepts passengers' loyalty and punctuality.

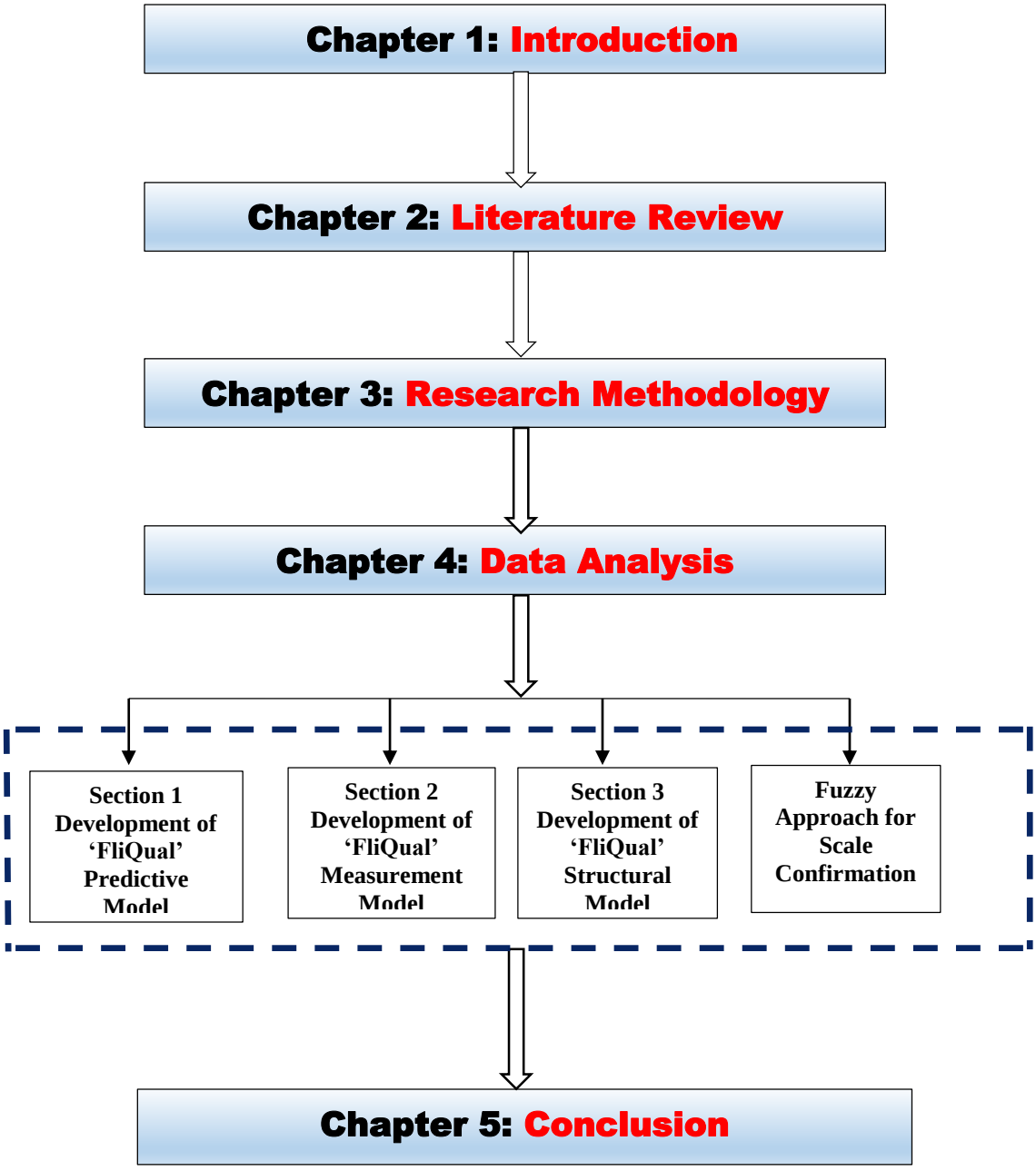

Figure 1.11 Structure of the Thesis

A self-administered survey questionnaire (closed as well as open ended) were designed to gather the passengers' about these five constructs. Data analysis was carried out by using different multivariate statistical and mathematical methods such as Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), Structural Equation Modeling (SEM) and fuzzy approach, a new system was used. A good level of effort was placed to minimize common method bias to make the study more reliable and effective. The study finally discusses the valuable research findings and its contributions to the existing body of knowledge.

1.23 Structure of the Thesis

Chapter 1: This chapter provides a brief outline of the study. It presents the current scenario of the service sector, transportation system and its history in short. Classification, subsectors, the importance and functions of transportation has been brought out. Economic impacts, its challenges and government strategies are discussed. Again, overall aviation industry, drivers of the sectors, aviation in developing countries and last notes on Indian airlines are mentioned. In last justification and research process was written.

Chapter 2: For this chapter, the researcher has reviewed the service, quality and service quality management and its practices in airlines. Furthermore, it has reviewed about punctuality, loyalty, pre-post journey and safety services. The criticisms of generic models are also discussed. Various literature related to the service quality models of aviation industry and their relationship between concepts are examined. In addition to that, background of conceptual framework and its possible proposed models were noted.

Chapter 3: This chapter explains the way for the current study has proceeded. It justifies the research design and research methodology that adopted for the study. Research questions were framed by referring to the statement of the problem and research gap, which was identified earlier and objective are set. Again conceptual models with hypothesis are stated, sample distribution, justification of the sample size and brief description of the data analysis tools, methods and techniques were described.

Chapter 4: The chapter has focused on the data analysis of the study. This chapter is divided into two categories such as Part -1 is classified again into three sections like, section -1 deals with development of 'FliQual' predictive model using EFA. The section-2 has taken care of the development of 'Fliqual' measurement models and picked out the best model. Section 3 of the category explains about the development of 'FliQual' structural model. In the second part, the study has used fuzzy approach and by using the fuzzy Delphi method to confirm the importance of the factors. Lastly, we found fuzzy interval and its membership fiction.

Chapter 5: This chapter emphasizes on the discussion and conclusion of the study. It précises the complete research activity data analysis with its theoretical and managerial implications. In the last part the study represents about contribution to the body of knowledge and way to future research.

CHAPTER II
LITERATURE REVIEW

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LITERATURE REVIEW

The preceding chapter discussed about the service sectors and its importance, history of transportation, types of transport systems and overall view about the aviation industry of the world at large and specific to India. Further, it looked into the hierarchal structure, strengths and weaknesses and regulating agencies and their role in Indian airlines. Apart from that, it also explained about various challenges before the sector, uniqueness and trends as well as the future course of action of the industry. In this chapter, previous literatures on air passenger service quality are explored. First, we will categorize the terminology related to quality services such as Service-Quality-Service Quality in chronological order. Thereafter, various conceptual and mathematical models on service quality and their relevance & limitation will be discussed. Then, we will describe the various specific and statistical generated dimensions of service quality about airlines.

2.1 Introduction

India's aviation industry promises huge growth potential because of large and growing middle class population, favorable demographics, rapid economic growth, higher disposable incomes, rising aspirations of the middle class, and overall low penetration levels. The industry has grown at a 16 percent CAGR in passenger traffic over the past decade. But the Global Airline industry is itself at this time going through a sturdy phase (with World Airline index down 22percent, Asia Pacific Airline index down 25 percent in last one year), due to below economic growth across the advanced economies and high crude oil prices. Besides, aviation economy currently remain unfavorable in India due to heavy competition, mandatory route dispersal guidelines, higher taxes on ATF, airport related charges and inadequate airport infrastructure. Services may be defined as intangible activities performed by persons, machines, or both for creating value perceptions among consumers. The quality of services results in perception and value assessment of the consumer. The service sector is the lifeline for the socioeconomic growth of a country. It is today the largest and fastest growing sector globally contributing more to the global output and employing more people than any other sector.

Availability of quality services is vital for the wellbeing of the economy. In advanced economies, the growth in the primary and secondary sectors are directly dependent on the growth of services like banking, insurance, trade, commerce, entertainment, social and personal service sector are growing relative to the rest of the economy. By the mid- 1990s services accounted for almost two thirds of world GDP, up from about half in the 1980s. Between 1990 and 2000, the growth of world services output was 2.9 per cent double that which was only 1.4 percent. As a result, the contribution of the service sector to world gross domestic product was 64 percent in the year 2000, compared to 57 percent in1990 (Chillimuntha, 2010).

2.2 Services

Products and services are two closely allied concepts, and products have element of services. But there are difference between them and it is vital to establish some working definitions. In customers' point of view, when a customer asks "what can you make for me?" They are inquiring about products; when a customer question "what can you do for me?" They are asking about services. While a product is something that can be measured and counted, a service is less tangible and is the result of the solicitation for skills and expertise to a need. A product is that can point at, but service, it is any activity "you can't drop on your foot (The Economist).

The service is originally associated with the work that an individual did for others. So a broader association appeared, captured in the dictionary definition of "the action of serving, helping, or benefiting, conduct tending to the welfare or advantage of another" (Trumble and Stevenson, 2002).

According to John Rathmell (1966), service is

> *"Acts, deeds, performances, or efforts" and argued that they had different characteristics from goods- defined as "articles, devices, materials, objects, or things".*

For a short definition of service, it is "somewhat that can be accepted and sold, but that cannot be dropped on your foot" Gummesson (1987), said. It is really comical and memorable; regrettably it is not helpful for marketing strategy. If services as economic activities between two parties, then it is simply an interchange of value between the seller and buyer in the marketplace.

According to Lovelock & Jochen (2011)

> *"Services are economic activities offered by one party to another, most commonly employing time-based performances to bring about desired results in recipients themselves or in objects or other assets for which purchasers have responsibility".*

A service is a process that leads to an outcome during partly simultaneous production and consumption processes. The most important characteristic of services, which is really unique one that services are processes, not things. Other characteristics like consumption and production are simultaneous activities and that customers participate in the service production process follow from the process characteristic. So service firm has no products, only interactive processes. A product variable should, therefore, not enter a service marketing model (Gronroos, 1984).

2.2.1 Types of Services

Core Services: A service that is the primary purpose of the transaction, e.g. a haircut or the services of lawyer or teacher.

Supplementary Services: Services that are rendered as a corollary to the sale of a tangible product, e.g. home delivery options offered by restaurants above a minimum bill value. Given below are the fundamental differences between physical goods and services:

Table: 2.1

Difference between Goods and Services

Goods	Services
Tangible	Intangible
A physical commodity	A process or activity
Homogeneous	Heterogeneous
Production and distribution are separated from their consumption	Production, distribution and consumption are simultaneous processes
Can be stored	Cannot be stored
Transfer of ownership is possible	Transfer of ownership is not possible

Source: Hoffman & Bateson (2006); Bhattacharjee (2006).

2.3 Structure of the Service Sector

The services sector is remarkably diverse. It comprises a wide array of industries that sell to individual consumers and business customers, as well as to government agencies and nonprofit organizations. Services make up the bulk of today's economy and also account for most of the growth in new jobs. The size of the service sector is increasing in almost all economies around the world. As the national economy develops, the relative share of employment among agricultural industry, and service changes dramatically. Following are a few structures of services.

1. Delivery Ease: Delivery refers to how well the product or service is brought to the customer. It includes speed, accuracy, and care throughout the process.
2. Ordering Ease: Ordering ease refers to how easy it is for the customer to place an order with the company.
3. Installation: It refers to the work done to make a product or service operational in its planned location. Ease of installation becomes a true selling point, especially when the target market is technology novice.
4. Customer Training: It refers to training the customer's employees to use the vendor's equipment properly and efficiently.
5. Customer Consulting: It refers to data, information systems, and advice services that the seller offers to buyers.
6. Maintenance and Repair: It describes the service program for helping customers keep purchased products in good working order (Kotler & Armstrong, 2004).

Zeithaml and Bitner (1996) found that services are deeds, processes, and performances. Their definition states that services include all economic activities whose output is not a physical product, is generally consumed at the time it is produced, and provides added value in forms that are essentially intangible concerns of the purchaser. The important differences exist among service firms, not just between service firms and goods firms.

The existing literature is dominated by discussions of the differences between goods marketing and services marketing. The review indicates that sample firms make specific efforts to encourage word-of-mouth communications. And service firms dealing with

institutional customers are more marketing oriented than firms dealing with the end consumer like they are more apt to contact customers after purchase to ensure satisfaction, and to regularly collect information about customer needs (Zeithaml et.al, 1985).

Services are associated, ceteris paribus, with greater perceived risk, it follows that service consumers would use more information sources as a risk-coping strategy than would consumers of less risky products. Services are conceptualized as experiential (Murray. Keith B). (Booms & Bitner, 1981; Lovelock 1981; Young 1981; Zeithaml 1981).

2.4 Quality

It is essential that without any question, needs of product or service quality is pivotal what was not before. Poor quality, especially in a globalized era incurs to the costs of nonconformance which is billions of dollars and it impact over costs of human life. The pursuit of product quality requires that an organization creates a quality framework. The development and application of standards to enhance organizational development remains relevant in spite of the overwhelming, constantly changing in twenty-first century explosion in technology and globalization.

Table 2.2

Quality Gurus' & Their Contribution

Quality Guru	Main Contribution
Walter A. Shewhart	Contributed to understanding of process variability Developed concept of statistical control charts
W. Edwards Deming	Stressed managements' responsibility for quality Developed "14 points" to guide companies in quality improvement
Joseph M. Juran	Defined quality as "fitness for use" Developed concept of cost of quality
Armand V. Feigenbaum	Introduced concept of total quality control
Philip B. Crosby	Coined the phrase "quality is free" Introduced concept of zero defects
Kaoru Ishikawa	Developed cause-and-effect diagrams Identified Concept of "internal customer"
Genichi Taguchi	Focused on product design quality Developed Taguchi loss function

Quality does not happen chance or at one activity or at once. It requires planned efforts. Though the head of the department is the leader of the team for quality, sustainability, every department and everyone is responsible for quality. Quality is built upon a strong foundation, with adequate basic facilities, staffed with competent personnel who are trained and provided with an environment where there is a strong urge to perform quality work (Murthy, 1999).

Quality, however, "is an elusive and indistinct construct" (Parasuraman, Zeithaml, and Berry 1985). Defining and measuring quality are complicated because the concept can be viewed from several perspectives. For example Garvin (1983), identified five completely different approaches to define quality. Lewis and Booms (1983) and Gronroos (1982) have also discussed problems associated with defining and measuring quality. The definition of quality depends on the role of the people defining it. Some people view quality as "performance to standards" and while others view it as "meeting the customers' needs" or "satisfying the customer." *Conformance to specification* measures how all the product or service meets the targets and tolerances determined by its designers. *Fitness for use* focuses on how well the product performs its intended function or use. So higher conformance means fewer complaints and therefore increased customer satisfaction.

Table: 2.3

Manufacturing vs. Service Organizations

Manufacturing Organizations	Service Organizations
Conformance to specifications	Tangible factors
Performance	Consistency
Reliability	Responsiveness to customer needs
Features (easy to use)	Courtesy/friendliness
Durability	Timeliness/promptness
Serviceability	Atmosphere (anticipating customer needs)
Availability of options	Esthetics
Reputation	Reputation

Source: Chhabra & Grover (2002); Kotler (1994).

2.5 Poor Quality and Its Impact

Poor quality, follows when a customer is not satisfied with any one of the criteria or a combination of the criteria of 'total customer satisfaction'. Poor quality results in customer dissatisfaction, which means loss of customer goodwill and poor sales. Some of the factors causing poor quality are followed.

- Poor design with good manufacture
- Good design with poor manufacture
- Good design and good manufacture with service

Poor-quality results in extra burden on the consumer. A faulty product can injure him or cause a fatal accident. Customer satisfaction is achieved through superior design, with additional features, tangible and intangible, like the other esteem factor of which the customer is the judge.

2.6 Service Quality

Service quality is a crucial tool for attracting customer and differentiate from its competitors (Bozbura et al., 2010; Parasuraman et al., 1985; Lovelock & Chatterjee, 2007; Lewis & Bernard, 1983; Gronroos, 1982). However, defining and measuring service quality are harder relative to manufacturing products (Parasuraman et al., 1988; Lovelock & Jochen, 2011; Bozbura et al., 2010; Kotler et al.; Murthy, 1999; Juran & Gryna, 1988). According to the Philip Kotler,

> *"Services are usually perceived as intangible, invisible, perishable and requiring simultaneous production and consumption, while goods are tangible, visible, and storable, and do not require direct interaction between producers and consumers."*

For every organization, having certain objectives that have to achieve for sustain, in the market. These are financial stability, universal service, competitive market conditions, quality and delivery etc. In service sector an important characteristic of services that lot of implications in service marketing is inseparability. Hence, it does not mean that all the services require the physical proximity of the provider and the user. There are two broad types of services like (i) those that basically require the physical proximity of the provider and the user, and (ii) those that do not, require any kind of physical proximity. According to Shajahan (2008) the nature and characteristics of services can have larger influence on quality issues and hence service quality is difficult to quantity in a short cut way.

2.7 Service Quality Management

Measuring service quality is one of the extreme challenges fronting practically for the organization. So total quality assurance, every organization must define and manage service quality. As the markets mature, service becomes an effective competitive weapon, and indeed in some cases, the only form of differentiation. The challenge of any service operation is by bringing together various facets of the business. But in reality the content of a service may be largely invisible to the customer, his perception of service delivery is influenced disproportionately by the manner of his treatment at the point of contact. It is widely believed that service is difficult to manage because it is intangible.

Effective service quality management system in the transportation sector is established in the view, to obtain a viable high quality and reliable public transit system for the society (Rathmell, 1966; Bozbura et al., 2010; Wei & Hansen, 2004).

In business, it has a realistic interpretation as the non-inferiority or superiority of something. Quality is a perceptual, conditional and somewhat subjective attribute and may be understood differently by different people. A subjective term for which, each person has his or her own definition. In technical usage, "quality can have two meanings: (a) The characteristics of a product or service that bear on its ability to satisfy stated or implied needs; (b) A product or service free of deficiencies"(American Society for Quality). Quality in a product or service is not what the supplier puts in. It is what the customer gets out and is willing to pay for" (Peter Drucker). It is the "Value to some person"(Gerald M. Weinberg).

Quality is an elusive and indistinct construct. Often mistaken for imprecise adjectives like "goodness, or luxury, or shiny, or weight" (Crosby, 1979), quality and its prerequisites are not easily pronounced by consumers (Takeuchi and Quelch, 1983). Elucidation and measurement of quality also present difficulties for researchers (Monroe and Krishnan1 983), who often bypass definitions and use one-dimensional self-report measures to capture the concept (Jacoby, Olson, and Haddock 1973; McConnell 1968; Shapiro 1972).

Service is a planned system of labor and material resources used to fulfill the needs of the public. Customer service is a chain of activities planned to improve the level of customer

satisfaction and ensures a product or service meets customer expectation (Turban et. al. 2002). A service is any actor's performance that one party can offer to another that is essentially in intangible and does not result in the ownership of anything. Its production may or may not be tied to physical product (Kotler, 1994).

Customer service differs from one company to another. In contextual perspective, it is the series of marketing logistic activities required to accept, process, deliver and build customer orders through to the 'amiability of staff at the service counter. In historically bound 'service' as a subservient activity and encumber acceptance of the view that service strengthens the exchange process and influences long term relationship to mutual advantage. (Christopher. Payne, A. Ballantyne, D.1991). Customer service provides time, place and resources for pre-sale, sale and post-sale transactions for customers (Christophe, M.G.; Schary, P. P. and Skjott, L., 1979). Service quality can thus be defined as the difference between customer expectations of service and perceived service. If expectations exceed performance, then perceived quality is less than satisfactory and hence customer dissatisfaction occurs (Parasuraman et al., 1985; Lewis and Mitchell, 1990).

Usually there is one question often came to our mind as why should we measure the service quality? Measurement elucidates quality issues and problems and helps in the formation of clear standards for service delivery. According to the experience of Edvardsen et al. (1994) the preliminary point in including quality of services is an evaluation and measurement.

Quality concept is explained by defining two quality dimensions called as technical and functional quality. The technical quality describes the outcome of a service and the functional quality describes more about the process that means how a consumer gets a service (Gronroos, 1982). Service quality is measured in terms of the extent to which performance as perceived by the customer (i.e. experience) meets or exceeds implicit or agreed levels of service (expectation). So in advance position the basic measure of service quality:

$$\text{Service quality} = \frac{\text{Perceived performance X 100}}{\text{Desired expectation}}$$

Lehtinen and Lehtinen (1982) assumed that service quality is produced by interaction between a customer and components in the service organization. They used three quality dimensions: physical quality, which includes the physical aspects of the service (e.g., equipment or building); corporate quality, which includes the company's image or profile; and interactive quality, which derives from the interaction between contact personnel and customers as well as between some customers and other customers. They further differentiated the process quality and outcome quality of the service.

2.8 Services in Public Transport

Services for passenger is a memorable customer experience at every customer touch point. It may be a procedure or systematic activities to inculcate passengers' confidence, show sincere concern to them, and ensure operations run for their smooth reaching to their destination.

Beirao & Cabral (2007), expressed that public policies which aim for increasing effectiveness of public transport should well positioned its brand image, and at the same time, it needs to become more market oriented and competitiveness, hence it requires a well-equipped service quality, and can be achieved through clear understanding of travel behavior and customer needs and expectations.

According to Beirao & Cabral (2007), developing suitable measures for service quality is a difficult task, as it deals with perceptions and attitudes of passengers. For this to get a clear understanding of passengers' perceptions about the service quality provided by public transport is essential than any other. Various policies which aim at increasing public transport practice should promote further its brand image, but at the same time, it has to increase competitiveness and market development, increase frequency etc.

Table 2.4

Summary of Service Quality Models

Model Name	Author-year	Sample	Data of collection	Scale Point	Method of Analysis	Key Findings	Limitations
Technical & Functional Quality Model	Gronroos (1984)	219	Survey	5	Basic Statistical Analysis	SQ = TQ+ FQ+ corporate image & FQ>TQ	Not mention how to measure TQ & FQ
Gap Model	Parasuraman *et al.* (1985)	298-487	Survey	7	Factor Analysis	Identify service quality gap & factors	Exploratory and no explain about the procedure
Performance only model	Cronin & Taylor (1992)	660	Survey	7 –point semantic	Factor Analysis & -CFA	Service quality is an antecedent of satisfaction and better purchase intention	Quantitative relations should be established between constructs
Ideal Model	Mattson (1992)	40	Survey	7	Correlation, Chi-Square test	Ideal standard & mentally sustained	Less number of items used
Normed quality and performance model	Teas (1993)	120	Personal Interview	--	Quality assessment, correlation, t-test	Conceptual and operational definition, higher validity	Limited sample with narrow settings
Attribute and overall affect the model	Dabholkar (1996)	505	Observation & survey	7	CFA &SEM with LISREL VII	Evaluations technology based self-service options	Demographic profile is not considered
Perceived Quality and Satisfaction Model	Spreng & Mackoy (1996)	273	Survey	7	CFA, SEM using LISREL	Service quality and satisfaction are separate and expectation have positive	Achievement and operationalization of service quality
Service quality, customer value and satisfaction model	Oh (1999)	545	Survey	6	Path Analysis using LISREL-VIII	Used for the consumer decision process	Generalizations of service settings
Antecedent mediator model	Dabholkar *et al* (2000)	397	Telephonic Interview	--	Regression, SEM with LISREL	Satisfaction is predictor of purchase intention	Measurement of purchase intention & generalization

Source: Seth *et al*, (2004). *Note*. TQ= technical quality, FQ= functional quality, SQ= service quality, CFA= confirmatory factory analysis, SEM= structural equation modeling; Scale point= Likert scale; LISREL= Linear Structural Relations

Olio & Cecı´n (2010), portrayed as passengers' perception of quality can change depending on their class. Users of public transport appear for frequent changes in the overall quality of service till they are triggered into thinking about other variables which they did not initially consider, so it will be very influential on evaluation of overall service quality. According to them, reliable services and less waiting time are the primary factors of service quality.

Paulley et al. (2006), in his "guidance manual for use by public transport operators and planning authorities, and for academics and other researchers" elaborated quality of service may be defined by a wide-ranging attributes that can be well comprehended by planning authorities and transport operators. The attributes such as access and egress time, service intervals and in-vehicle time and others which directly involve time, can be measured easily and incorporated in suitable demand forecasting models, using relevant elasticity.
Kuo & et al. (2009), evaluated that certain value-added services if included by the provider, then the customer feels the service is more valuable for the price what he paid ''more valuable than it costs". So the consumer will be felt that perceived services are best relative to other competitors in the industry.

Emphasized on service quality and customer satisfaction and accordingly making strategy is very valuable for companies as well as customers, mostly for transit stakeholders. An enhancement of the supplied service quality implied, appeal further passengers for public transport. This activity could resolve many problems like helping to reduce traffic congestion, maximal usage of space, delay of reaching, air and noise pollution, and energy consumption because personal transport would be used less (Eboli & Mazzulla, 2007).

According to Dell'Olio, Ibeas & Cecin (2011) service quality of public transport is very essential to change the traditional habit of transportation keeping in view for sustainability in this edge. Congestion in urban areas and its consequences on the climate are pushing for the governments to initiate effective transport policies. The policies are also to be framed keeping in view passenger's desires and measure the most influential variables on their decision to travel on public transport. Again, desired quality is varied with user categories.

Table 2.5

Summary of Selected Empirical studies on Public Transportation

Author/s	Salient Features	Research Design				Result	Limitation/ Scope
		Sample	Questionnaire	Stat. Procedure	Scale		
1. Cunningham et al., (2000)	The study demonstrates how triangulation can actually be used in measuring trans. service quality	Stratified (2020)	SA, FGD, II	Descriptive Stat. & t-test	5	Identify areas of passengers satisfaction and dissatisfaction in priority basis	No Statistical significance except triangulation
2. Grotenhuis et al., (2006)	To identify customers' desired quality of integrated multi modal travel information (IMTI) provision of public transport	NA (191)	SA -Internet survey	Descriptive	2-3-5	Study identify the primary determinant is time like travel and search time; effort savings like physical, cognitive, and affective effort	Compare between unimodal and multimodal transport system
3. Murray et. al., (1998)	Examines access to public transportation and discusses approaches for improving such access.	Observation	Secondary sources	Descriptive	NA	Performance affected by the proximity of regional stops. Can be improved by incorporating more dynamic proximity measures, service considerations, demographic and socioeconomic factors.	Lack of Statistical significance.

Continue…

Author/s	Salient Features	Research Design				Result	Limitation/ Scope
		Sample	Questionnaire	Stat. Procedure	Scale		
4. Thompson & Schofield, (2007)	Identifying the dimensions of public transport performance in the perspective of overseas visitors and which one has more predictive effect for destination satisfaction	Purposive (280)	SA- Semi-structured,	EFA-Regression Analysis	7	Identify the ease of use on destination satisfaction is greater than the influence of efficiency and safety. Perceived performance of the public transport system has only a minor influence on destination satisfaction.	In future target for domestic visitors and its applicability.
5. Fellesson & Margareta, (2008)	A transnational comparison of the perceived service satisfaction with public transport in eight European countries	Simple Random (9,542)	SA_ Telephonic and Interview	EFA	5	Identifies the four satisfaction dimensions of system, comfort, staff, and safety	Implementation of standardized instrument and acknowledge to local constraints
6. Wall & McDonald (2007)	It reports the results of a package of measures, contained within a quality the bus partnership (QBP), and designed to improve the bus service quality and information.	NA	Secondary sources	Descriptive	NA	Measures included the introduction of new buses, increasing the frequency, new bus Infrastructure such like shelters and poles, physical improvements to the bus/rail interchange.	Lack of Statistical significance.

Continue….

Author/s	Salient Features	Research Design				Result	Limitation/ Scope
		Sample	Questionnaire	Stat. Procedure	Scale		
7. Hensher & Prioni (2002)	Propose a method of filling in a missing link in the specification of contract performance service effectiveness, which measures the effectiveness of a service of passengers for customer satisfaction.	Convenient (4,334)	SA- structured,	Multinomial logit (MNL) regression procedure	NA	Developed an approach to quantifying a service quality index (SQI) to enable the economic regulator and bus operators to benchmark service effectiveness, adding this much neglected dimension of performance assessment.	This measurement can be used for public transport and, generally competitively tendered public services.
8, Hensher, Stopher & Bullock (2003)	The authors, investigates ways of quantifying service quality and comparing the levels within and between bus operators	Stratified sampling (4500)	SA_ Survey	Multinomial logit (MNL) regression	NA	It reveals what matters to actual customers and provide some signals as to which attributes need more effort for potential patrons.	Compare the performance of each segment (benchmark) meaningfully.
9. Wall & McDonald (2007)	Examining public transportation performance and how it may be enhanced is much needed. And also it addresses strategic aspects of service access	NA-Linear Model	Observation and Earlier literature	Mathematical modeling	NA	Significant improvements in system performance are possible if some inefficiencies and redundancies are eliminated along routes.	Strategic planning objective is to reduce private vehicle dependence

Note. NA= not available; SA= self-administered; EFA =exploratory factor analysis; FGD= focus group discussion; II=in-depth interview.

Lai & Chen (2011) attribute that to overcome the problem of traffic congestion in urban transport is essentially have to reduce the private transport use and encourage to avail public transport system. Public transport systems need to become more market oriented and competitive, as they tend to be viewed as the service sector.

Wardman (2001), in his effort the relationship between time and service quality for public transport expressed that the various attributes related to time are walk time, in-vehicle time, wait time, service headway, interchange, departure time, search time, late time, time spend in congested traffic conditions, halt time for long journey, time for reservation, waiting for getting seat and so on essentially need to be consider critically to provide value further for the passenger's.

Molinero and Sanchez, (1997) writes that the service quality of a public transport system is defined by many factors, such as comfort and safety within the vehicle, the travel time and the convenience, cleanliness, friendly behavior of employees reasonable price, the existence of any supporting infrastructure and so on.

Eboli & Mazzulla (2011), expressed about passengers' perceptions as subjective and the objective measures. So the combination of these two types of service quality measure can provide a useful and reliable measurement tool. Adopting subjective gauges for measuring service quality is considering only the customer requirements; on the contrary, by considering objective measures is helpful in a way to meet not habitual users' needs or attract new users.

2.9 Services for Air Passengers

Though managing to the complexity and heterogeneity of service quality is itself an ambiguity and uncertain (Parsuraman et al., 1985/1994; Iacobucci and Ostrom, 1995; Grönroos, 1984; Lehtinen, 1991; Haywood-Farmer, 1988; Cronin, Brady & Hult, 2000; Oliver, 1999; Dabholkar, Shepherd & Thrope 2000), in similar way measuring level of service quality in the airlines have also been difficult and pandemic. In spite of that that service quality is a subject that has raised considerable interest both in academic research

and in public and private service sectors, where managers are motivated towards customer-focused service and continuous performance improvement.

According to Chen and Chang (2005), Service is composed of a set of various activities in a systematic process. Airline service is a chain of services starting from reserved a seat to reach the destination and more, in which the total service delivery is divided into a series of interdepended process. Passengers' expectation of service quality varies at different stages in the service delivery process. By taking into account, the nature of air transport, these services can be divided into parts such as ground services and in-flight services.

Mazzeo (2003) attributed a strong relationship between high market concentration and poor airline service. He explained about how the various USA airlines used to make delays on departure and even after long delays, cancellation of flights is usually informed. This difficulties of passengers make to study by research communities, and also both the executive and legislative branches have applied pressure on the industry by threatening to impose strict requirements on the quality of service airlines provide.

Lu and Ling (2008), portrayed that passengers' perception of service quality has been playing a key role in the success of an airline. In his study, found how there is a difference in passengers 'perception of service quality with different culture, background and regions. Donthu & Yoo (1998) studied about to, how cultural dimension effect to the expectation of passengers' on airline service quality. By using the various cultural dimensions developed by Hofstede, 1980 and SERVEQUAL scale by Parsuraman et al. (1994a), consumers vary in both their overall service quality expectations and their expectations on each of the dimensions of service quality with their cultural orientation's.

Surovitskikh & Lubbe (2008), examine the positioning of four selected middle eastern airlines based on expectations of the particular airline in terms of service quality attributes deemed important by passengers, where previous studies have measured the performance of airlines against the same set of service quality attributes and service quality is an integral part for positioning strategy, as services in the airline are dependent on customers' perceptions and expectations of the airline product.

Young, Cunningham & Lee (1994) studied about the effectiveness of different measured tools of service quality about to airlines. They examined perceived service quality to airlines based on the SERVQUAL and the traditional industry-based measures, and consumer awareness and usage of the Air Travel Consumer Report (ATCR) published and disseminated by the Department of Transportation. They identify various SERVEQUAL and industry-based items, that are significantly influenced to consumer's perception of overall service quality and behavioral intention towards the specific airline. Pakdil & Aydın (2007) outlined in their study on Turkish airline that the highly competitive market in the airline industry will pressurizes airlines to deliver high level quality services. They also develop a new structure to define airline service quality dimensions using weighted scores of SERVQUAL. According to them passengers' past experience is the most important reason in selecting an airline. It shows with airline firms how crucial it is to retain old customers and increase customer loyalty. They also found that in the expectation and perception section the most important dimension is ''responsiveness'', while the least important one was ''availability''.

Saha & Theingi (2009) examine the relationships among the various constructs related to service quality, satisfaction, repurchase intention on his work about LCC (low cost carrier) in Thailand. They found a specific order of importance of different dimensions like flight schedules, flight attendants; tangibles; and ground staff etc. Positive behavioral intention of passengers' will prevail due to higher levels of satisfaction and other of service quality attributes perceived. In consequences, service quality is a significant determinant of customer satisfaction; and also quality and satisfaction influence behavioral intentions.

According to Gilbert & Wong (2003), delivering superior service quality is a prerequisite for success and survival in this competitive business environment. Again, imagination perfectly about what passengers expect is essential to provide desired service quality. They also studied about the link between customer expectations and service quality about to how an airline can use a standard measure of different passengers' expectation as a diagnostic tool for managing its service quality. Again, they perceived that assessing passenger expectations is not a static exercise as passengers are becoming increasingly sensitive to quality Wang (2007).

According to Park (2007), service quality affects passengers choices, but most of these are subjective, that referring to passengers' overall impressions of the relative quality of airlines and their services. He also explored passenger perceptions about different service factors towards buying behavior for different segments of air passengers. Passenger satisfaction is a feeling based about to service experience of a passenger's most recent flight.

Gursoy et al. (2005), studied about the relative positioning of the few US airlines based on 15 attributes that measure actual airline performance on service quality criteria for passengers. They said that passenger service quality is maximum customer satisfaction. For that airlines should recognize to their target customer want in order maximize satisfaction. Sim et al. (2006), outlined about to the interactive effects of service quality such as on-time arrivals, flight delays and complaints as well as aircraft productivity in terms of firm's future performance as measured by one-quarter-ahead for Return on Assets (ROA) or Return on Sales (ROS) and found implementation of frequent benefit programs to attract passengers for continuing patronage, unhappy customers adversely affect future ROA or ROS that impact to overall service quality to airline passengers'.

As previous literature argues that customer satisfaction is a useful enhancement to financial performance because it captures elements of value that not reflected in historical accounting-based measures (Maines et al., 2002). Whereas service quality is one of the few key aspects in attracting and retaining loyal passenger and the airlines are falling far short with the standard (Ostrowski et al., 1993). It is expected that happy customers will continue to return and higher service quality will positively affect to current and future sales revenue. Similarly, lower service quality or negative customer satisfaction (like flight delays, baggage missing) will negatively affect current and future sales revenue. Park et al. (2004) stated that service quality is defined as a consumer's overall impression of the relative efficiency of the organization and its services offered. Customer satisfaction can be defined as a judgment made on the basis of a specific service encounter. They studied about how passengers' decision-making processes affect by the various service dimensions such as, service perception, service value, passenger satisfaction, and airline image simultaneously.

Tiernan et al. (2008), Service quality levels of airline alliances as a group than individual airlines have presumed most importance at this time. In an alliance overall levels of service quality are extremely important for member airlines, so that customers may book with one airline, but will experience service quality levels of partner airlines as well. According to Cunningham et al. (2002), measurement and management of service quality are the fundamental issue for the survival and growth of airline companies.

Venkatesh & Nargundkar (2006) explained about on the service quality delivered by four major airlines in India. In the airline services, pricing and service quality are the key variables that decide the brand equity of each in the industry. They categories to service process of traveling on a domestic airline as pre-flight, in- flight and post- flight experiences. They found that there are clear differences among the airlines, with two of them perceived as being similar to each other, and the other two differing in many respects. Botimer (1996), advocated about how price discrimination and yield management having impact towards the service value of the passengers. He assesses differentiated fare product structure with a range of price levels with effective yield management techniques will provide airline seats to the consumers who value it the most it, when demand exceeds supply. Tiernan et al. (2008), compare about to consumer perceptions of airline service quality attributes with actual data reported by the Department of Transportation, USA and the Association of European Airlines (AEA), EU. They found that actual consumer perceptions of airline performance in key areas of airline service quality are far worse than the data reported in the US Air Travel Consumer Report or AEA Consumer Report.

The study about to understanding of air passengers' decision making processes through the various dimensions such as service value, airline service quality, satisfaction, perceived sacrifice and behavioral intention found that service value is the major factor, which can influence passengers' purchase option. And also this study demonstrated that responsiveness is the most important airline service attribute (Huang, 2009). Nadiri et al. (2008), defining and evaluating quality service is important to airline service providers. Because passenger always seeks quality service nowadays, so firms are more sensitive and trying to give their best services to be fore runner and compete in the challenging environments.

Table 2.6
Summary of Selected Empirical Studies of Service Quality in Airlines

Author/s	Salient Features	Research Design				Result	Limitation/ Scope
		Sample	Questionnaire	Stat. Procedure	Scale		
1. Fageda et al (20012)	Propose of this paper is to determine the factors, which account for airline passengers' perceptions of the quality of service they receive. Specifically, to find the relationship between quality perception, variables of operator size	110 Airlines (8,638)-2006/2009	SA-structured,	Multivariate analysis-Ordinary Least Squares regression (OLS) & various Descriptive Statistics	NA	Developed an approach to quantifying service quality through the various dimension such as check-in experience, aircraft, cabin crew reliability, punctuality and comfort that can be determined by various organizational.	This can be used for sectors. Regional airlines receive the worst Assessments, no marked differences between low-cost and network airlines.
2. Mazzeo (2003)	Study explores potential connections between the two by examining whether the lack of competition on a particular route results in worse on-time performance.	Secondary Data-50 Airports-800,000 observation.	SA	Descriptive Statistics & OLS regression	NA	Fight delays are significantly greater on routes where only one airline provides direct service. Further, extra competition is correlated with better on-time performance.	Demand for air travel as a function of prices and on-time performance would be a useful exercise.
3. Degirmenci (2012)	To evaluate customer satisfaction at Turkish Airlines by comparing SERVQUAL and SKYTRAX dimension on service quality for air passengers.	Primary-1110/2000	SA-Survey-5 Likert scale	EFA	5 point Likert scale	Image dimension has the highest customer satisfaction level; Employees and empathy dimensions followed the image.	none of service quality dimensions are around the desired 5-star customer satisfaction

Continue….

Author/s	Salient Features	Research Design				Result	Limitation/ Scope
		Sample	Questionnaire	Stat. Procedure	Scale		
4. Huang (2009)	To improve the understanding of air passengers' decision-making processes by testing a conceptual model that considers service value, airline service quality, satisfaction,	602/700 Airlines 2007	SA- structured,	EFA-CFA-SEM.	Five-Point Likert Scale	The service value is the major factor that can influence the behavioral intention. IPA results indicate that responsiveness is the most important airline service quality attribute in passengers.	SEM analysis provided support that airline service quality and perceived sacrifice dimensions are indirectly affected behavioral intention by satisfaction.
5. Namukasa, (2013)	This study is to test the influence of airline service quality on passenger satisfaction and loyalty. For this four specific objectives to which data collection was effected by interview method.	Random sampling-378/303	SA-Structured	Descriptive Statistics & Chi-square - test & Regression analysis	Five-Point Likert Scale	Passenger satisfaction act as a mediating variable also had a significant effect on passenger loyalty. Passenger satisfaction differed from person to person as some were more interested in off board facilities, others onboard in the quality of food while others wanted more extra luggage	An empirical examination needs to be undertaken in order to assess how domestic passengers' opinions are different from that of international passengers.
6. Baker (2013)	This study was to examine the service quality and customer satisfaction of the top 14 U.S. airlines since 2007 to 2011.	Secondary Source from DOT, USA. 2007-2011.	NA	Descriptive Statistics	NA	The traditional carriers are converging toward a higher level of service quality using the four measures, there continue to be significant variation.	Airlines should offer services that they are capable of delivering..

Note. NA= not available; SA= self-administered; EFA =exploratory factor analysis; CFA= confirmatory factor analysis; SEM=structural equation modeling.

Table 2.7

Studies of Service Quality Dimensions in Airlines

Gursoy et al. (2005),	Park et al. (2004)	Cunningham et al. (2002),
On-time performance	Valued Services	Loyalty
Involuntary denied boarding	Satisfaction	Satisfaction
Mishandled baggage	Airline image	Image,
Customer complaint	Behavioral intentions	Repurchase intention
Liou & Tzeng (2007)	*Ippolito (1981)*	*Chang & Yeh (2002)*
Employees' service	Origin and Destination	On-board comfort
Safety and reliability	Fare	Airline Employees
On-board service	Income of Passenger	Reliability of Services
Schedule	Population	Convenience of services
On-time performance		Handling of abnormal conditions
Frequent Flyer Program (FFP)		
Chen (2008)	*Pakdil & Aydın (2007)*	*Saha & Theingi (2009)*
Expectation	Employees	Tangibles
Perceived Performance	Tangibles	Schedule
Perceived Value	Responsiveness	Ground staff
Overall Satisfaction	Reliability and Assurance	Flight attendants
Behavioral Intentions	Flight patterns	Satisfaction
	Availability	Repurchase intention
	Image	Feedback
	Empathy	Word-of-mouth
Gilbert and Wong's study (2003)	*Cunningham et al, (2000)*	*Namukasa (2013)*
Employees	Satisfaction	Reliability
Facilities	Quality of the system	Responsiveness
Responsiveness	Importance of the Activities	Discounts
Reliability	Funding priorities	Tangibles
Flight patterns	Input into decision making	Courtesy
Assurance	Airline Quality issues	Language skills
Customization		Frequent Flyer programs
		Timeliness

2.10 Airport Services

The airport is an import part of Aviation industry. It provides more than two third of the total airline services. The airport is the base and locus of the control through which airlines enable to offer the various levels of its passengers'. Further, it is the boarding and deplaning point to access the aircraft. It is the key and integrated part of the aviation industry.

Abdelaziz *et. al.* (2010), studied extensively and intensively about the relevance and impact of self-service technology and its impact to overall service quality to passengers since they have already uses in international airports, therefore they prepared a model that includes all applications of self-service technology in all international airports and specifically emphasized on the Common Use Self-service Technology (CUSS) and associated with a corresponding system in the function, called as Common User Terminal Equipment (CUTE).

Park & Jung (2011) explained about the transfer (transit) passenger's perception of airport service quality and its influence on value, satisfaction, airport image, and passenger behavior future growth prospect and success of the airport. According to them, airport passengers can be divided into different groups like to departing, arriving and transfer passengers. Fodness and Murray (2007), development of a conceptual model of service quality in airports through an empirical investigation into passengers' expectations. Air travelers have a meaningful choice with different airports and it is an increasing urgency among airport marketers to differentiate themselves by providing high customers value than competitors. Passengers' perception on airport service quality contribute an increase importance for a customer orientation to gain competitive advantage.

Hansen et al. (1998) studied by taking an example and build two metrics to capture the passengers' benefit from hub airport expansion. The first metric is an index of the passengers' transferring time and convenience at a hub airport; the second metric is the number of passengers who are supposed to connect at the hub airport. Wei and Hansen (2006) classify the passengers' benefits resulting from airport capacity expansion into two categories: direct benefits and indirect benefits. Indirect benefits are obtained through airlines' adaptation and service improvements after expansion.

Indian Airlines was able to improve its service standards, but its financial problems continued. The government pressed on with its reforms in 1994 when it took steps to corporatize Air India and Indian Airlines and to legalize the scheduled services of the new carriers (Paul Hooper, 2006).

Shank and Govindarajan (1993) suggest that there are three ‘‘value stages’’ that define the way in which commercial airlines provide value to their customers. These are: (1) providing reservation and ticketing services. (2) Operating the aircraft from point A to point B. (3) providing service to the passenger before flight, during the flight, and after arrival. The main rationale for increasing service frequency in a competitive environment is reducing passengers’ schedule delay. Schedule delay in air transport is defined as the difference between the passenger’s preferred time of departure and the nearest available service (Douglas and Miller, 1974).

Mohring (1976) demonstrated that aviation in deregulated markets are two obvious differences. First, the transport company would no longer minimize social costs, but minimizes operating costs (or maximize profit in the case of elastic demand). The second is a many submarkets aviation is characterized by a certain degree of competition. It is in this context that frequency is an important competitive tool.

Schipper shows that in more general where total demand is elastic this simple square root law no longer applies. The elasticity may well be higher. Demand for air travel is not uniformly spread across the day and therefore scheduling (when flights are offered) is more important than just how many flights are offered (Johnson and Savage, 2006). The benefits of high frequency of service are indisputable, but it is expected that the marginal benefit of an additional service after a certain level of service has been achieved will be close to zero while it will be large when level of service is relatively low (Givoni and Rietveld, 2008). The marketing strategy of the new entrants focused on winning customers over with higher service standards, particularly since the scope to reduce operating costs was limited (Hooper, 1997a).

Table 2.8

Differences between Low Cost Carriers and Regular Carriers

Characteristic	Low cost carriers	Regular carriers
Price	Simple pricing structure	Complex pricing structure
Distribution	Internet, Direct booking	Internet, direct, travel agent
Checking in	Kiosk, e-tickets	Kiosk, paper tickets, e-tickets
Network	Point-to-point	Hub-and-spoke
Classes	One class	Multiple classes
During Journey	No frill	Frills-food & beverages
Aircraft type	One type	Multiple type
Turnaround times	30 minutes or less	Slow: congestions/complexity
Customer service	Generally, under performs	Full service, offers reliability
Airport	Secondary	Primary
Brand	One brand: low price	Extended brand: price/service
Operational activities	Focus on core-flying	Flying, cargo
Target group	Leisure, price and time sensitive travelers	Business and leisure travelers
Services	No frequent flyer program or passenger lounge	Frequent flyer program and passenger lounge

Source: Holloway (2008), O'Connell & Williams (2005) and Baker (2013)

2.11 Service Quality Dimensions in Airline Services

The dimensions are the combining variables through which a fact or activity can be measured. It can't be measured directly, but it will be measured through the various concerned items. In dictionary meaning, it is the measurable factors or construct in the extent of a particular aspect and feature of situations. In the sense of service quality it is the characteristics of particular services, it is the extent through which service quality can be achieved (Tan et al., 2010; Bloemer, 1999).

Though various authors (Lu and Ling, 2008; Donthu & Yoo, 1998; Young, Cunningham & Lee, 1994; Saha & Theingi, 2009; Wang, 2007) have studied on airline service quality, these are almost about developed countries such as USA, France, and Germany etc. There are very few studies conducted (Connell & Williams, 2006; Venkatesh & Venkatesh, 2006; Khan et al, 2009; Hooper, 1998) in Indian context without any sophisticated statistical methods. In the above table definition of few important dimensions of airline passenger service quality have addressed.

Table 2.9

Definition Service Quality Dimensions in Airlines

Dimensions	Definition
Flight schedule	Frequency with which one can travel between two destinations
Airfare	One way flight fare
Flexibility	Ease and flexibility of travel plan and booking changes
Frequent flyer program	Possibility to collect miles or bonus points
Punctuality	Dependability to be on time departure and to the possess security of planning the schedule
Catering	Basic food and beverage in-flight services
Ground services	Additional services on ground (e.g. quick check-in)
Pre-flight service	Services before boarding the aircraft such as reliable of airline website, discount offer, quick response to exigency like hassle free cancellation, baggage allowance etc.
In- flight services	Different services offered inside the aircraft like safety percussions, seat comfort, quality of food, on-board entertainment, language skill and courtesy of in-flight crews.
Post-flight service	Various services such as promptness of baggage delivery, communication facilities, good retail shop refreshment lounge etc.
Reliability	The degree of appropriate, accurate and updated services in airlines and its consistency in offering.
Accessible and availability	Extent of which staff are available for guidance, advice and also easily available all the basic requirements and also easily accessible.
Courtesy	Positive attitudes employees, crews towards the passengers
Security	System followed by airport and airlines to protect passengers', employees, crew member, and aircraft from any kind of multifaceted accident or malicious crime and other kind of threats.

Source. Teichert et al, (2008); Namukasa (2012); Gursoy et al. (2005)

2.12 Customer Loyalty

In the dictionary meaning of customer loyalty is that if an existing customer used to buy or experience from the particular organization, even if the price increased, then this customer called as a loyal customer (Tellis, 1988)). It has both attitudinal as well as behavioral inclinations to purchase and referred to peers before other brands due to satisfaction, easy to get and handle, familiar and affection (PR Loyalty Solutions, 20011; Ciotti, 2009; Namukasa, 2013; Park & Jung, 2011; and Geraldine & Chikwendu, 2013).

This competitive world marketer, given prior importance by offering more value and services to retain customers to increase loyal customer, because the overall loyal customer is valued more than ten times than a new one for the company. In addition to that a loyal customer increases purchase time to time, ready to pay premiums for extra services and referred to others (Reichheld & Deane, 2004), it incurred costs six to seven times more to attract a new customer than to retain the old one (Ciotti, 2009), three out of five customers used to give up a favorite brand by expecting to have better service, nine to ten Americans are ready to spend more from the companies that they believe, it providing excellent service (American Express, 2011).

According to Newman & Werbel (1973), those who used to brought a brand and considered only that brand and even not seeking other related brand called as loyal customers. Oliver's (1997) emphasizes about the four phases of loyalty such as cognition (attitude towards the brand about information accrued), affective (liking the brand in cumulative satisfaction), conation (behavioral intention through repeated purchasing), action (desire to overcome obstacles, which prevent to get). This study discussed on passenger loyalty in Indian airlines that contribute to the management and authority to follow suitable activities to promote, establish and maintain full-fledge long term relationship with the airline passengers'.

2. 13 Punctuality

Punctuality is a psychological and behavioral state to be prompt. Punctuality refers to the proportion of flights delayed by more than 15 minutes. It considered in case airline scheduling, pre- departure delays and also in-flight delays (Reichmuth, 2005). According to Thomas Chandler Halliburton, cited in OAG 2014 report "punctuality is the soul of business", because the present world with soaring transparency, rapid information and its allied action have been playing a pivotal role in planning (John Grant, 2015). Punctuality is an important performance indicators for the airlines and also it differentiae before the other competitors for valuable and elite passengers'. As considering it as key leadership challenge airlines need to address the following three levelers for punctuality improvement with strategic and comprehensive framework within and outside the organization such as- net planning and control; availability of aircraft and ground operations and departure system etc. (Niehues et al 2001).

With whatever reasons poor punctuality incurs costs to the fellow passengers', airports and airlines in a huge amount. In his study, delays in airlines' costs around 0.7 to 3 percent of the operating revenues and in the amount it may about 6- 20 billion euro every year. Though it happens due to insufficiency of infrastructure capacity, poor maintenance, lack of employee motivation, political infiltration, and the tardiness of bureaucracy, the airlines have to overtake to sustain in coming days (Wu and caves, 2003; Mazzeo, 2003; Albers et al, 2005; Teichert et al, 2008). Again for the economy passengers are more price-sensitive and less worried to schedule, punctuality, and flexibility. In contrary, economy passengers are even less price sensitive than business passengers (Teichert et al, 2008). When punctuality comes to point in the public transport sector, it strengthens further as the importance of public transit.

2. 14 Safety and Security Services

It is a procedure or a system followed by airport and airlines to protect passengers', employees, crew member, and aircraft from any kind of multifaceted accident or malicious crime and other kind of threats (Chang and Yeh, 2002; Billings et al, 1976). In today's trend such as liberalization, globalization and huge urbanization impacting towards the society to the considerable increasing mobilizations of people and commodities. And the airports have become the gateways for the wider access the universe, ensuring the possible complete safety and security for the stakeholders and also assets have become primary concerns (Abdelaziz *et. al*, 2010; Fodness and Murray, 2007; Hinka et al, 2010). Again to win the confidence of passengers, safety and security are key elements to sustain the passenger loyalty (Delange et al. 2009; Enz and Taylor, 2002).

Aftermath of the terrorist attacks on 11 September 2001 in the United States changed and influence the travel behavior of airline passenger particular to security issues and government responses to the crisis (Hall, 2002; Enoma and Allen, 2007). It becomes as key indicators for the airline passengers'.

2.15 Pre-post Airport Services

Pre-post airport service is another core service for the airline passenger. To provide higher passenger valued services, and to achieve passenger loyalty through their satisfaction, a long standing relationship is matter. So this organization should build and maintain long lasting relationships with passengers through providing various

passenger services so that the satisfied passenger will convert to loyal ((Oliver, 1997). Apart from this relationship he service such as full-fledged and easy accessible reservation facilities, sufficient communication facilities, hassle free cancellation, baggage handling in time, and proper communications related information to the passenger mobile (Namukasa, 2013; Shank and Govindarajan, 1993; Lu and Ling, 2008) .

2.16 Relationship between Service Quality and Loyalty

As most of the airline services are intangible, passenger evaluates these service quality by comparing to the both experience with an actual expectation he/ she has about the number of service indicators. Due to these characteristics make the organization difficult to measure the same exactly. Hence, if the service provider will emphasize to the tangibility on overall services, it will contribute greater extent quality of the service (Gronroos, 2004). Again the provision for greater service quality needs appropriate tools or technology so the service provider has to implement as it is tangible, and any organization ready to perform well relative to intangibility. Hence experiencing with greater service quality makes the passenger more satisfaction that prompt towards the loyal by the passenger with the particular airline (Parasuraman, Zeithaml, & Berry, 1988; Bitner, 1990; Taylor & Baker, 1994; Oliver (1997) demonstrated that extremely satisfied customers are much more likely to remain loyal to firm than those who are merely satisfied.

Again the passenger or customer used to compare and test the promised service and what they perceived in time of service interaction (Bitner, 1995), in results if it is higher before expectation, implies customer happiness otherwise negative attitudes and hence passenger used bad word mouth' and negative references to his peers. Therefore, higher service quality is the essence of this trend and informative passenger and it will make passenger satisfaction. This satisfied passenger becomes loyal to the organization and stick to the company's product and services (Grönroos, 2007; Berry, 2000; 1999; Bloemer et al., 1999: Reichheld, 1996 and Reichheld & Sasser, 1990). Hence, from the discussion Loyalty and service quality has significant direct and indirect relation with each other.

2.17 Relationship between Service Quality and Punctuality

Punctuality is another key indicator for the airline service quality (John Grant, 2015). So that all business used to stick their planned schedule and implement accordingly in the competitive world. The punctuality may in the sense of frequency, in time departure, and prompt solution in case of any miscarriage etc. If punctuality is not followed by the service provider, it may cost both for the passenger as well as to the service provider or airlines. In a study shows that little delays make the burden incur cost around the 6 billion euro in the world over aviation sectors (Mazzeo, 2003; Albers et al, 2005; Teichert et al, 2008). So punctuality or prompt services are similar to the reliability and responsiveness by the original service quality model of Zeithaml et al, (1985) 'SERVEQUAL' model contribute to the overall service quality directly or may indirectly significantly to the airline passenger.

2.18 Relationship between Service Quality and Safety and Security Services

In post USA terrorist attack on September 11, 2001 changed the face of most of the service sector, such as tourism, aviation, travel, finance and others. So either the passenger or tourist thinks twice before planning to journey to the terrorist affected countries for any kind of purposed. It hampers the corporate world. Safety and security is part of human civilization. As per the society modernized, technology developed, speed communication emerges ha results it compels to the service provider to use sophisticated technology such as X-ray machines, explosive detectors, metal detector, backscatter X-ray machine and other gadgets to protect any kind of multifaceted threats (Hinka et al, 2010). As passenger considering the safety is an important part of choosing the particular airlines, so the airport as well as airlines have to implement and deployed electronic gadgets and individual personnel to ensure the safety of the passenger can be the another distinction for the service quality for airline passenger and a pivotal indicators to choose (Enz and Taylor, 2002; Billings et al, 1976).

2.19 Relationship between Service Quality and Pre-post Airport Services

If the airline will offer good pre airport services such as easy to access the official portal, and user friendly portal of third party travel agency with updated information, for online booking facilities boosting to the satisfaction of passenger. Apart from the online facilities, reservation staff courteous, and providing accurate information as per passenger requirements in case of off line reservation facilities. In this with reservation

facilities will add to the overall service quality through passenger satisfaction. Apart from earlier, post airport related service such as availability of carrier wheel for deplaning and going to board passengers, even wherever required, added value to the passenger services. Hence there is significant relation of pre-post services towards the overall air passenger service quality. For this a long standing relationship as well as to offer post airport services, prompting to retention of the passenger (LaBarbera and Mazursky, 1983 and Oliver, 1997).

2.20 Relationship between Service Quality and Loyalty and Punctuality

As the study have already reviewed about the existing relation between service quality and loyalty, here the review addressed in indirect relation of loyalty with the overall air passenger service quality through the punctuality. Now a days as service sector overtake to the other sectors like agriculture, manufacturing and even considering to services in this sector, service literature has dominated and focused by the scholarly research to provide more accurate and valued services. Not only the theoretical but also in operational, specifically to identify the relationship among the various construct and mediation as well as the moderating effects of the constructs have been debated so far (Bloemer et al., 1999; Chang and Yeh, 2002). It is obvious that if airlines sticks to its punctuality in services, sincerity in its service operations, passenger will be satisfied with high perceived service quality. Hence the satisfied passenger become loyal towards the service provider, particular airline and they will ready to repurchase even price of the product or services increases and able to pay more for external services (Oliver, 1999; Parasuraman, Zeithaml, & Berry, 1988; Bitner, 1990; Park et al., 2004).

Again in another direction, if the passenger perceived greater service quality including, the customers' satisfaction level increases and this satisfaction have positive impact to the loyalty of the customer towards the organization and they would be less prone to shift from the existing brand. So it is a gain of competitive advantage for the service provider (Mohsan et al, 2011; Fornell 1992 and Oliver, 1997). Again, punctuality has a significant relationship (as addressed above) with overall service quality, so there is the positive effect of loyalty on overall service quality through punctuality.

2.21 SERVQUAL

The SERVQUAL from Valarie A. Zeithaml, A. Parasuraman, and Leonard L. Berry (1985) is a sophisticated tool which can be used for performing a gap analysis of an organization's service quality performance against customer service quality needs. SERVQUAL is an empirically derived technique that may be used by a service organization to improve service quality. The method involves the development of an understanding of the perceived service needs of target customers. SERVQUAL takes into account the perceptions of customers on the relative importance of service attributes.

2.21.1 Key Dimensions of SERVQUAL

The following are the ten key dimensions of SERVQUAL which were initially proposed having 33 attributes.

1. Tangibles: Appearance of physical facilities, equipment, personnel, and communication materials.
2. Reliability: Ability to perform the promised service dependably and accurately.
3. Responsiveness: Willingness to help customers and provide prompt service.
4. Competence: Possession of required skill and knowledge to perform service.
5. Courtesy: Politeness, respect, consideration and friendliness of contact personnel.
6. Credibility: Trustworthiness, believability, honesty of the service provider.
7. Feel secure: Freedom from danger, risk, or doubt.
8. Access: Approachable and ease of contact.
9. Communication: Listens to its customers and acknowledges their comments. Keeps customers informed in a language which they can understand.
10. Understanding the customer: Making the effort to know customers and their needs.

After making further empirical test, the authors simplified to 5 out of above ten dimensions (1988, 1991, and 2006) like tangible, reliability, responsiveness, assurance and empathy.

2.21.2 Service Quality Gaps

There are seven major gaps in the service quality concept. This model is an extension of Parasuraman et *al* (1985) where five original gaps were discussed on the service marketer’s side.

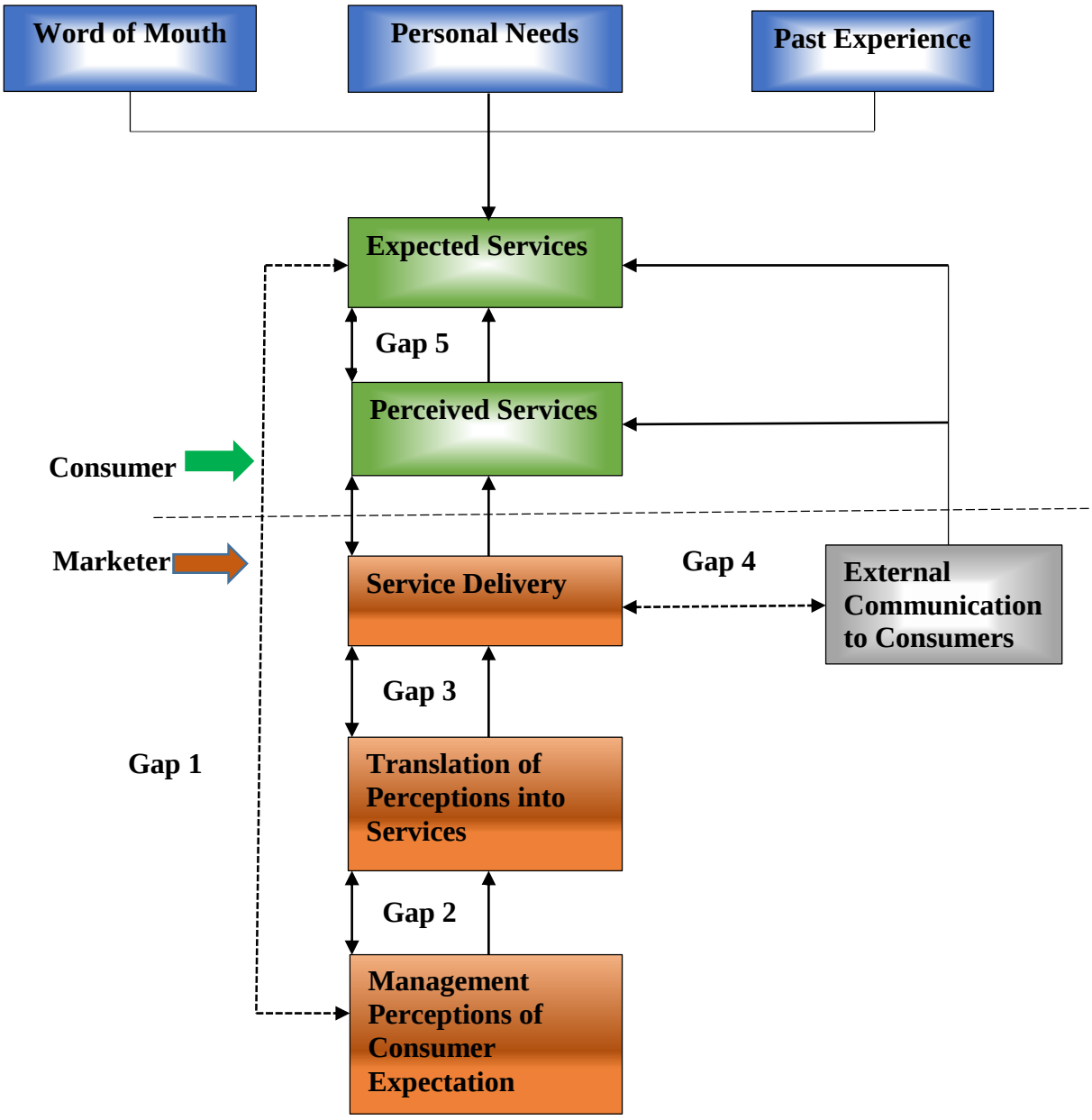

Figure 2.1 Conceptual Model of Service Quality

Source: Zeithaml, V.A., Berry, L. L., Parasuraman, A. (1988)

According to the following explanation (ASI Quality Systems, 1992; Curry, 1999; Luk and Layton 2002), the three important gaps, which are more associated with the external customers, are Gap1, Gap5 and Gap6 since they have a direct relationship with customers.

Gap1: Customers' expectations versus management perceptions as a result of lack of marketing research orientation, inadequate upward communication and too many layers of management.

Gap2: Management perceptions versus service specifications as a result of inadequate commitment to service quality, perception of unfeasibility, inadequate task standardization and an absence of goal setting.

Gap3: Service specifications versus service delivery as a result of role ambiguity and conflict, poor employee-job fit and poor technology-job fit, inappropriate supervisory control systems, lack of perceived control and lack of teamwork.

Gap4: Service delivery versus external communication as a result of inadequate horizontal communications and propensity to over-promise.

Gap5: The discrepancy between customer expectations and their perceptions of the service delivered as a result of the influences exerted from the customer side and the shortfalls (gaps) on the part of the service provider. In this case, customer expectations are influenced by the extent of personal needs, word of mouth recommendation and past service experiences.

2.22 Critics of Service Quality Models

From the above discussed models, it is found that the models are more effectively applied in service quality literature and provided important insights to understand the concepts of service quality. The leading models such as SERVQUAL (Parasuraman, Zeithaml & Berry, 1988) and SERVPERF (Cronin & Taylor, 1992), has given a wide range of platform to evaluate service quality. In general, though SERVQUAL and SERVPERF were designed to measure services across the industry, in the latter, it has been suffering with a lot of trends. Hence it is necessary to modify for the specific application in context, though these approaches have played a significant role to measure service quality about the service market.

After further reviewing the earlier literature by many scholars, professionals (Buttle, 1996; Lewes and Mitchell, 1990; Babukus and Boller, 1992; Cronin and Taylor, 1992; Parasuraman, et al, 1991; Brown, Churchill and Peter, 1993), they conclude that late service quality and its measurement models are mostly originated from the so- called basic model developed by Grönroos, and the SERVQUAL model established by Parasuraman and others. In spite of its growing popularity and wide range of application, SERVQUAL has been subjected for operational as well as theoretical criticisms are discussed in the following table.

Apart from the models like SERVQUAL based on the expectancy paradigm where SERVPERF is based on perception other criticisms are focused on preceding model only. In SERVQUAL (Parasuraman et al) model frequent modifications related to text of scale statements (new statement vs. original statements, negative statements vs. positive statements), normative wording statements (high average values vs. common values), rephrasing to perception statements, introducing communication related question in tangibility, reduction of dimensions from ten to five dimensional model (where factor analysis can't reflect the difference in characteristics, but reflect to the original model), high correlation between them, conversion of one- dimension into two dimensional of tangible factors are few pitfalls has been debated in service sectors. The following are few criticisms on SERVQUAL till date across the research community of the service sector.

Table 2.10

Pitfalls of SERVQUAL Instrument

Limitation of SERVQUAL	Suggestions
Treating all items (22) as equally	Weighting them (Carman, 1990; Lewes and Mitchell, 1990) & Allocation of points (Parasuraman et al, 1991a)
Using negative words	Either warning (Babukus and Boller, 1992) or changed these words into positive (Parasuraman et al, 1991a)
Using the word 'should'	'should" can be changed to 'would' (Parasuraman et al, 1991a)
Restricting 7 point to respondent	Graphical scale (Lewis and Mitchell, 1990).
Using lengthy questionnaires	Using either direct measurement approach or bipolar semantic differential graphical scale.
Using differential score	Use performance base SERVPERF (Cronin and Taylor, 1992) and non-differential score by rephrasing (Brown, Churchill and Peter, 1993)
Questioned on reliability and validity	Convergent and Discriminant validity strengthened to complex evaluation criteria Babukus and Boller, 1992) and use of non-differentiated score will improve reliability and validity (Brown, Churchill and Peter, 1993).
It is only for multiple service function	Should for each service function.
Using adjectives makes confusion	Use of bipolar semantic differential scale (Lewis and Mitchell, 1990) and certain items may be modified.
Factorizing of 22 items that not generic	Modifications of no. of items and wording (Carman, 1990)
Based on process quality	Outcome quality attributes should be included (Rechard and Allaway, 1993; Buttle, 1996)
It is based on expectation	It should be based on P-E gap (Buttle, 1996)

Source: T. Teichert et al (2008)

2.23 Models on Airlines

2.23.1 Hub-and-Spoke Network

Hansen (2006), studied on hub-and-spoke network operated by an airline and the aggregate travel demand originating from each spoke to all other spokes. He proposed a log-linear demand model is specified as follows:

$$\text{Log}(PAX_{S,H,A})=\alpha+\beta_1*\log(DFREQ_{S,H,A}) + \beta_2*\log(SIZE_{S,H,A}) + \beta_3* \log(SPOKE_{H,A}0)$$

$$+\beta_4*\log (HFREQ_{H;\,A}) +\beta_5*\log (FARE_{S;\,H}) +\beta_6* \log (MILE_{S,H})$$

$$+\beta_7 *\log (LOCALs_{,H,\,A}) + \beta_8* \log (BASE_S) + \beta 9* \log (INCOME_H)$$

$$+ \beta_{10}*\log (CAPACITY_H).$$

Where, $PAXS_{H,\,A}$: the number of passengers originate from spoke S, go through hub H and travel to all other spokes, flying with airline A**;** $DFREQ_{S,\,H,\,A}$: the service frequency provided by airline A between spoke S and hub H; $SIZE_{S,\,H,\,A}$:average number of seats of airline A between S and H**;** $SPOKE_{H,\,A}$: total number of spokes served by airline A through H**;** $HFREQ_{H,\,A}$: average frequency by airline A between H and all its spokes; $FARE_{S,\,H,\,A}$: average fare per passenger charged by A to passengers flying from S through H to other spokes; $MILE_{S,\,H,\,A}$: average flight distance for all connecting passengers flying from S through H to other spokes; $LOCAL_{S,\,H,\,A}$: number of local passengers travel from S to H by A**;** $BASE_S$: total number of initiated passenger trips from S; $INCOME_H$: total income in the metropolitan area of H**;** $CAPACITY_H$: aircraft rate arrival capacity at H, in terms of acceptance.

2.23.2 Utility-Based Model

Wei (2008) to quantify passengers' benefit resulting from airlines' adaptation and improvement of service after airport expansion,

$$V_{j\,m} = \alpha \ln (Freq_{j\,m}) +\beta \ln (Size_{j\,m}) +\gamma (Fare_{j\,m})$$

Where $V_{j\,m}$: passengers' deterministic utility if they take a flight from airline j in market m; $Freq_{j\,m}$: service frequency provided by airline j in market –m**;** $Size_{j\,m}$: is the average aircraft size (seats per flight) used by airline j in market- m; $Fare_{j\,m}$: is the average fare charged by airline j in market –m**;** and α, β, γ are the co efficient to be estimated.

2.23.3 Passenger Traffic Demand Model (PTD Model)

The study considers the total passenger demand between the two cities as the dependent variable. The model suggested to individual travelers to the city level, the flow of airline passengers between any two cities is largely explained (Srinidhi. S, 2011) as follows. The specifying model follows.

$$\text{PASS-TRAFIC (PT)}_{i\text{-}j} = \alpha \times A_{f\,I\,,j} \times \text{INCM}_{i\text{-}j} \times \text{POP}_{i}\,\text{POP}_{i} \times \text{DIST}_{i\text{-}j} \times \alpha^{\epsilon}$$

Where, $PT_{i\text{-}j}$: represents the passenger (PASS) demands from city i to city j; $A_{f,\,i,\,j}$: air fare charged to fly from i to j; $INCM_{k}$: the k^{th} passenger's income that decides his travel; $DIST_{i\text{-}j}$: represents the distance between origin -i and destination- j.

Apart from the above discussed model, there are several mathematical models are available about Fuzzy set theory, & DEA to evaluating production efficiency for bus, train and air transportation (Tzeng et.al, 2001). And also models based on a Data envelopment analysis and Tobit analysis studied by various scholars for operational efficiency versus financial mobility in the global airline industry (Scheraga, Carl A. 2004).

2.24 Various Competing Models

After reviewing the existing literature, the study found that there is no particular comprehensive conceptualized service quality model to analyze the most of the relationship between service quality and other theoretical construct related to airline services. So the present study is an attempt to develop a multi- approach model, which will cover various direct and indirect relationships between overall air passenger service quality and loyalty, punctuality, safety and security services and pre-post airport services. It is based on recent current approach of service marketing to estimate the concerned relationship among the five constructs in Indian airlines passenger services. Though the study is focused on few important constructs on Indian airline services, it is relied upon revised version of the SERVEQUAL instrument (Letcher & Neves, 2010; Arambewela & Hall, 2009 & Peng, 2008). Based upon the above reviewing to existing literature, the current study proposed few selective models as shown in the following figures.

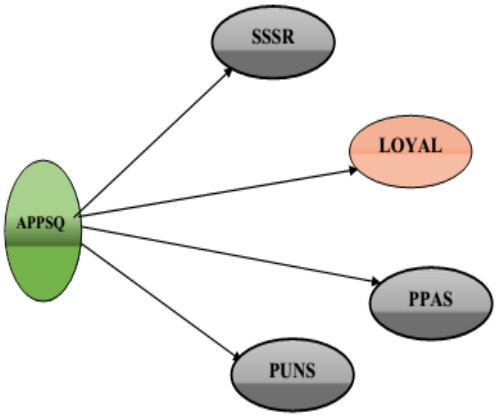

Figure 2.5 Direct Model (M1)

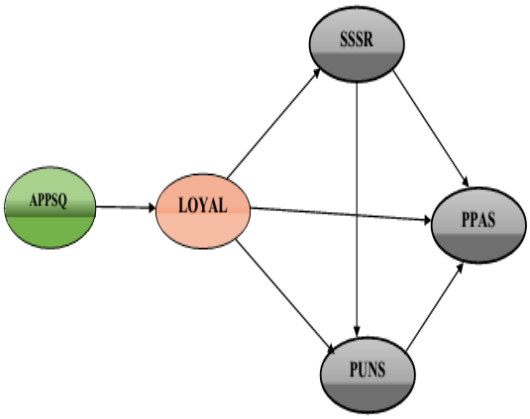

Figure 2.6 Indirect Model (M2)

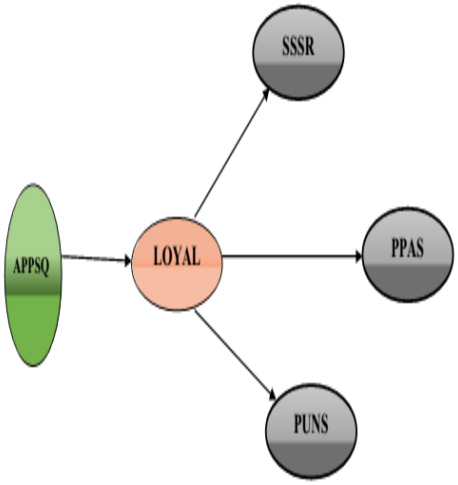

Figure 2.7 Indirect Model (M3)

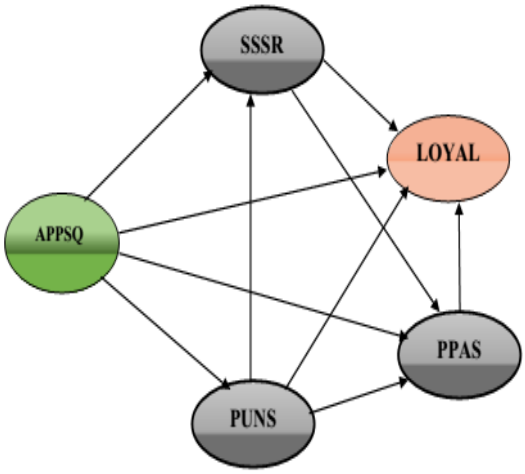

Figure 2.8 Research Model (M4)

Note. APSQ: air passengers' perceived service quality; LOYAL: loyalty of the passenger; SSSR: safety and security services; PPAS: pre and post airport services; PUNS: punctuality

The first model is based on overall air passenger perceived service quality directly related towards the loyalty, punctuality, pre-post airport services and safety and security related services. Most of the studies emphasized that the effect of service quality has indirectly on loyalty through other constructs like satisfaction, punctuality Patterson & Spreng, 1997; Roest & Pieters, 1997; Lageza, 2002; Lai & Chen, 20011) etc. Whereas other explained that there is direct impact (Parasuraman, Zeithaml, & Berry, 1988, 1991; Cronin & Taylor, 1992; Zeithaml, Berry & Parasuraman, 1996; Bloemer, et al., 1998). The proposed model as seen above.

In the second model, called as an indirect model (M2) illustrate from the loyalty, indirect relations between overall service quality and other construct such as punctuality, safety and security and pre-post airport services through loyalty and again with another construct consecutively (Parasuraman, Zeithaml, & Berry, 1988; Cronin & Taylor 1992; Fornell et al., 1996; Namukasa, 2013; Lu and Ling, 2008).

In the third model (Indirect model- M3) derives from the various literature, which studies the indirect relationships only via loyalty that unlike to the indirect model (M2) between the service quality and other three construct like punctuality, safety and security services and pre-post airport services (Taylor, 1997; Roest & Pieters, 1997; Rizan, 2010). So this model has the indirect effect on service quality only through loyalty.

In the fourth model called as research model (M4) that proposed by considering different relationships from the earlier literature that relationship among the constructs have both direct and indirect relations between the service quality and other constructs (Clemes, Gan,& Kao, 2008; Albers et al, 2005; Teichert et al, 2008; Mazzeo, 2003; Hinka et al, 2010). This model explained about the multilevel indirect relationship such as mediation and moderation effect of the constructs at different levels. And that can be shown in the following figure.

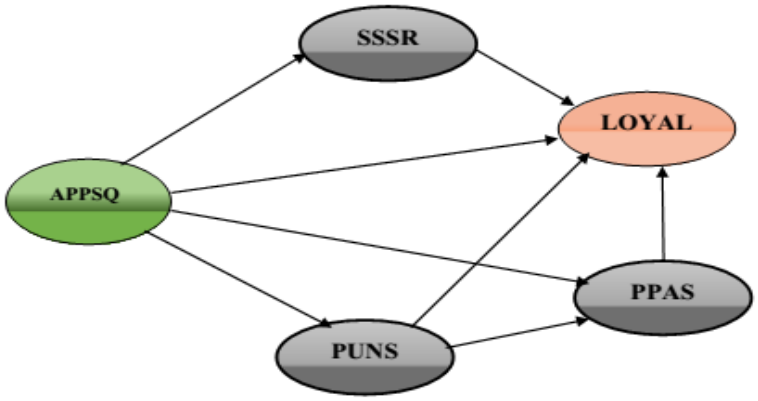

Figure 2.9 Research Model (M5)

Due to of complexity and expected over identified (Hair e al, 2008; Schumacker & Lomax, 2004; Kline, 2011; Baron & Kenny, 19860), the current study proposed another model called as second research model (M5). This model revised to the above model

and simplify to establish direct relationship between service quality and other exogenous constructs. It also described few indirect relationship of these five constructs each other's (Teichert et al, 2008, Wang, 2007; Trip and Dera, 2002; Tsaur, 2001; Pakdil & Aydın, 2007; Saha & Theingi, 2009).

The study considered as this last model is more pragmatic to establish relationships among the existing concerned constructs based on earlier literature. Again, unlike the earlier model the current proposed model will perform well to establish relationship among the five constructs through the better fit. It is shown in the above figure.

2.25 Research Gap

Research gap is the difference or gap between previous research literature and current practices for the same as well as inequitable opportunities spread over. In other words, it is failure to conduct the different types of research, which is best suited for addressing the complicated issues (Klingner & Boardman, 2011). It is the identification of opportunities that to be explored in this study. It is the difference between what is already existed (like theories, assumptions, and practices) and what is required or targeted (or what should be done).

From the previous literature we found that lot of studied on airline service quality were based on the USA and European countries apart from few about the Asian continent like Taiwan, and Hong Kong. In India, there are a few studies even, that are used only with descriptive statistics, EFA, ANOVA etc. In this study, we used to some sophisticated techniques, which are both independent and dependent techniques. From the earlier research, the study found some gap in terms of concept, and techniques used.

- Service Quality depends upon human **behavior** and its **attitude**. Various dimensions of overall service quality also **differ** in respect to settings, time, sectors and medium etc.
- Till the day, there is **no single** tool that can enable to measure prospective quality in all above factors, due to their **uniqueness.**
- The concept of overall services, and the impacts of punctuality, loyalty, pre-post airport services and safety measures not well discussed subjectively for air passengers in India.

- No study **directly and indirectly** relates, to service quality (SQ) and safety measure to loyalty, SQ and pre - post airport services (PPS) towards the loyal, SQ and punctuality to PPS as well as loyalty to retain existing passengers.
- No study till, has implicitly looked into the level of service quality of air passengers in Indian context.

2.26 Conclusion

From the above discussion, the study has illustrated different conceptual frameworks of service quality and its related constructs such as loyalty, punctuality, pre-post airport services and safety and security service for the aviation industry. Apart from that, various empirical issues for measuring service quality and loyalty as well as direct and indirect effects of other concerned constructs are addressed with literature survey. As a result of which, the study concludes as service quality is multidimensional construct and it measured through multiple factors. And there is no comprehensive agreement that service quality and loyalty are either same or have the distinction between them. Hence the relationships between the service quality and other four constructs are ambiguous and complex in service literature. So the application of generic models in different service sectors did not fit well due to each sector having its unique characteristics. By considering the limitation, it is ensured that there is no significant study found in Indian Airlines. So the study is looking into only to perceived part of the passengers' services and has developed five competing models by considering overall direct and indirect relationships.

CHAPTER III

RESEARCH METHODOLOGY

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RESEARCH METHODOLOGY

The preceding chapter described the existing literature on services, quality management and its importance, service quality and service quality management. Apart from that, various conceptual and mathematical models on service quality, models related to transportation, air transport and their relevance & limitation were outlined. Definition related to various dimensions was also discussed lucidly. This chapter will looked at, research methodology, sampling frame, data collection instrument development, and also various statistical generated dimensions of service quality about airlines. The final section of the chapter explores suitability approach considered in this thesis.

3.1 Introduction

India's aviation industry promises huge growth potential because of large and growing middle class population, favorable demographics, rapid economic growth, higher disposable incomes, rising aspirations of the middle class, and overall low penetration levels. The industry has grown at a 16 percent CAGR in passenger traffic over the past decade. But the global airline industry is itself going through a sturdy phase, due to below economic growth across the advanced economies and high crude oil prices. Besides, aviation economics currently remain unfavorable in India due to heavy competition, mandatory route dispersal guidelines, higher taxes on ATF, airport related charges and inadequate airport infrastructure. So this study will be helpful in this crucial phase of the industry.

This study is academic type and its journey started from selection of research topic from an area of interest, till submit an elaborate report. In order to the preliminary steps, the mini literature review was conducted. Followed to that, full fledge study with theoretical background, identified research problem based on the research gap, was established. According to Kumar and Vijayalakshmi 2011, there are various essential features to have of academic research such as it should be rigorous, controlled, valid and verifiable, empirical, critical, reliable, systematic, arguable and even challengeable etc.

3.2 Statement of the Problem

Statement of the problem is a snapshot of the particular study (Simon, 2011), likely to be a brief part of whole writing that usually comes earlier part of report to outline the issue, the researcher is going to add to the existing literature. It is a problem statement that will explain the basic facts on the topic.

After going through the earlier literature, the transport and the airlines sector in particular, it was found that the industry mingled with all the stakeholders from the booking agent, medium of information, transportation to airport till passenger reached his/ her own destination can be further looked into to boost the research. The organizations like Ministry of Civil Aviation (MCA), Airport Authority of India Ltd (AAI), and various Airlines have been making a continuous effort to improve the quality of services, to meet customer expectation and satisfaction at the highest level.

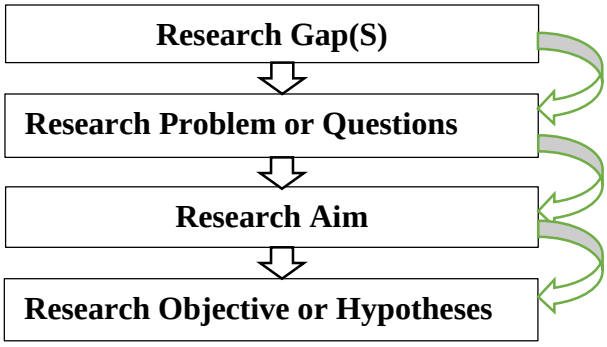

Figure 3.1 Order of Research Activities
Source. Abdulai & Ansah (2014)

Though it is differing to the different passengers' perceptions, it can be predicted through various service quality attributes. It is not the first study in the concern field, rather ample of research findings are available. But quality related to airline passengers in Indian context is very few and even untouched and unanswered to many curiosities till date. Hence it is inquisitive about many questions that are still remaining unanswered and unearthed. So few questions can be asked in the study and needs to be explored. These are given below.

- Are there any differences in perceptions about service of various aspects?
- Is it differing in expectations for services by the airline passengers?
- Are the developed service quality models for airline passengers really improved passenger satisfaction level or not?
- Is there any possibility to give more services with existing air fares?

- What is the trend of no-frill services in Indian airline sectors?
- Are there any unexplorable factors which can contribute more value to the passengers' angle and award to the service provider?

3.3 Significance of the Study

This section will discuss how and why this study is important and what its implications are. It also indicate, how the study might fill the knowledge gaps in the sector, either by developing better theoretical models, or the way towards further study. Uniqueness of the section is to explain "the rationale" of this study in other words the researcher tries to convince the intellectual community that the research is worth doing.

Passenger growth: Generally it has observed that the air transport grows at twice the rate of GDP growth. The international passenger growth has been growing at CAGR of over 14% and domestic growth has been an impressive 22% for last 6 years. IATA reported that, by 2034, India is expected to be among the top five air domestic travel market's globally, in terms of additional passengers per year. Domestic air passenger traffic in India has posted double digit growth of about 16.3 percent in October 2014. Aircraft, passengers' and freight movements' at all Indian airports are expected to grow at a rate of 4.2 percent, 5.3 percent and 5 percent respectively for the next five years.

Apart from the above, following few thrusts can be out looked at.

- The Indian aviation industry is one of the fastest growing aviation industries in the world.
- This sector is investment friendly (100% in green field and existing projects, schedule services-49% & NRI-100%; Non schedule 74-100%).
- The ICAO estimated that $100 spent on air transport produce benefits worth $325 for the economy and 100 additional jobs in air transport result in 610 new economy wide jobs.
- The ICAO study attributes over 4.5% of global GDP to the air transport component of civil aviation.
- The trips per capita in India are remaining very low (0.04) even by the standards' of other emerging markets, such as China (0.15), Brazil (0.25) and Malaysia (0.54).
- Air transport grows at twice at the rate of GDP growth.

- The aircraft is the second fastest mode of transport, after the rocket.
- India has 1 aircraft for every 2.89 million population, which is little in comparison to 1.14 million in China, 0.96 of Indonesia, 0.89 in the Philippines and 0.63 in Brazil. Out of the 32,000 helicopters in the world India has merely 210 while out of 15,750 freighter carriers globally, India has just 12.
- The airport has created about 65,000 direct and 120,000indirect jobs in the region.
- At present India contributes over one percent of the world air cargo and traffic only. It is the need of hour to augment further.
- There is no specific tool to measure air passenger service quality in Indian context.

The study will assess to service quality interval of various indicators using fuzzy approach that can use to predict passengers' satisfaction of Indian airlines. Furthermore, it would be beneficial to the service provider and passengers, as this study would provide necessary information about to overall service quality and its impact to loyal, punctuality, pre-post board services & safety measure and their interrelationships. The researchers expect, this study may provide baseline information on the current status of airline service quality to carry forward the same for future research. In order to address this, the basic purpose of the study, the research questions and research objectives are indicated in the following sections.

3.4 Research Questions

A research question is the basic core of a research, study. It focuses the study, determines the right methodology, and hence guides all stages of study, analysis, and reporting. According to Voss (2003), it is the onus of the researcher that how can she or he make the study more interesting? Good research question will prompt constant effort to articulate and frame the ways to produce more interesting research.

On the basis of the background of the study about the existing service delivery system as well as management practices, and gaps identified in the reviews of available literature about passengers' of Indian airlines, interactions with passengers and employees and focus group discussions, leads to formulate the following research questions that boosted the present research. In the inceptions, an attempt has been made

to analyze the structure of airline services in Indian context. The present course of action, perceived services at the passengers' point of view, and trends in future service quality has been incorporated for widening this study. At most care was taken to reduce multicolinearity within the variables through which hypothesis to be framed.

- What is the **structure** of Air Passengers' Perceived Service Quality?
- What are the **Prerequisites** of the Air Passengers' Perceived Service Quality?
- What is the most appropriate **model** and measurement methods for measuring air Passengers' Perceived Service Quality?
- What is the **relationship** between Air Passengers' perceived Service Quality and Loyalty, Punctuality, Safety and Security Services, & Pre-post airport Services?

3.5 Research Objectives

Research objectives are the goals the researcher set out to attain in the study. It is the kind of specific information from the researcher that what the study want to attain. The objective of research is to find the answers to certain questions through the applications of scientific procedures. It is the depiction of what is to be achieved by the study (Doorewaad, 2010)

Based on the research questions the broad objective has been framed as "better understanding and evaluates service quality and satisfaction level among airline passengers by developing a tool". In order to substantiate the broad objective the following sub-objectives of the study are framed.

1. to categorize air passengers' service quality dimensions and its attributes to construct 'FliQual' instrument for measuring airline passengers' perceived service quality;
2. to develop 'FliQual', a predictive model by identifying factors which measure air passengers' perceived service quality in Indian airlines and identifies individual service quality attributes which are significant contribute to their respective service quality dimension;
3. to confirm the identified air passenger perceived service quality variables and factors by developing 'FliQual' measurement models;

4. to test the different relationships between air passenger perceived service quality and some of unique constructs such as punctuality, loyalty, safety - security services, & pre-post airport services using structural equation modeling;
5. to find the interval level of overall air passengers' perceived service quality using fuzzy approach;

3.6 Research Hypotheses

It is a statement of assumption about fact, relationship between variables, concept etc. It is a proposed expression for a phenomenon. According to Kinnear and Gray (1998), a hypothesis is a provisional supposition through which a variable has the causal relationship on another variable. According to Guther et al. (2001) & Romesburg 1981, statistical hypothesis is a means of assessing the variety of deductions under the shadow of uncertainty. According to (Kosko 1992), statistical hypothesis and research hypothesis are mostly described as members of fuzzy, as it opposed to crisp sets.

In this study, we are considering the various research hypotheses based on the earlier approach and objective of the study. These are classified into two categories such as based on proposed predictive and theoretical model. Again, the study extracted various critical factors to evaluate the air passengers' experienced service quality and test level of effect of these factors towards the overall passenger service quality as well as correlate the significant of variables. The following hypotheses are framed based on predictive model.

H1: Availability and accessibility (ASF1) have significant impact on overall passenger service quality (APPSQ)

H2: Staff services (SSF2) to passengers has significant impact on passenger service quality

H3: Courteousness employees (CTF3) has significant impact on overall services to air passengers

The hypothetical model of the presented study is shown in the figures 3.2 &3.3

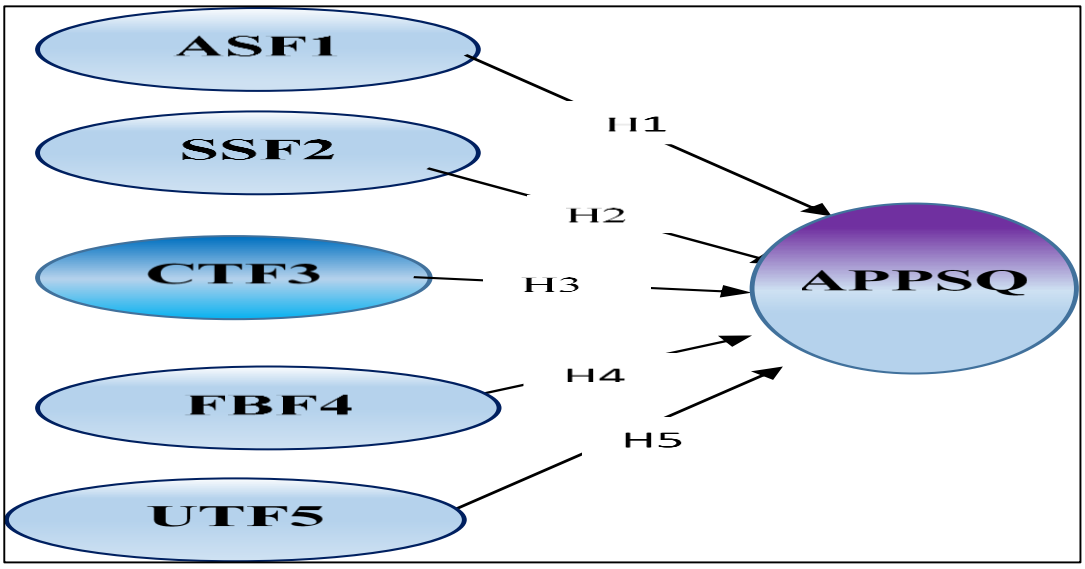

Figure 3.2 Predictive Model (M 1)

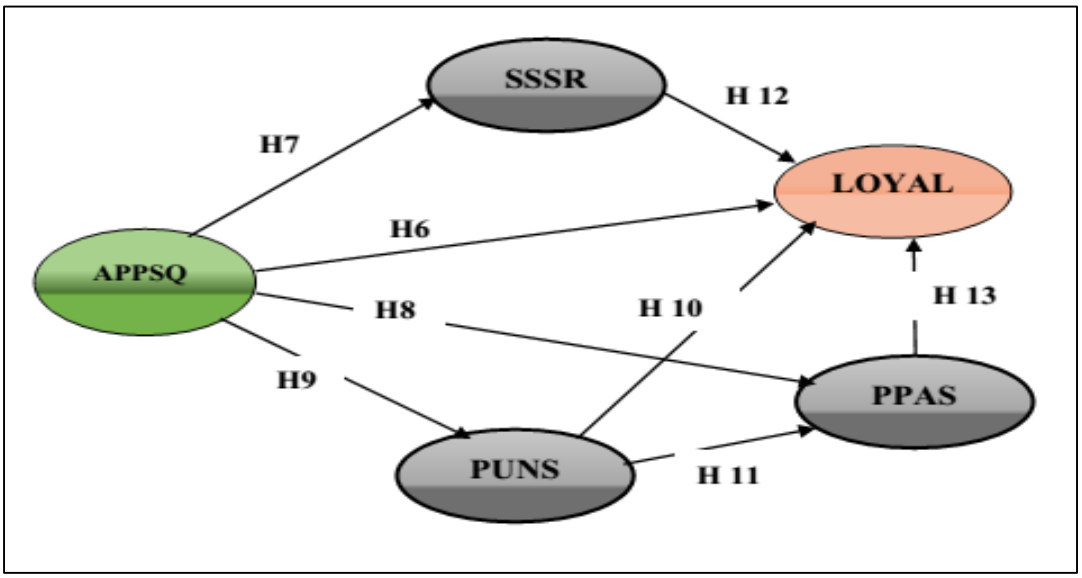

Figure 3.3 Theoretical Model (M 2)

H4: Food and beverages (FBF4) having significant impact on air passenger service quality

H5: Updated technical services (UTF5) has significant impact on overall service quality

H6: Passenger service quality has significant impact on loyalty (LOYAL) program offered

H7: Passenger service quality (APPSQ) has significant impact on safety measure (SSSR) taken by authorities.

H8: Passenger service quality has significant impact on pre and post airport services (PPAS)

H9: Passenger service quality has significant impact on punctuality (PUNS)

H10: Punctuality has significant impact on loyal services

H11: Punctuality has significant impact on pre and post airport services

H12: Safety measure has significant impact on the loyalty of passenger

H13: Pre and post airport service s has significant impact on the loyalty of passengers

H14: Air passengers' perceived service quality (APPSQ) has significant indirect impact on loyalty (LOYL) through punctuality (PUNS).

H15: Punctuality (PUNS) has an indirect effect on loyalty (LOYL) through pre-post airport services (PPAS).

3.7 Research Design and Methodology

The term 'research design' and 'research methodology' are used interchangeably still they have some distinctive concepts. 'Research design' is the logical structure of the study, which articulates, what data is required, from whom, and how it is going to be, answer research question. But in a real sense, research design is dealing with a logical problem and not a logistical problem, according to Yin, 2009. Design means, "How to do the research or what information to collect becomes a choice of methods".

3.7.1 Research Design

In social science research it needs to structure or design the study before starting data collection, its analysis, even starting the project also is called as research design. The function of research design is to ensure that the evidence obtained enables the researcher to answer research questions, which are initiated earlier as unambiguously as possible. The selection of an appropriate research design is crucial to the effectiveness of the good research (Sachdeva, 2008).

The main aim of this study is to identify the boundaries of the problems or situations are likely to reside with the help of identifying variables or factors. This study is descriptive research is to provide an accurate and valid illustrations of the factors and variables that relevant to this research questions. The study has designed to evaluate various quality levels of services offered by the Indian Airlines.

Table 3.1
Research design Vs. Research Methods

Research Methodology	Research Methods	Research Design
Quantitative vs.	Methods of Sampling	Experimental
Qualitative vs.	Data Collection	Descriptive
Participatory/Action Research	Data Analysis	Exploratory

Source: Wyk, B. V. (2014)

3.7.2 Research Method

Using a suitable research method is paramount to get effective results of a research work. Generally there are varieties of research methodology with no single accepted research methodology applicable to all research problems. Each research methodology has its own relative weakness and strength (Tuli, 2010). The selection of research methodology depends on the paradigm that guides the research activity, more specifically, beliefs about the nature of reality and humanity (ontology), the theory of knowledge that informs the research (epistemology), and how that knowledge may be gained (methodology).

3.8 Data Collection Tool

Data can be collected by two different ways. It depends upon the type of research the researcher is going to absorb. As the study is descriptive so data were collected the primary type of data using the survey method.

Survey method is the most important modes of data collection, and it is widely used. A survey collects data from a large number of samples or respondents, using a standardized closed ended set of questions. The primary benefit of a survey is that it can give quantified, reliable data on a variety of issues. The survey is classified into 1) cross-sectional surveys where data are collected at one point in time from a sample selected to represent a larger population and 2) longitudinal survey, which involves repeated observations over a period of time. Hence this study is based on cross-sectional surveys.

3.9 Reliability and Validity Estimation

In social science research, it reveals that measurements of complex variables are always changing. So that it is sure that there are inaccuracy between what we measure and the truth about the nature of the construct. So it is important to measure the reliability and validation of the research instrument.

Reliability*:* This test would give the same result if used several times over. Reliability is the degree to which measures are free from error and therefore can yield consistent results. (Thanasegaran, 2009). Reliability is the degree to which a test consistently measures whatever it measures (Gay, 1987). Reliability measures in quantitative data are to improve quality. The most common methods are: Test-retest reliability, Equivalent-forms, and Internal consistency etc. This study is to be followed to the last one, internal consistency that measures the degree in test or questionnaire to all other items. It is also called as a split-half method is used to measure internal consistency. It used to check on half of the results of a set of scaled items against the other half. For reliability, the study will check about Chronbach Alpha. Due to the study is on it is difficult to say what will be the value of Chronbach Alpha, But usually if the value above .50, then it is good reliability and if the value will be abode .60is ideal and above .80 best suited to the study.

Validity*:* As par to reliability, it is essential for validation of the instrument towards the theory. Validity is the extent to which a construct truly measures what it was set out to measure. There are many types of validity. These are – *statistical conclusion validity*, here the important aspects to look at is there a causal relationship between the variables and whether the study is sufficiently sensitivity to pick up on the correlation. 2nd one is *internal validity:* here if a change is observed, it is important to understand how confident we can be that the intervention contributed. Apart from that, there is external validity, construct validity and so on.

3.10 Sampling Strategy

Sample selection strategy is a crucial part of the research design. The study has chosen as non-probability sampling technique. It is purposive sampling technique. The main data is collected across the three cities like Hyderabad, Vishakhapatnam and Bhubaneswar which contribute more than 5% of passengers to the total population. The researcher has visited the concerned airports frequently and consulted to respective

official also to access the passengers. A purposive sampling approach is used. Judgment sampling is an approach whereby the researcher selects a non-probability sample they believe is representative of the population as a whole (Zikmund, 1997).

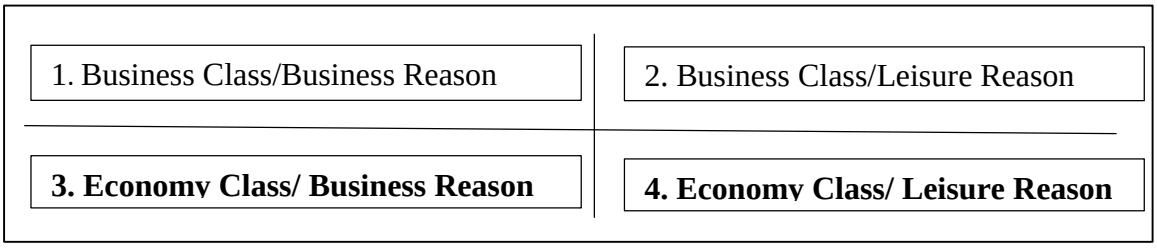

Figure 3.4 Sample Categorization
Source. Teichert, Shehu & Wartburg (2008)

Total population can be categories on the basis of class, such as Business and Economy class. Again, each class be divided into two sub-types on the basis of reason they are journeying each, as business and leisure reason etc. In the following figure 3.5, categories 3 and 4 are the samples of the study.

3.10.1 Why Purposive Sampling?

In the current study, we used the purposive sampling technique i.e. a non-probabilistic, because total population cannot be define perfectly, that means passenger movements are not listed properly, and all data set is scattered. It is not permitted by the authorities to give data set for the academic purpose. Again in particular, purposive sampling is used when the study is descriptive, non-sampling errors are high, respondents are homogenous and is least expensive, least time consuming and most convenient method

3.10.2 Determining Sample Size

Sample size must be sufficiently large to be representative of the population of interest. The required sample size increases with the size of the population, the desired confidence level, and the desired level of precision. The 'confidence level' is the level of confidence that the research has the results from the sample represent the population. Therefore a confidence level of 95% means 95 times out of 100, sample results will accurately reflect the population. The higher the confidence level is, the higher the sample size will need to be to arrive at that level of confidence.

3.10.3 Perceived Target Population

There are 449 airports/airstrips in the country. Among these, the AAI owns and manages 92 airports and 28 civil enclaves at defense airfields and provides air traffic services over the entire Indian airspace and adjoining oceanic areas. Presently, the various airlines are operating only through 61 airports. The remaining is lying unutilized, at best handling occasional aircraft operation.

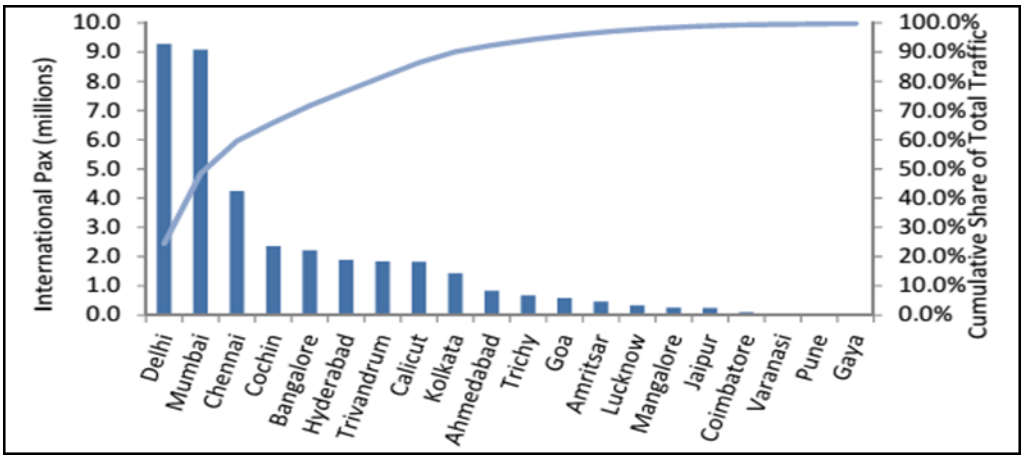

Figure 3.5 International Passenger Handled by Indian Airports FY2011 (in nos.)
Source. AAI, 2013; *Note.* AAI= Airport Authority of India, FY= financial year.

3.10.4 Working Population

The study was conducted at the Rajiv Gandhi International Airport, Hyderabad; Biju Patnaik International Airport, Bhubaneswar; and Vishakhapatnam airport, Vizag-Andhra Pradesh, which comprises more than 4.05% of total traffic of our country. But the major portion of traffic usually concentrated in major cities in 1st tier cities such as Delhi, Mumbai, Kolkata, and Chennai, Bangalore etc.

3.10.5 Sampling Method

The sample is the soul mate of research design & methodology of a research. Careful and proper sampling is stand tall of designing a research which often called as the heart of the whole process of study. The purposive sampling method is to be used to collect data from Eastern, and Southern region, which comprises more than 4 to 7 % of total airways services. In this study, the researcher has taken a sample size of 1500 from different categories of respondents. The sampling method, data collection technique, and reliability of the research instruments of the different respondents have been described in the following table.

Table 3.2
Sampling and Data Collection Methods

Sampling Method	Sample Respondents	Sample Category/Class	Data Collection Method	Research Instrument	Instrument Reliability
Purposive	Air passengers	**Economy**	Survey & observation	Structured questionnaires	0.71
Scale point	Likert's Five point scale				
Study Initiative	Literature review, expert consultation & FGD				
Valid Respondents	Economy class passengers who travelled at least once in a flight				

3.10.6 Sample Size

The study assumes that the proposed sample is based upon 95 percent confidence level and 5 percent sampling error. As far as the geographical locations are concerned all the Passengers, airports and cities are basis wise exploited to study the perceived air passenger service quality for the entire airlines service supply chain. As our total population is based upon 92 operated airports with 120million (approx.) passengers' movement, and out of that we have taken out as working population for 10 airports that are in Telangana State, Andhra Pradesh and Odisha etc. Out of that we have considered three airports of the three cities as our target sample.

The study was collected samples from the passengers who were waiting to fly on the last lobby after completion of the final security check with request and permission from the concerned airport authority. Apart from the airport, the study also collected off the airports by visiting different leading software companies and educational institutions of these three cities. Number of sample purposed for each airport and cities are distributed on the basis of the concern airports' total passenger movements, categories, types and operators of the airports. These three airports are in the category of above & below five million, and close to bellow and above one million categories respectively in terms of their passengers' movement. Apart from that, these samples also considered for the status of the airport like international, limited international and domestic etc. This study has also followed the different statistical method to discard the samples to reduce non-sampling and sampling errors. The study accounts 120 million of passengers as upper limit for the detail analysis.

Table: 3.3

Sample Categorization

Total Population	120 million (Approximate)		
Working Population (in million)	Hyderabad 9.7	Bhubaneswar 1.3	Visakhapatnam 1.01

Name of Operations	Type of Operation	AIR	Ownership/Operator	Total traffic (In %)	Cumulative percentage
Hyderabad	I	6	GMR-AAI	3.55	3.55
Bhubaneswar	I	17	AAI	0.3	3.85
Visakhapatnam	LI (D-CE)	26	AAI-Indian Navy	0.2	4.05

Note: AIR= All India Rank; AAI= Airport Authority of India; I-International, LI-Limited International, D-Domestic, CE= civil Enclave, GMR = G M Rao group of companies

Table 3.4

Sample Distribution

Cities	Sample Distributed (In nos.)	Returned	Discarded	Valid Sample
Hyderabad	800	677 (84)	68	609
Visakhapatnam	300	262 (87)	21	241
Bhubaneswar	400	314 (79)	27	287
Total	1500	1253 (83)	116	1137

Discarded category		
Un-engaged	SD > 4	Never Fly
29 (25)	39 (33)	48 (41)

Note: ( ) = in percent; SD= standard Deviation

3.10.7 Sample Discarded Procedure

After collecting the returned questionnaires about 1253 that means more than 83 percent, the researcher cleaned the data to separated valid and invalid samples to reduce common method bias. Here the study follows multiple approaches such as un-engaged respondents, standard deviation and never fly principle. In the first case, the respondents who filled the questionnaire, without having and kind of little responsible like putting single vertical line or zigzagging to the questionnaires, the respondent were discarded. Total 29 samples discarded, that means it is 25 percent of total discarded samples. Similarly, in standard deviation, when the value of SD of individual respondent is more to 4 were discarded. In the last case the respondents if never fly (if any) were discarded. It is shown in the table 3.4.

3.10.8 Sample Justification

The above table of sampling was framed by considering existing literature and different categories available. According to the annual report of the Ministry of Civil Aviation 2013-2014, the total populations are 90 million ($\approx 90\times10^6$) passengers.

First Justification

As per the large sample principles, if total sample less than 30 is called small samples, and if it is greater than 30 known as large samples. Hence, for the large sample category the study can use almost all the statistical technique for the any kind of test (Hair et al., 2008; Sekaran, 2009; Sachdeva, 2008). But here we have taken more to 1500 subjects, so that the study subjected to satisfy this principle.

Second Justification

About the 5:1 principle, this means "five subjects for one attribute" should be used for the determination of the total number of subjects for the exploratory survey (Hair, Anderson & Black, 1995), so the sample size should be five times as large as the number of total attributes identified. Since in the study having 41 items in the final refinement, in compliance with the above requirement, the sample size should be 205. For any contingency compensation that to any kind of the potential bias, 225 subjects can be used. In the current study, 1137 is the sample size, even if proportionately split into different demographic strata, in each stratum sample is also around 205, indicates it is a proportionate representation of population.

Third Justification

By using the structural equation modeling (SEM), a sophisticated multivariate technique the sample size should follow the few norms to avoid any kind complexity in the model building process (Hair, et. al., 2008). The minimum sample size should be 150- if models having seven constructs or less, communalities with 0.5 and no under identified constructs. The minimum sample size should be 300, if the model having seven or more constructs, and communalities with 0.45 and multiple under identified (i.e. fewer than three) constructs. Again, the minimum sample size should be 500, if the model having a larger number of constructs with lower communalities, and having fewer than three measured items. Hence this study, satisfy all the pre-conditions and also for the group analysis, group wise sample size mate to the requirements.

Fourth Justification

Roscoe (1975) proposes the rules for sample size: Samples larger than 30 and lesser than 500 are appropriate for most research, where samples are broken into subsamples like males/females, minimum sample size of 30 for each category is necessary. Hence, in any multivariate research, the sample size should be several times (preferable 10 times) as large as the no. of variables. In this study, we have followed the following criteria: For the valid, good fit and for split half test, total Sample around 1137s were divided into two sub-samples n_1= 506 and n_2= 631. To overcome the threshold limit, it is "Five subjects for one attribute" were used to determine the total number of respondents in the sample to test EFA, Multiple regression analysis, ANOVA etc., for first sub-sample (S1= 506) and maximum sample size may be considered as 10:1 with variable suggested by Hair *et al*., (2008), and Cooper and Schindler (2006).

41 items * 5 samples = 205 samples for necessary condition

Again, for sufficient condition it will be 41*10=410

The second sub-sample (S2= 631) is adequate to represent the population of interest which exceeds the minimum requirement of 500 for conducting CFA, SEM. Even, when the Models with larger number of constructs, some having lower communalities, and/or of fewer than three measured items (Hair et al., 2008).

3.11 Data Analysis and Interpretation

The purpose of the analysis is to identify the different dimension service quality in Airlines. The study proposes to use factor analysis and reliability test. In order to analyze the impact of perception on SERVEQUAL factors on the passenger satisfaction and their image on Indian Airlines, multiple regression analysis was conducted. But to know the characteristics of different factors this study were used range inferential like EFA, CFA, multiple regression Analysis & SEM and relative statics like frequency, mean median standard deviation, range, skewness, kurtosis etc. Collected data set was analyzed using various multivariate data analysis tests using different software such as MS Excel, SPSS-21, AMOS-20 and MATLAB R2013a.

3.11.1 Exploratory Factor Analysis (EFA)

Exploratory factor analysis is a data calibration technique to explain the score on observed variables. R- type factor analysis and its principal component analysis with Varimax rotation were undertaken to identify the factor loading of each variable to a

construct. As the sample size exceed 1100, a factor loading of 0.5 was accounted to consider (Hair et al 2008).

The Cronbach alpha for the resultant scales was calculated to ensure its scale reliability. This is a measure of internal consistency of a scale and widely used ((Churchill, 1979; DeVellis, 2003; Hair et al., 1998; Tabachnic & Fidell, 2001). A Cronbach alpha value of 0.70 or above is generally accepted to demonstrate a high level of homogeneity within the scale and to determine that the items do reflect a single dimension ((Churchill, 1979; Hair et al., 1998; Hinkin et al. 1997). Again for factor analysis, certain preconditions were tested, such as determinant of the correlation matrix should be more than 0.00001; Kaiser Meyer Olkin Measure should be more than 0.5 and Bartlett's Test of Sphericity are satisfied.

3.11.2 Confirmatory Factor Analysis (CFA)

After EFA, a Confirmatory Factor Analysis (CFA), was conducted using AMOS- 20 version to test the measurement theory. The measurement theory specifies how the constructs were representing the data set. That means to confirm the above developed predictive factor structure. The following figure shows the various process of structural equation modeling comprises both the development of measurement models and structural model. The second sample group (S2) is used to develop 'FliQual' measurement model that comprises first order, second order and third order measurement model. Out them the second order model was chosen as a best fit measurement model and cross validated this with gender and travel frequency basis.

First-order measurement model, where only one layer of latent constructs; second order measurement model where two layers of latent construct and third order measurement model- where three layers of latent constructs are involved in the model were drawn. The validity of the model was assessed by the convergent, discriminant, nomological and criterion validity tests. The basic objective of this *second order* measurement model is to integrate all the service quality factors into one second order factor to study hypothesized relationship and will provide input for making complex structural models (Byrne, 2010 and Chen, Sousa & West, 2005).

In third order measurement model, we used it, whether is there are any further development in fit statistics or not. Here we form few new constructs by integrating all

the first order measurement model for second order factors and further integrated to all the second order factors in generating third order measurement model consecutively with the support the existing literature. After this process, the study have chosen the best competing model to carry forward the structural modeling.

3.11.3 Various Fit Indices

Validity of the measurement model depends on the model fit indices. Most the structural equation modeling provides multiple fit indices. Few of them, we are discussing here. There are three types fit statistics such as – Absolute fit indices, Incremental fit indices and last one is parsimony fit indices.

In case *absolute fit indices*, it directly measures, how well the specified model reproduces the observed data. That means it estimates of how well a researcher's theory fits the sample data. The most commonly absolute fit indices are Chi-square ($\chi 2$), Goodness-of-fit Index (GFI), Adjusted Goodness-of-Fit Index (AGFI), and the Root Mean Square Error of Approximation (RMSEA).

The Chi-square ($\chi 2$), is the sensitivity to the sample size as well as number of variables (Hair et al., 2008). So GOI of $\chi 2$ alone is sufficient to measure the model fit, hence we have to consider the other absolute fit indices (Hu & Bentler, 1995). Again Goodness-of –fit index (GFI) is less sensitive to sample size and it performs better than any other fit indices. Though its range is 0 to 1, the value above 0.90 is considered as a good fit, it may decrease if sample size increases (Hu & Bentler (1995); Marsh et al., (1988); Byrne, (2010); Hair et al., (2008)).

The adjusted Goodness-of-fit (AGFI) is similar to GFI, but it makes adjustment for the number of degrees of freedom in the model.

Unlike to *absolute fit indices*, the incremental fit statistics show the how well a specified model fit relative to some alternative baseline model (null model). This fit indices also called as comparative fit indices for clear reason. The null model assumes that all the observed items are uncorrelated. This fit indices represents the improvement in fit through the multi- item constructs (Byrne, 2010; Hair et al., 2008). And different fits are such as normed fit index (NFI), CFI, TLI, etc.

In case of *parsimony fit indices* is designed to provide information related to which model among a set of competing models is best, by considering its fit relative to its complexity. This fit measure is improved either by a better fit or by a simple model.

This fits are parsimony ratio (PR), Parsimony goodness-of –fit index (PGFI), parsimony Normed fit index (PNFI) etc.

3.12 Validity of Measurement

Validity is the extent to which it measures what is intended to be measured. It is the test of the extent to which it measures what it claims to measure. A test is valid to the extent through which it inferences made from it are appropriate, meaningful, and useful (Netemeyer et al., 2003; Saraph, et. al. 1989; Hair et al., 2008). In quantitative form of research validity is meant for the 'construct validity' (Sireci, Wainer & Braun, 1998). Construct validity is the extent to which measured variables actually reflects theoretical latent constructs (Hair et al, 2008). So construct validity can be measured by measuring face validity, convergent validity, discriminant validity and nomological validity.

3.13 Multigroup Analysis

Multi group analysis is used to conduct the cross validation of the model of the study across the different groups of the sample, or population by dividing it on meaningful characteristics like demographic. Basically multigroup study can be conducted by taking different samples from the same population. That means the respective sample units of each group having the same characteristics. This cross validation across groups will enable the researcher to understand thoroughly the extent, the results are the same in these groups.

The current study conducted multi group analysis for the finalized second order measurement model across gender. The second sample (S2) was divided into two groups such as male of 63 percent (n1= 397) and female 37 percent (n2=234) respondents. Then a test of invariance across the male and female were conducted by comparing the results of CFA from each group. Again the Chi-square Difference ($\Delta\chi 2$) test was used to compare this. For this we have two types of test like firs is Loose Cross validation (lose rigorous) and Tight cross validation (highest rigorous) method.

3.14 Structural Equation Modeling (SEM)

Structural Equation Modelling (SEM) is to test structural theory. Structural theory is a theoretical demonstration of the relationship between constructs. It is also called as the latent variable analysis (Baumgartner & Homburg, 1996; Hair et al., 2008) is a development of multiple regression analysis to combine a series of multiple equations in one structural model (Hair et al., 2008). And we have used to investigate the direct

and indirect relationships by integrating overall passengers' service quality (APPSQ) with the other construct such as punctuality (PUNS), loyalty (LOYL), pre-post journey (PPAS) and safety and security services (SSSR) with strong theoretical support.

Model Validity

Structural model validity was tested by using a range of tests such as examining fit indices, compared to various competing models, testing structural relationship and hypothesis.

Comparison with Competing Models

The aim of this comparison process, is to find the best fit one model among the many proposed competing models. For this, the various methods such as comparing fit indices as a necessary condition and find out the best fit model. The second method as sufficient condition, verifying parsimony fit indices and choose the best fit one. Then another sufficient condition is that, a comparison study can be done by assessing the chi-square difference index ($\Delta\chi 2$).

Testing Hypothesized Relationships

In structural equation modeling (SEM), the proposed theoretical relationship is reflected into hypothesis, which will be examined. That means the estimation of dependence relationship will be evaluated. It should be statistical significance and magnitude of the path may positive or negative relationship.

3.15 Fuzzy Numbers

Fuzzy numbers is a fuzzy subset of universe of numeric numbers (real numbers) and represent the expansion of the idea of confidence with closed interval. There are different types' fuzzy numbers, like triangular, trapezoidal, exponential, Gaussian, cosine which are based on member function. The fuzzy number concept can be used to represent the feature of uncertainty.

According to Zadeh (1975), it is very difficult quantification to express reasonably those situations which are hard to define. A linguistic variable is a variable with *lingual expression* as its values. For example, term like "service quality of airline" represents a linguistic variable in this study. A triangular fuzzy number A with a membership function $\mu_A(x)$ is specified by three parameters {a, b, c}, denoted by "triangle (x: a, b, c)"

$$A \triangleq \mu A(x) = \begin{cases} 0 & \forall\ x < a \\ (x-a)/(x-b) & \forall\ a \le x \le b \\ (c-x)/(c-b) & \forall\ b \le x \le c \\ 0 & \forall\ x > c \end{cases}$$

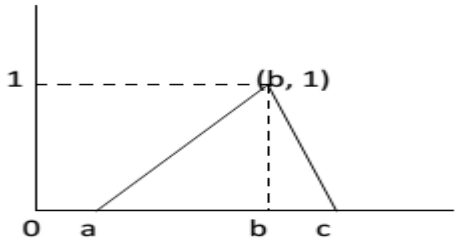

Figure 3.6 Triangular Fuzzy Number 'A'

Triangular numbers are used in the applications to fuzzy controllers, managerial decision making, business and financial decisions, and social sciences etc. The triangular number can be represented as above figure. In second a trapezoidal fuzzy number is specified by four parameters {a, b, c, d} as bellow.

$$A \triangleq \mu A(x) = \begin{cases} 0 & \forall\ x < a \\ (x-a)/(x-b) & \forall\ a \le x < b \\ 1 & \forall\ b \le x < c \\ (d-x)/(d-c) & \forall\ c \le x < d \\ 0 & \forall\ x > d \end{cases} \quad \textbf{(3)}$$

In figure it can be represented as bellow:

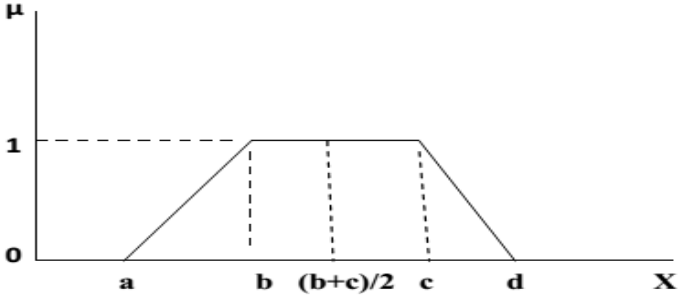

Figure 3.7 Trapezoidal Fuzzy Number

It is a particular case of a fuzzy triangular number with a flat. The supporting interval is [a, b] and the flat segment on level α = 1 has projection [b, c] on the X-axis. With the four values a, b, c, and d we can construct a trapezoidal number as (3). It can be denoted as

$$A = (a, b, c, d) \qquad (4)$$

If b = c = (b+c) /2, the trapezoidal number is reduced to a triangular fuzzy number and is denoted by (a, b, b, d). So a triangular number (a, b, c) can be written in the form of a trapezoidal number, that means (a, b, c) = (a, b, b, c).

3.16 Defuzzification

It is a technique to convert the fuzzy number into crisp real numbers, a single representative value that captures the essential meaning of the distribution. There are several methods available to serve this process. Mean of maximum (MOM) method, Center of Area (COA) or the centroid method, height of defuzzification method (HDM) and α-cut method (Yen and Langari, 2011). As per earlier literature, the fuzzy number $AV_{ij} = (lA_{ij}, mA_{ij}, uA_{ij})$ attains its maximum at $A_{max} = mA_{ij}$, so that we call it maximizing value. So there are three options for defuzzifying AV_{ij} which are essentially converted to statistical average as bellow. From the above explanation, the study concludes that step by step procedure for defuzzifcation are, first find triangular fuzzy numbers, second get it average, next is to aggregation then find the maximum value from above (9) method. The above method is based on mean of maximum (MoM) method.

$$1.\quad A_{max}(1) = \frac{lA + mA + uA}{3}$$

$$2.\quad A_{max}(2) = \frac{lA + 2mA + uA}{4}$$

$$3.\quad A_{max}(3) = \frac{lA + 4mA + uA}{6}$$

3.17 Fuzzy Delphi Method

This method is the classical method for long range forecasting in management science known as Delphi Technique. It was developed in the sixties by the Rand Corporation at Santa Monica, California. The essences of Delphi method are followed.

- Expert with high qualification regarding the subject are requested to give their opinion separately and independently of each other about the realization experienced in science, technology, or business. They may be asked to expect the general state of the market, economy, technology advances etc.

- The data which have qualitative character are analyzed statistically by finding their average and the results are communicated to the experts.
- The experts review the result and provide a new estimation which are analyzed statistically and sent again to the experts for estimation.
- This process could be repeated again and again until the outcome converges to a reasonable solution from the point of view of a manager or governing body. Usually two or three repetitions are sufficient.

3.18 Conclusion

In this chapter, the research design and methodology applied to the study are described. This study is descriptive for its first part and exploratory with the second half at large. After extensive review of the existing literature, the investigators' finalized research gap were discussed and what will be its future contribution were explained. With reference to the research gap, research question and research objective were framed followed by hypothesized relationship. Again, research methodology and its design were discussed to make a smooth flow of the study. The study also explained to what to be studied and how it will gather such as data collection method, sampling strategy and its analysis were elucidated. In the last part of the chapter, various statistical techniques such as EFA, CFA, SEM and its validity as well as fit indices were discussed briefly. The survey method was used in the study because aim of the research was to gather data regarding passengers' attitude about the service quality of Indian airlines. For this purpose, two surveys were conducted such as pilot testing and main survey using purposive sampling method.

CHAPTER IV
DATA ANALYSIS

CHAPTER IV

DATA ANALYSIS

4.1 Introduction

The first decade of the twenty first century has seen the confluence of many powerful, long term trends in the business sector. First one is quick shifting of the economy from manufacturing to services and rapid expansion of information technology in almost every sector. This infiltration has given rise to the era of IT enabled public services, which is defined as a niche of customized service over the traditional long pending and bored red eyes. This developed technology has boosted to track the own customer for business communities by providing leading-edge and competitive win information through sophisticated data analysis tools. For that we have to augment our research capabilities by compiling various stakes and opportunities.

The service industry is an emerging sector in the corporate world. So it has been evolving to ignite for all the countries. The people of the world, considering as it as opportunities to know the world around them irrespective of every sect. So it has not left to the research communities. To explore this, opportunity and challenges have generated significant interest in both practitioner and academic communities in understanding how the sector can be harnessed in providing value to end users. Hence continuous evaluation, frequent experiment, and artificial manipulation makes the service more useful and customized.

With this continuum, various approaches have been identified from earlier literature almost all of the services. Apart from this approach, we have also looked at a consecutive relationship between overall service quality, punctuality, safety measure, loyalty or behavioral intention, and also earlier and latter involved services of airports. Extensive studies have already evaluated different service attributes for air passengers' by using various generic forms of Groonros' three dimensional model, SERVQUAL, DOTS method (USA), Lewis model etc. There are also very few studies have developed some unique tools to measure the services for this sector, such as Caro and Garcia (2007), Khan, Rajdutt & Bansal (2007), Chiou and Chen (2009), Park et al.(2004), Fondness and Murray (2005), Wei's Hub-and Spoke network model (2006) & Utility-Based Model (2008), Srinidhi's PTD Model etc. But in Indian context the researcher unable to get any studied till now with multiple culture need based and using

sophisticated statistical techniques. Even though, there are few studies are existed in Indian airlines at the range certain statistics viz. Milind Sohoni, Srinidhi, 2011; Bhagyalakshmi & Nargundkar, 2006; Mahajan & Rau, 2009; Malhotra & Kalra, O' Connell & Williams, 2006; Hooper, 1998 & 2006; Nagar; and Archana & Subha, 2012; Khan, Dutt & Bansal, etc. Therefore, by considering this as scope, for further studies to measure service quality for passengers, this research extends to the earlier approach by investigating the direct and indirect relationship with the aviation sector. So it will be a new contribution in evaluating services for Indian air passengers.

This study included the identification of the various aspects for air passengers that are make the satisfaction through quality services in terms of air passenger perceived service quality (APPSQ). Again, the research also measures the direct and indirect relations among punctuality (PUNS), security and staff services (SSSR), pre-post airport services (PPAS) and behavioral intention (LOYAL) by developing different models through empirical indication.

In the current chapter, data analysis has been categorized into four section on the basis of their approach called as qualitative, quantitative and fuzzy. In qualitative category, the researcher has discussed about how to develop and validate "FliQual" a tool to measure air passenger service quality.

In the second type, quantitative approach of the study has further divided into three sections such as:

- In the first section, the respondents responses S_1 = 502 have used to develop 'FliQual' predictive model by identifying the different factors, which measure air passengers' perceived service quality (APPSQ) in Indian airlines using Exploratory Factor Analysis (EFA). By compiling this extracted factors for APPSQ statistically (without loss of generality), the study develops a theoretical model for direct and mediated relations with other unique dimensions. Thereafter the study, also tested various hypotheses using multiple regression analysis.
- In the second section of this category, the samples (subjects) S2 = 635 are considered to develop 'FliQual' measurement model with Confirmatory Factor Analysis (CFA). In this part, first, second and third order measurement model is involved. Out this, the best and final model was cross validated across gender and groups with the help of multiple group analysis.

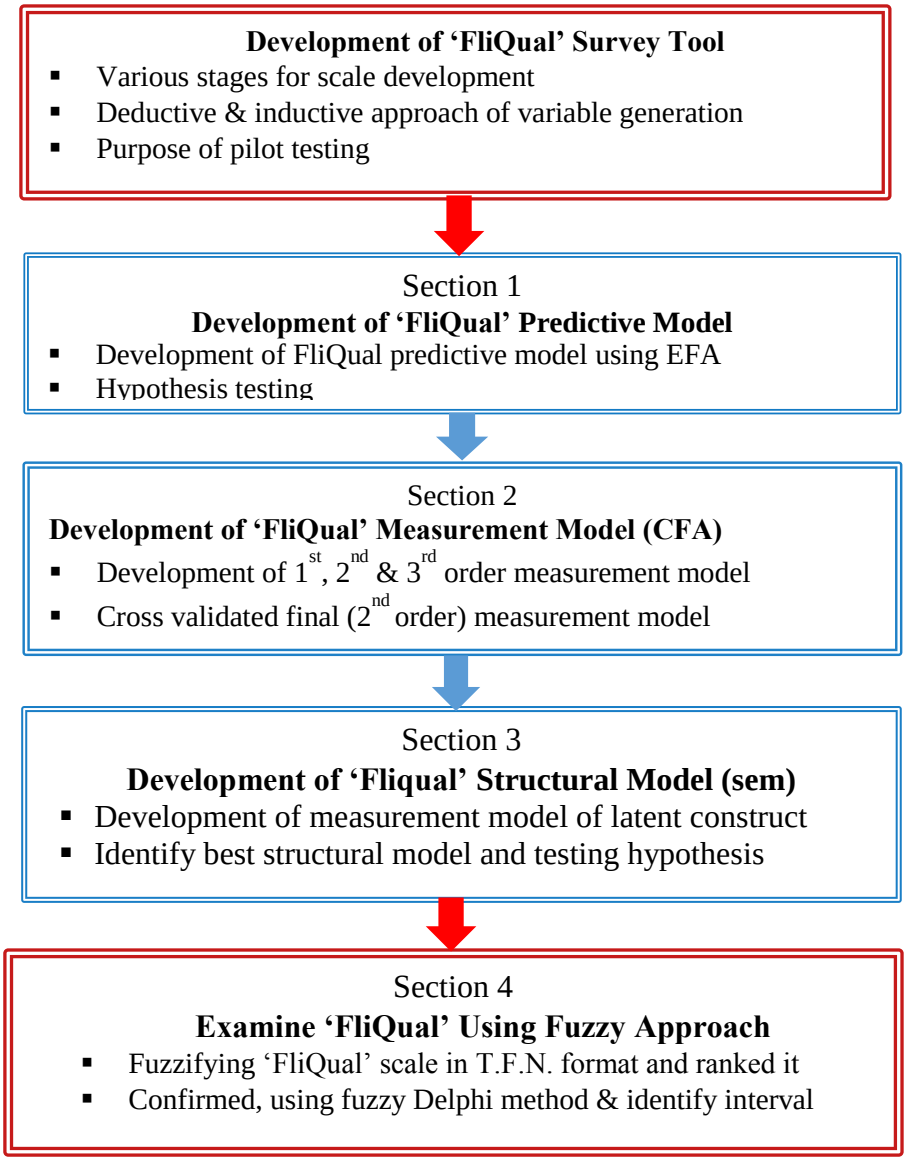

Figure. 4.1 Classification of Data Analysis

- In the third section, as considered as an important part of this category included development of best structural model and also tested the different hypothesized relationship among the constructs such as APPSQ, punctuality (PUNS), pre-post airport services (PPAS), Staff and security measures (SSSR) and behavioral intention (LOYAL) using Structural Equation Modelling (SEM) techniques.

In the last but not least the fourth section of this chapter, we have used fuzzy approach to measure the same. For this, the researcher has been followed to the first section with same respondents' responses (S_1). The same factors have been excerpted to convert each into fuzzy format (fuzzy triangular number), ranked consecutively and defuzzified into crispy numbers for the reporting. Again, the study has found the overall service quality and also factor wise exact interval that means this service range (should be provide by the airlines) using the Fuzzy Delphi Technique (FDT).

All the above sections are consecutive and order manner. That means first section is the input for the second one and similarly for the last section. Again in the second sections the first part is the input for the second part and the second part is the input for the third part respectively see to above figure.

4.2 Development of 'FliQual'

Effective measurement is a foundation of scientific research. Though social science research is uncertain, unbounded and not so obvious, investing with developed scale or develop own scale needs a rigorous theoretical review. There are several approaches have already identified by Churchill (1979); DeVellis, 2003; Hinkin, 1995; Hinkin et al., 1997; Llusar & Zornoza, 2002; Clark & Watson, 1995 and so on. Though there are several strategies and approach for developing and refining measures, the relevance of a given strategy will depend on what type of phenomenon is being measured.

Measurement consists of certain rules for assigning symbols to objects, which numerically represent quantities of different attributes of interest (Netemeyer, Bearden & Sharma, 2003). It includes assessment of numbers in such a way that they reflect the different degrees of the attributes being assessed (Nunnally &Bernstein, 1994; Churchill, 1979; DeVellis, 1991; Haynes et al., 1999; Neff, 2003). It is not just some numbers and words of the study, it is looking for some words that tap the important construct of concern. It is the generation and selection of items to form a scale to measure a construct (Rossiter, 2002). According to Churchill (1979), a critical element in the evolution of basic knowledge in marketing and also for improved marketing practice, is the development of better measures of variables, in which marketers work.

For this we will discuss first a clear conceptualization of the target construct through various theoretical principles, its various practical issues, with pragmatic decisions to

maximize the construct validity of scales and subscales. Though, there are many approaches are existed to develop a measure, days now most has been subjected to criticize since Jacoby, 1978; after that by Hinkin, 1995; Clark & Watson, 1995, Hinkin et al., 1997; Flynn & Pearcy, 2001; Ping, 2004 and so on, specific to their reliability and validity.

In order to a survey report, portrayed by Clark & Watson (1995), scale development has been as growth in psychology discipline. A database of "PsycLIT" survey report on articles that, within the period of 1989 to 1994 , revealed there are more than 1,726 articles with the key words 'scale development' or 'test construction' published in English language and 270 in other languages, 552 in doctoral thesis. Most of the articles, are development of one or more new measures (82 percent) and rest presented new scales derived from an existing instrument (10 percent). In this study, though we have followed the SERVQUAL scale with other different names like Punctuality (PUNS), Loyalty (LOYAL) and overall service quality, another two safety and staff service and pre-post airport services are newer. Hence the researcher felt genuinely to develop a new scale for these all five dimension in Indian context.

Clark & Watson, 1995 exhibited that most of the scale (around 61 percent) is to evaluate the psychopathology and personality. Next common categories of measures are attitudes and interpersonal base relations about 20 and 15 percent respectively. The remaining scales is to assess assortment of behaviors, abilities, response validity, trauma experience etc.

The researchers are continuing to fill the gap of unabated scale by developing it, as the nature of unmet needs. Many social scientist, psychologist, scholars and authors (Churchil, 1979; Nunnally, 1967 DeVellis, 2003; Hinkin, 1995; Gerbing & Anderson, 1988; Churchill, 1992; Mullen, 1995; Clark & Watson, 1995; Cronbach and Meehl, 1955; Welbourne, Johnson & Erez, 1998; Diamantoulos & Winklhofer, 2001; Llusar & Zornoza2002; Rossiter, 2002; Jarvis, Mackenzie & Podsakoff, 2003; Boyd, Gove & Hitt, 2005; Worthington & Whittaker, 2006) have proposed strategic basic principles for development of scale. Again, these basic principles, the researcher articulated are applicable to interview-based measures and rating scale designed for respondents.

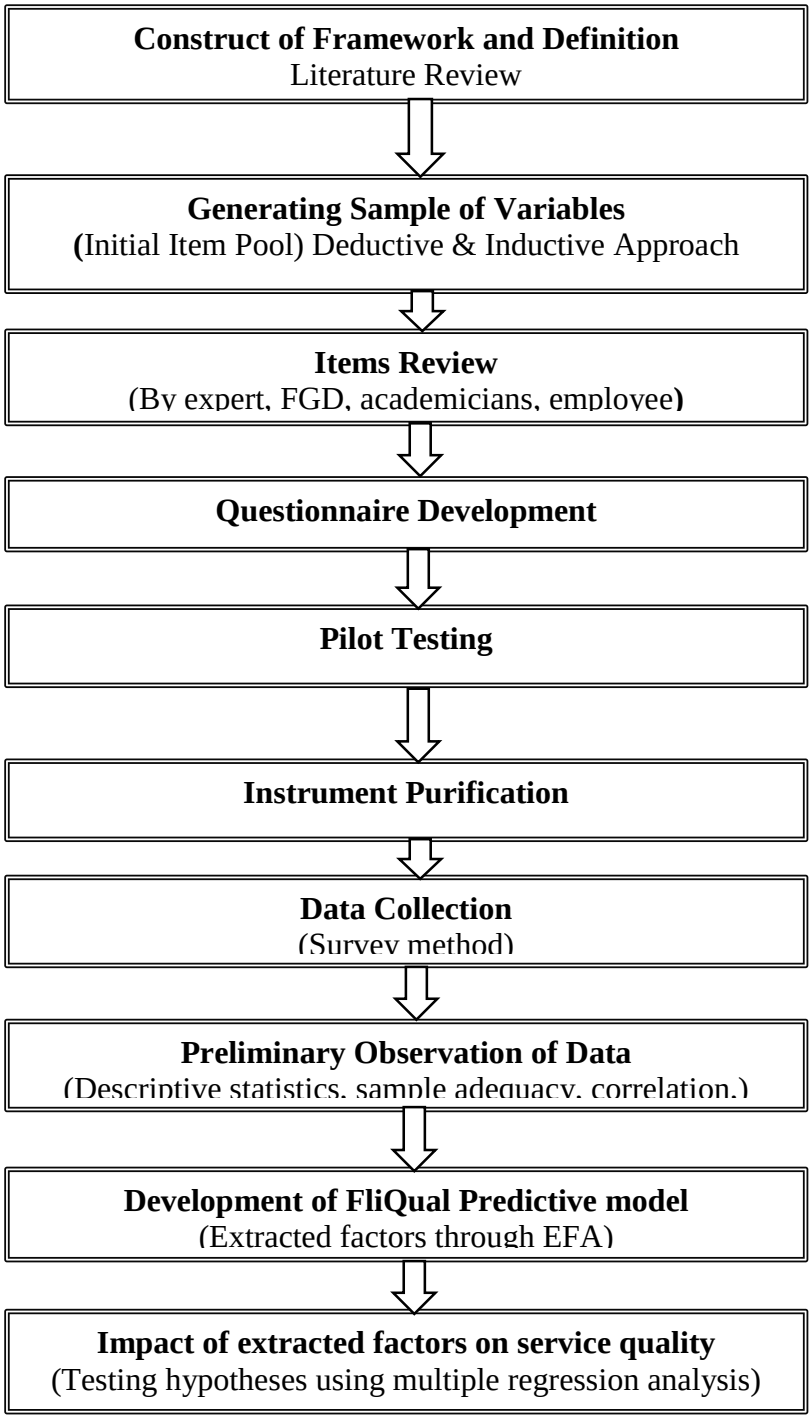

Figure. 4.2 Stages for Scale Development

In the social sciences "objects" are people, "rules" involve assignment of numbers explicitly, and "attributes" are particular features of the objects being measured. So it is noted that objects are not measured; their attributes are measured. The earlier procedures suggested various stages for scale development such as ten stages (Llusar & Zornoza, 2002), eight stages (Churchil, 1997; DeVelli, 2003), seven stages (Hinkin

et al., (1997), six stages (Hinkin, 1995; Ping, 2004; Rossiter, 2002), five stages (Clark & Watson, 1995), four stages by (Netemeyer, Bearden & Sharma, 2003) three stage (Schwab, 1980) and so on. The essence of this procedure is to maximize internal and external consistency. In this study, seven stage procedure has been followed to Churchill (1997)'s, which are extensively used. The scale development process are shown in the above figure.

4.2.1 Standardized of Measure

Norms of measurement require lots of explanation and theoretical base. Though the rules and regulation for measuring social-psychological constructs are not obvious, developing norms, which can be eventually accepted is important for standardization and establishment certain regulation. Sound procedures for scale development include establishment of effective norms. When by using these norms, a person can leveled a measure as low, medium or high on an attribute, then this measure id standardized. At the very point, "*repeatability and standardization* are the measurement properties of reliability and validity". Again, both are related concept. That means under similar conditions, research findings under same measure should replicate. For this, we will discuss later in reliability section. According to Nunnally & Bernstein (199), the measure is standardized if, (a) rules of measurement are clear, (b) it is practical to apply, (c) it is not demanding of the particular administrator or respondent, and last one is (d) results do not depend on the administrator. Standardization has several advantages (Netemeyer, Bearden & Sharma, 2003) such as:

First, a standardized measure enhances social scientific *objectivity*. That means, when one investigator found independently a relation between two constructs that also found by another researcher, hence objectivity is enhanced, (which gives the measure used are the same and are standardized) otherwise objectivity is compromised. Second, this produces *quantifiable* numerical results. And this quantification enhances proper communication and generalizability of results. In the third, scale development is a *time consuming* endeavor. In other words, if a measure has been well developed with well time spent, the measure is available for use with little or no time invested because as it has already standardized.

4.2.2 Construct of Framework and Definition

It is the first step of scale development that include the importance of theory cannot be inflated. This step, has followed by most of the scholar (Churchill, 1979; DeVellis, 2003; Netemeyer, Bearden & Sharma, 2003; Rossiter, 2002 etc.). So developing and refining a theory, needs a through literature review. Reviewing to literature have two important objectives. First, it will alert the researcher about previous attempts to conceptualize the construct of interest and so the construct will useful as an independent or dependent variable. That means it ascertain and uncovered, its boundaries and domain, as well as potential antecedent and consequences. Second, as scale development is a time consuming and costly affairs, and developing a new measure has an advantage of incremental validity, redundancy can't be ignored. So through literature can help to avoid the redundancy of developing another scale to asses an already well developed construct (Netemeyer, Bearden & Sharma, 2003). In this study, construction of framework and definition were derived in the preceding chapter.

4.2.3 Generating Sample of Variables (Initial Item Pool)

Item generation is a "creative work". This step is for developing a poor of sample items with specific domain and have potential relevance to the target construction (Churchill, 1979; Clark & Watson, 1995 and Hinkin, 1995). This step is typically produced in the exploratory study, including experience survey, literature survey and even insight stimulating etc. (Selltiz et al., 1976). The emphasis at this stage is to develop a set item, which can tap each of the dimensions of the study. It includes multiple items for each potential construct. And the items that will proof for distinctive or tangential to a construct. The techniques like critical incident, focus group discussion, expert opinion and asking for family and friends were used to generate number items. There are two basic approaches were followed in this study to generate the pool of variables. The first one is "deductive", in other words, it is "logical partitioning" or "classification from above". Second one is "inductive" that means "grouping" or "classification from below" (Hunt, 1991).

There are a number of basic principles for item writing to avoid loose external consistency should be addressed. The researcher should use simple, straightforward, and appropriate language with adequate to reading level, again, it should not trendy expression or any kind of colloquialisms. That means, it should be short and simple

language, easily understandable by the respondents. Attribute should address only one aspect at a time and should not be double- barreled. Again, individuals must differ in items, i.e. the attributes that assess attitudes and behaviors should not be included in the same scale. It should avoid frequencies in item wording, item wordings including negative mood terms, avoid negativity to reverse meaning, but include negative aspect (DeVelllis, 2003; Hinkin et al., 1997; Churchill, 1979).

4.2.4 A Deductive Approach of Variable Generation

Deductive approach of item generation begins with a theory and uses theory to guide variables to consider. It moves *from general concept to particular*. This approach basically used in the quantitative type of the study (Creswell, 2011). This approach requires an understanding of the phenomenon to be investigated and a thorough review of the literature to develop the theoretical definition of the construct of study. This definition is then used as guide for the development of items (Schwab, 1980). This approach is used in two basic primary ways. First one, designed items is to tap previous theories. In the second way, again the researcher develops conceptual definitions using theory, and then utilize a sample of respondents to experts to get critical incidents, through which subsequently can be develop items.

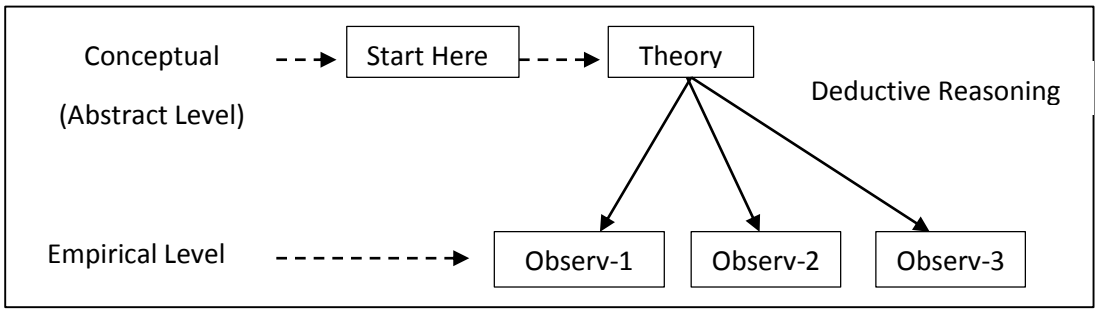

Figure 4.3 Deductive Reasoning

The existing literature for airline perceived service quality, punctuality, staff and security services, behavioral intention (loyalty), and pre and post airport services were reviewed to get conceptual clarity of the constructs and their interrelationship. With this interrelationship, a theoretical model is proposed by incorporating a number of scales derived from earlier literature. A brief overview of the scales is followed.

4.2.4 A (I) Perceived Service Quality

This scale is used in most of the studies and it is the starting scale to evaluate services in almost all the sectors. This scale is used to measure air passengers' experienced service quality. In addition to the various items incorporated in this widely used scale, respondents were asked to rate overall air passenger service quality in respect to their own expectation.

4.2.4A (II) Punctuality

It is a subtle characteristic of the individual. It is a human trait. Similarly for organization, it reflects reliable service, and ready to offer valuable service to the passengers'. For both, it is being able to complete or fulfil the obligation before or prescheduled time, which value of service will be enhanced. This communicates a plethora of positive sense, such as dedication, interest, capability, professionalism and commitment (Daniel Ketchum). It helps to achieve the advancement and competitiveness.

In this study, the punctuality scale included five items in early stage and later on it finalized about three more items. The Items like aircraft departed on time, it arrived in prior scheduled time and airline provided services at the required point and necessary documents. It addressed to the strong concern of air passengers' about delay services.

4.2.4 A (III) Safety and Security Services

Safety and security is a top priority for all passengers' about post 9/11 incident. At par with international usual practice, all departing passengers will have to go through security checks at the respective airports. It refers to the high quality techniques and methods used in protecting passengers, staff and aircraft used the airports and airlines from any kind of accident or malicious crime, and threats. So in this airport security play a key role and attempt to prevent any threats or potential dangerous situation raised in the country. There are various factors which can affect the safety of airports. Aircraft and airlines. These include the weather, terrain, aviation related infrastructure and also the effectiveness of the system, in which a country regulates its aviation sector.

In India, beefed up of its security after the 1999 Kandahar hijacking, earlier of WTO crackdown, 9/2011. The regulating agency in security concern is Bureau of Civil Aviation Security, Ministry of Civil Aviation working round the clock with the Central

Industrial Security Force (CISF) and other paramilitary organization. In this study, we use three variables such as the airport has a good security system and announcement system with updated technology.

4.2.4 A (IV) Loyalty Services

It is a customer trait, positioned and a tendency towards specific product, services and organization. It is both attitudinal and behavioral tendencies to favor one brand, one airline over others, either due to satisfaction with a product or service, better performance, simply familiarity and comfort with the brand or convenient to use or gain etc. It is an emotional attachment of a passenger or customer with a product or service provider. It is the result of consistently positive experience, feature wise satisfaction, perceived high value. It encourages to passengers, customer to journey frequently, shop more, visit frequently and spend more, helping attract to other consumers, uses good words before another competitor.

In this study, this scale has included four attribute such as airline have good loyalty program to recognize frequent flier; I would continue my travel by his airline even if the fare increased somewhat in future about the price; I received good value for money; and I would like to recommend this airline to others.

4.2.4 A (V) Pre-post Airport Services

It is another important dimension of airline service quality. In other words, it is called as pre-airport or pre-flight and post flight services. To sustain for a longer period in the competitive world for global business, organization must have to build and maintaining long-standing relationships with customers, passengers, travel agents and other supporting service provider etc. Again the airline has also maintained vertical as well as horizontal integration with the other supporting service providers such as online portal service provider for online booking, various hotels, catering service, banks, hospitals, with other airlines, various regulating agencies, and outside private service provider to facilitate smooth and flexible journey for passengers with increase business. The various services like reliable airline website, discount offers, proper handling for cancelation of booking, ready to serve in emergency situation viz. cancellation of flights, baggage allowance, promptness of baggage delivery, special service to old age and physically challenged person have an influence on passenger satisfaction.

In this study, we have used few refined items in this scale, such as good transport facilities, official portal was reliable and reservation staff are updated and courteousness, availability of code sharing with other airlines etc.

4.2 4. B Inductive Attribute Generation

This approach is usually used in case of qualitative studies. This qualitative study investigates through theory only in various ways. Likely to quantitative approach, it used for the explanation for attitude, and behavior and complete with variables, construct, and hypothesis. This approach reveals, about a *particular case of a more general factor*, i.e. fits of observation into a pattern or a theory. As every research, usually begins with many observations and for inductive approach a theory derives from these observations. So here theory becomes the end point that means it is building form the data to broad them to a generalized model or theory. This approach is also labeled as a theory and involved in beginning in attempt, to identify constructs and generate scale from the individual respondent's response. This can occur by asking a sample of respondents to provide a description about their feelings about services and organization.

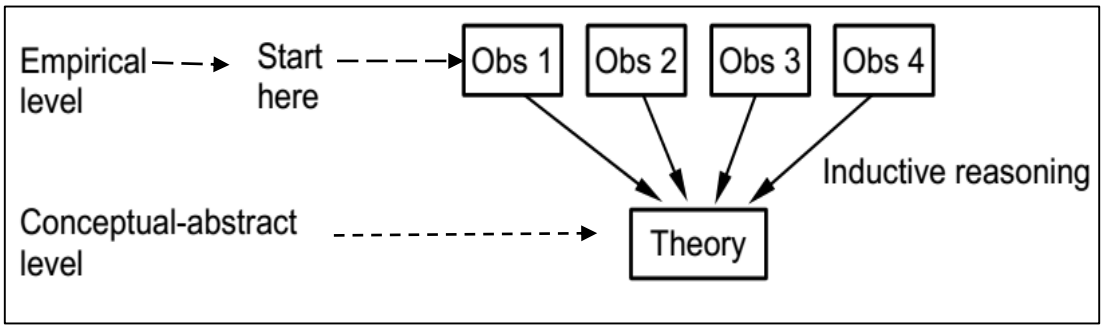

Figure 4.4 Inductive Reasoning

These theories make a sense of observations. Because the theory is formed after observation are made, so it is called post factum theory (Merton, 1968). Again, this approach uses grounded theory as a methodology to derive a new theory, i.e. items from respondents' responses and comments (DeVellis, 2003).

As we have already portrayed, the qualitative study comprised focus groups of expert in this field, frequent flier and researchers, line staff, and genuine passengers etc. Due to the full data analysis have addressed in coming chapters, the scale related to perception for air passenger is discussed. The various comprised focus groups have

different expectation and also experienced different perception. This demonstrated perception and their theme of service quality were converted into various items for air passenger services. All the items are categorized into booking facilities, airport services, on-board services, behavior intention, and overall satisfaction etc.

A full scale list of 41 variables was found from various focus groups and earlier literature on passenger service quality of airlines are followed.

4.2.5 Items Review

In this stage, the whole items will be reviewed throughout the various phases till, the remaining items have good face and content validity. The review process will ensure good face and content validity and remove the redundancy, repetition, unclear, negative items. It will examine how well these are confirmed expectations about the structure of the measures. That means it includes an assessment of the psychometric properties of the scale by examining a relationship with other variables of concern (Hinkin, 1995). Haynes et. al., 1995, explain that content validity is the degree to which elements of a measurement are relevant and representative of the construct for a particular objective. Content analyses suggested a coding structure that will be applied to a new set of process (Hoover-Dempsey & Jones, 1997). The items should be regarded as samples of content and they should be evaluated for how well that implied domain and how relevant for the concern construct (Selltiz et al., 1976, DeVellis, 2003). Again, all the items should be should be reviewed in iterative process and it should be inclusive rather than parsimony as what concerned the by researcher (Churchill, 1979; Devellis, 2003; Hardesty & Bearden, 2004; Llusar & Zornoza, 2002). Furthermore, according to Nunnally & Bernstein (1994), reviewers should be chosen broadly. In this stage, suggestions for modification, addition, and deletion of items may incorporate. This evaluation of items should be a formal norm wise (Slvec & Drnovsek, 2012). In this proposed evaluation process, each item was rated as 'clearly representative,' somewhat representative, or not representative of the new construct (Zaichkowsky, 1985).

The researcher should ensure that all the judged items for face and content validity. Again the response formats, the number of scale points, all he items, and other instructions have judged for representativeness through multiple experts at different phases with qualitative and quantitative (Perreault &Leigh, 1989) approach. As the items are five point scale, we have six experts from different angles complied with an

employee (second level manager), a scholar in this field, two frequent flier (passenger), an academician crossed the minimum number of expert 5 to 7s. Similarly, if for 3-point Likert scale we should be used at least five experts (for content validity) and five target population/passengers for face validity (Haynes et al., 1995).

In this study, we have followed only for perceived service quality not for expected services, because it does not form a valuable alternative, and a meaning of measurement and also the responses of respondents are not measurable, uncertain and abstract (Lewis and Mitchell, 1990, Carman., 1990; Parasuraman et al,. 1994; Teas, 1993) Again the researcher considered economy class air passengers' perceived quality for the present study. So all the items are based upon economy class passengers'. In the results of the review we got four heads of service such as booking facilities, various services at airports, services in aircraft, loyalty and overall satisfaction. Apart from this, we have also included few relative service constructs like punctuality, safety and security, and pre-post airport or pre-post flight services.

4.2.6 Tool Development

Very common and appropriate method for authorized data collection in social science research is through questionnaires (Chandler & Lyon, 2001; Crook et al., 2010). Properly designed questionnaire facilitates to collect relevant data for the primary study. By following a reliable data collection method will help to increase benefits to society, establish trust among participants, increase response rate and decrease cost. After questionnaire formation, a pre-testing was conducted, as it is indispensable in survey development. This pre-test was conducted with expert, scholar with specialized knowledge and known frequent fliers on some aspect of questionnaire quality (Dillman et al., 2009), target construct, other social desirability scale and maintain cross- cultural equivalence. In his study, we have proposed a self-administered structured questionnaire of Likert's five point scale and given to the mentioned experts, for their further suggestion regarding sentencing, language, sense towards constructing and their suggestion were incorporated to increase face validity. Again, we have followed multichotomous Likert's five point scale to represent more variance towards the target constructs (De Vaus, 2002, Netemeyer, Bearden & Sharma, 2003). Here we retained 76 items out of 123 from the above step (Item pool review) of scale development.

4.2.7 Pilot Testing

Pilot study is the first pragmatic approach of any intervention research. It is a very common method prior to original survey process in business research for developing measures that boost reliably and proper validation further. Before going to large data collection for estimating any psychometric properties for any new construct, it is essential to conduct a preliminary study with moderately size sample of the target population (Slvec & Drnovsek, 2012). It may around 30-50 samples. Pilot testing allows to examine the most important aspects of the questionnaire with respect to time taken, ease of completion, ease of data collection (Kriel, 2006).

A pilot study is a mini-version of full-scale study or a trial run of the complete study. It is also called a 'feasibility' study. It is a pre-testing of research instruments, such as questionnaires or interview schedules (Polit, et al. & Baker, 2002; Van Teijlingen & Hundley, 2001). Pilot study is to provide Information that contributes to the success of the research project as a whole. According to, Teijlingen & Hundley (2004), it refers to the feasibility and small-scale versions of studies conducted in preparation of the main study. Pilot studies warn of possible project failures, deviation from protocols, problems with method, measurement and other problems that affect the whole research. It is a "small study for helping to design a further confirmatory study"(Arnold et al.,2009).According to Thabane et al. (2010), this study has various purposes such as testing study procedures, validity of tools, the estimation of the recruitment rate, and estimation of parameters such as the variance of the outcome variable to calculate sample size etc. Pilot study is "to see if the beast will fly" (De Vos, 2002); "reassessment without tears" (Blaxter, Hughes & Tight, 1996) and "Do not take the risk. Pilot test first." (Teijlingen & Hundley, 2001). Through this study, the researcher will be enabled to save some time, effort and money, which can be incurred loss for main study if it follow to wrong process. According to Netemeyer et al. (2003), for a large pool of items, it will be useful trim the pool for the further studies that to obtain some initial estimates of reliability and validity. So pilot studies can be helpful in this regard, by deleting items that do not meet certain psychometric criteria. It is an initial testing for validity. There are four issues should be considered in pilot testing include, (i) the size of the sample; (ii) Sample composition; (iii) initial item reliability; and (iv) the number and type of validity-related scales to include. First, for sample size in pilot

testing, De Vellis (1991) suggest n = 300 range, Clark &Watson (1995) it is n = 100 to 200 and Slvec & Drnovsek, 2012, suggest n = 30 to 50 will suffice. For this issue to consider sample size, in order to items for every item, five samples or for every construct there should be 10 samples is ideal (Clark &Watson, 1995; Slvec & Drnovsek, 2012). And for large items 300 samples are preferred.

Table 4.1
Purpose of Pilot Testing

Ticchurst and Veel (2000)		*Welman and Kruger (1999)*	
Purpose of Test	Relevant	Purpose of Test	Relevant
Questionnaire Sequencing	Yes	Detect flaws in measurement procedure	Yes
Questionnaire Wording	Yes	Operationalization of Independent variables	Yes
Questionnaire Layout	Yes	Identify unclear items	Yes
Estimating Response Rate	Yes	Non- verbal behavior of participants	Yes
Estimating questionnaire completion time	Yes	*International Nursing Standard (2002)*	
Testing analysis Procedure	Yes	Advance Warning for failure of study	Yes
		Whether research protocol allowed or not	Yes
	No	Identify practical problems of the research procedure	Yes
	No	Identify inappropriateness and complication of instrument	Yes
	No	Identify complication of method	Yes

According to Netemeyer et al. (2003), though students are convenient sample for piloting, the researcher cannot draw fair, reliable conclusion as construct have different properties in different samples (Clark & Watson, 1995). And also collegiate samples from single campus are rarely representative of anything beyond student concern (Reynolds, 2010). So samples from a relevant target population are preferred, which will more confidently assessed as a candidate for inclusion of developmental studies. In case of third for reliable issue, Cronbach alpha will be analyzed and further average inter-item correlation, and factor structure analysis will make sense. In the initial

assessment of validity can be made through pilot sample. As in literature review, the researcher can be able found about few measure constructs in the study, this three to four key construct should be considered in the initial estimation of the validity (Netemeyer et al. 2003).

In the current study, to estimate the reliability of the measures, alpha coefficient was analyzed and for face validity, consultation was done by various experts. The retained, variable based questionnaire from the above step (expert pre-testing), were used for pilot testing. Each question was Likert's five point scale to ensure sufficient variance and to get a sufficient range of responses with freedom of respondents through middle value (Graziano & Raulin, 2000, De Vaus, 2002, Netemeyer, Bearden & Sharma, 2003). This middle value stands for "not applicable" or "Neither agree nor disagree" or "can't say" to minimize non-response, response and unengaged bias. Around 230 structured questionnaires were distributed to purposive samples at Hyderabad Airport and University of Hyderabad for a period of three weeks, November 2012. Out of this distributed survey questionnaire, 190s were returned and 163 questionnaires (crossed all the threshold limit of sample for consideration) were usable after discarding to unengaged respondents, without flight experience respondents, and high standard deviation related responses.

Table 4.2
Limitation of Pilot Study

Ticchurst and Veel (2000)	
i) Familiarity with respondent will not be happened	ii) It will not test and train field workers
iii) It will not test field work requirement	
Prof. Manjunath (2012)	
i) Actual Result vary form pilot study	ii) It is not suitable for case study
iii) Different in pilot sample and final respondents	iv) Due to small, it will give limited information about measures.

4.2.8 Instrument Purification

In this step we will discuss about how items will be refined using various statistical procedures. Here we have used a statistical package SPSS.21 version to clean the pilot data. Exploratory factor Analysis (EFA) is a first and the foremost independent statistical technique and initial stage of scale development, scale modification and

refinement and also for its performance (Netemeyer, Bearden & Sharma, 2003; Clark & Watson, 1995; Worthington & Whittaker, 2006; Slvec & Drnovsek, 2012). Factor Analysis is used to identify a smaller number of factors or latent constructs from a large number of observed variables. There are two main categories of factor analysis: (I) exploratory, (II) confirmatory Khan, 2006; Hair et al., 1998). Each one used by the researcher for scale development for a certain range of purpose. This analysis is one of the most prevalent uses of factor analytic techniques to support the validity of newly developed constructs. EFA can be used for two primary purposes in scale development: (a) to reduce the number of items in a scale, so that the remaining items maximize the explained variance and maximize the scale reliability (Tabachnick & Fidell, 2001; Netemeyer, Bearden & Sharma, 2003). EFA estimate the construct validity during the initial development of a measure. It becomes a combination of both qualitative and quantitative methods (Worthington & Whittaker, 2006). When conducting EFA it is assumed that a researcher has a limited idea of the new measure`s dimensionality (Netemeyer et al., 2003).We have already discussed more in preceding chapter about EFA.

In the present study, all the valid data were entered into SPSS 21 and cleaned to minimize non-sampling errors by removing any entry errors, invalid and unengaged responses. Again for the purpose of further analysis, data normalization was checked using skewness, kurtosis and central limit theorem (Hair et al, 1998). After the preliminary confirmation, refined data were used R –type factor analysis using principal component analysis and varimax (orthogonal) rotation. Principal component analysis (PCA) is used instead of common factor analysis (CFA), because it estimated in a manner that to represent the variances among the items as economically as possible, with the fewest number of components, analyzes the correlation matrix among the variables, it maximizes all the variance regardless common factor and unique item (Floyd & Widaman, 1995; Hair, Anderson, Tatham, & Black, 1998; Hair et al, 1998). The factors, which shows Eigen value greater than one, were extracted and confirmed it with scree plot (if any other not considered for extraction). The implied component analysis was observed and the items with complexity that means if an item show substantial loadings (> .32) in more than one factor were removed (Hair et al, 1998; Worthington & Whittaker, 2006). Again the items, shows factor loading of 0.5 or bellow were tested further to retain or not, about the theoretical as well as the

importance of current study about the item. According to Hair et al., (1998); Tabachnick and Fidell (2001) & Worthington & Whittaker, (2006) believed that factor loading > or equal to 0.3 is significant at .05 level of significance and further it less if samples will increase. Again Comrey and Lee (1992) suggested that factor loading above 0.71 be considered as excellent, above 0.63 very good, above 0.55 good, greater than 0.45 fair and below 0.32 as poor. In this study, loading about 0.35 and above as considered for further study.

In this continuous process, item deletion and retention in scale development should simultaneously consider about reliability and internal consistency through item- based statistics such as reliability test, item-to-total correlations, average inter-item correlation, and item variances etc. Here we will discuss only about reliability and others, we have on forward sections in this chapter. For the current study, Cronbach alpha (or alpha-coefficient) for each scale were calculated to confirm about consistency and replicability. This alpha-coefficient is widely used by the research community to assess reliability or internal consistency (Churhill, 1979; DeVellis, 2003; Hair et.al. 1988; Tabachnick & Fidell, 2001, Worthington & Whittaker, 2006). Again, the alpha coefficient value about 0.70 or above is usually accepted to define a fair level of homogeneity in the scale and it reflects, he item is unidimensionality. The alpha value of may be less slightly if samples increases (Churchill, 1979; Hair et al., 1998; Hinkin et al., 1997; Trochim, 2009). The final scale compiled with 41 items (273-201-132- and further included in **five** dimensions. Final version of measurement is enclosed in Appendix 1.

4.2.9 Conclusion

The present section of this chapter, is the qualitative part of data analysis, where various attributes service quality for air passengers' are identified through literature review, expert opinion, and different round of focus group discussion, interview by experts, and in-depth interview from the target population. The identified items are subjected to appropriate for proper representation to the new dimensions with statistical significance and expert views. The implication of the section was pushed to prepare the final version of the instrument, after testing its reliability and external validation such as content validity and face validity. The following chapter looked about the main study and development of 'FliQual' models.

Section-1

DEVELOPMENT OF 'FliQual' PREDICTIVE MODEL

4.3 Introduction

In the preceding category of the chapter, we have a discussed qualitative approach of the study that means, what is scale, how to develop scale and its various steps of the scale development process and its role to the scale adoption, modification or revision. The present category is quantitative approach and further divided into four sections such as development of predictive model, its consecutive measurement model and the last one is development of final and best structural model.

From the earlier section, 67 variables and following that 43 (41+2) items were finalized, from the final refinement of scale development to measure air passengers' perceived service quality. Again, four items were used to evaluate passenger loyalty and three items each were used to measure safety and security services, punctuality and pre-post airport services respectively. Apart from that two more items were used to appraise passengers' opinion on overall satisfaction about airlines and airport service quality consecutively. In the present study, all the measured variables are Likert's five point scale except last two items with ten point scale that are meant for overall satisfaction.

4.3.1 Survey for Data Collection

Through the final version of the questionnaire and finalized number of items (43), full swing data collection survey was conducted across three airports such as Rajiv Gandhi International Airport, Hyderabad, Visakhapatnam Airport, Visakhapatnam and Biju Patnaik International Airport, Bhubaneswar of three states viz. Telengana State, Andhra Pradesh and Odisha respectively by considering various categories of the sampling process. The respondents were chosen while they were seated in the last lobby after final security check for boarding. Apart from the respective airports, data also collected from various leading academic and corporate Institutions of the concern cities after confirming about their journey frequency through proper channel. The survey was done for period of six months, April-August, 2013. From this survey, 1137 were valid samples, out of 1500 distributed questionnaires.

Table 4.3
Demographic Profile of Respondents

Demographic	Category	F	P	Demographic	Category	F	P
Gender	Male	721	63	Profession	Govt. Employee	233	21
	Female	415	37		Private Employee	196	17
Age	LT 30	749	65		Self Employed	4	0.4
	30 - 50	329	29		Student	702	62
	GT50	59	6		House wife	2	0.2
Marital Status	Single	692	61	Travelled Airline	Air India	316	28
	Married	445	39		Indigo	263	23
Family Size	LT 3	302	27		Jet Airways	29	2.6
	LT 5	801	70		King Fisher	71	6.2
	GT 5	34	3		Spice Jet	315	28
Income	LT 20,000	379	33	Purpose	Business	853	75
	LT 50,000	681	60		Friends	167	15
	GT 50,000	77	7		Tourist	106	9
Education	Professional	351	31	Decision	Self	755	66
	PG	763	67		Secretary	43	4
	Graduate	23	2		Agents	59	5
	Inter	--	--		Family	253	22
Airline Chosen	Air India	348	31		Sponsor	27	2
	Spice Jet	380	33	Frequency/year	Once	79	7
	Jet Airways	116	10		LT 5	821	72
	Indigo	145	13		GT 5	237	21
	Go Air	8	7	Reason to Chosen	Promotion	2	0.2
					Fast reach	31	3
					Recommend	54	5
					Familiar	356	31
					Cheap fair	460	41
					No alternative	50	4

Note. F = Frequency; P = percent; LT = less than; GT = greater than

4.3.2 Preliminary Observation of Data

Exploratory factor analysis was conducted to recognize the principal factors of air passengers' perceived service quality. For this the total valid samples were grouped into two approximately sub- samples such as $S_1 = 506$ and sample $S_2 = 631$ through a random selection process. Data was split for the purpose of good validity, to get good fit indexes in structural study and split half testing (Hair et. al.2003 & Trochim, 2009). After splitting, exploratory factor analysis was performed with 43 (41+2) variables of the measurement scale through principal component analysis

4.3.3 Descriptive Analysis

A preliminary observation about the data set was analyzed by the various descriptive statistics such as mean, and standard deviation. Here it is observed that various items have very low standard deviations i.e. < 2.0, which shows that respondents have a high level of agreement about the importance for their perceived service quality in flight journey.

Table 4. 4

Descriptive Statistics of Demographics

Particulars	N	Range	Min	Max	Mean	Std. Deviation	Variance	Skewness		Kurtosis	
	Stat	Stat	Stat	Stat	Stat	Stat	Stat	Stat	SE	Stat	SE
Age		49	19	68	30.86	8.258	68.187	1.798	.073	2.969	.145
M- Status	1137	1	1	2	1.39	.488	.238	.446	.073	1.805	.145
Family Size		6	1	7	4.00	.907	.823	-.087	.073	.314	.145
Education		2	1	3	1.71	.496	.246	-.426	.073	-.687	.145
Trav-Frequency		3	1	4	2.15	.543	.295	.586	.073	1.369	.145
Annual income		80000	10000	90000	29215.6	12767.303	16300.26	1.727	.073	3.161	.145

Note. Stat = statistics; SE = standard error

Factor analysis is an interdependence statistical technique, whose primary objective is to define the different underlying structure among the items in the study. As it is a multivariate technique having more number of variables, implies that it is prone to committee more measurement error in the data set. So to minimize this, the researcher has to strive more correlations among the variables. And hence as the variables are correlated, the researcher needs to manage to group these highly correlated items to

form a new composite measure called as factors. That means its basic intention, for grouping highly correlated items into distinct dimensions. Again, it's important is that the researcher require factors analysis to make progress to the confirmatory factor approach (Hair et. al.2003).

Again for the factor analysis, necessary conditions such as stable factor structured should emerge, scaled items & any kind of bias free and suitability of data set should be satisfied (Ferguson & Cox 1993). Again, according to Hair et al.2003, these are similar to, the various assumptions about factor analysis such as data set are normality, linearity, and homoscedasticity, there is homogeneity of samples and have linkages in concepts. Concerns subjects have satisfied almost all the general threshold limit introduced by Hair et al. (1998) and Hair, Anderson and Black (1995), Gorsuch (1983), Kline (1996), Nunnally (1978), Comerry (1978), Cattell (1978). According to them the sample size should be at least minimum five and maximum ten times as large as the number of attributes in the study.

The present study has adopted Likert's five scale point, which is suitable for the attitudinal studies to provide the interval scaled data that makes appropriate for exploratory factor analysis (Cooper & Schindler 2006; Furguson & Cox, 1993). Again, we have tested the normality of a data set using simple skewness (± 2) as per Muthen & Kaplan (1985).

4.3.4 Sample Adequacy

As per the above discussion, total sample size should be 10 times more to one item (Hair et al., 2008) that means it is 41 items in the study. So maximum sample requirements for 41-items are 410 (41x10), but in this study sample size $S_1 = 506$, hence it is sufficient larger to that limit. So the current sample size is more than sufficient to conduct factor analysis.

The other statistical test for sample adequacy is Kaiser-Meyer-Olkin (KMO) measure for sampling adequacy. That means samples are adequate to progress, whether or not the factor analysis was appropriate for study (Pett, Lackey and Sullivan 2003 and Garson 2008). It also indicates that the proportion of variance expressed by the variables towards the factors. Its range is 0 to 1, while it is 1 that means the variable is perfectly predicted without any error due to other variables.

Table 4.5
Results of KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.857
Bartlett's Test of Sphericity (significant Correlation)	Approx. Chi-Square	1895.350
	df	120
	Sig.	**.00

Note: ** Significant at p<.01

The value of 0.60 or above on the KMO measure denotes that adequacy of the data for EFA (Tabachnick & Fidel 2001), if it is 0.8 above considered as ideal and if above 0.9 is superb (Hutcheson & Sofroniu, 1999 cited in Field, 2009). The KMO measure value of current samples is 0.857 as ideal.

4.3.5 Inter-Item Correlation

It is another prerequisite for exploratory factor analysis to test the significance of correlation between the variables. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy is also commonly used measure for the pattern of correlation between the various items. For this, rule is if the value of KMO is 0 that implies, high degree of diffusion in their correlation, hence the factor analysis is not suitable for the study. If it is closer to 1, then the pattern of correlation is solid and so factor analysis is appropriate. As in the present study, KMO is .857 so it is ideal for exploratory factor analysis.

Again, the Bartlett test of sphericity which measure the significance of correlation through a null hypothesis. The null hypothesis is correlation matrix is an identity matrix that shows all the coefficient correlation is zero, which implies variables are unrelated to each other. As we should reject the null hypothesis and establish the correlation between the variables is significant, at least five percent level of significance (<.05). As here $\chi 2 = 1895.350$ and value is significant at .001 that means, $p < .001$.So it reject the null hypothesis and the correlation matrix is not an identity matrix, therefore, there are some relationships between the items and factor analysis is appropriate.

4.3.6.1 Inclusiveness of Items (through Individual KMO values)

KMO values for individual variables will identify the further problematic items should be excluded from the factor analysis. This KMO values individual variables can be shown from the on the diagonal of anti-image matrix table. These should be minimum

greater than .5. In the present study all the variables have > .5 value on the diagonal of the anti-image correlation matrix table. If it is less than 0.5, then the variable should be excluded from factor analysis. And further, off the diagonal represent the partial correlation. So the values for off the diagonal elements should be less as possible as for better result.

4.3.6.2 Inclusiveness of Items (through correlation values)

As per suggestion by Field, 2005 & Hair et al. 2008 coefficient value of correlation matrix should be 0.3 or above to be considered as factorable item. It implies that there is reasonable inter-correlations between the variables subjected to represent the factor. If it is less than 0.3, the variables should exclude from the factor analysis. Further, it is greater than 0.9, that means the variables are highly correlated should also be excluded, because it is not possible to find the individual contribution of these variables to the total variance. In this study all the variables, have correlation within 0.3 to 0.9, so the data set mates the criteria.

4.3.7 Exploratory Factor Analysis

The current study uses R-type factor analysis to understand the underlying structure of the multiple perceived variables and their inter-correlation between them. Here, finally 41 variables after many rounds of review and analysis were considered for further process. The basic purpose of the analysis is to identify the underneath critical factors of passengers perceived service quality for airlines, which will be considered for predictive model. And this will provide a base for theory testing using multivariate techniques. After fulfilling all the preliminary requirements for factor analysis, we have to discuss various factor extraction and suitable rotational method as well as criteria for the required number of factors should extract.

4.3.8 Number of Factors to Extract

After establishing the appropriateness of data set, inclusiveness of variables, and type of factor analysis, the next step is to determine how many possible number of factors can be extracted. There are a number of principle have to follow to determine number factors to extract. Though there is no single rule, through which the best factors can be extracted, and so it is valuable to follow the range of methods to approach the best number factors (Habing, 2003; Field, 2005 & Hair et al. 2008). The study has followed various methods such as Kaiser's criterion (Eigen value rule), Scree test criterion, and

the last one is Priori criterion, are commonly principles used to extract various underlying factors.

4.3.8 (I) Kaiser's Criterion

It is also called as a latent root criterion or Eigen value principle. Eigenvalue, which explain the total amount of variance is explained by the data. With this criterion, the number of factors having Eigen value 1.0 or above should retain (d (Field, 2005; Pallant, 2005 & Hair et al. 2008). And it is by default available in SPSS- version and used widely. Though by this to retain as many as factors are too many or too less factors, so taking the number of factors with Eigen value > 1.0 is more reliable for 20 to 50 variables (Hair, et. al. 2003) and also the communalities are greater than 0.7 (Habing, 2003). And if he sample size is > 500, communalities may 0.5 can considered (Habing, 2003 & Field, 2005).

Table 4.5 (I)

Explained Total Variance

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.007	18.796	18.796	3.007	18.796	18.796	2.599	16.244	16.244
2	2.452	15.322	34.118	2.452	15.322	34.118	2.290	14.311	30.554
3	1.361	8.507	42.626	1.361	8.507	42.626	1.522	9.515	40.069
4	1.218	7.614	50.240	1.218	7.614	50.240	1.500	9.375	49.445
5	1.021	6.379	56.619	1.021	6.379	56.619	1.148	7.174	**56.619**
6	.976	6.102	62.721						
7	.907	5.667	68.388						
8	.760	4.751	73.139						
9	.731	4.569	77.708						
10	.629	3.932	81.640						
11	.621	3.882	85.522						
12	.576	3.599	89.121						
13	.529	3.307	92.428						
14	.425	2.659	95.087						
15	.412	2.577	97.664						
16	.374	2.336	100.000						

.

Note: Extraction Method: Principal Component Analysis

4.3.8 (II) Catell's Scree Criterion

It is another popular test for number factors to extract (Pallant, 2005 & Field, 2005) proposed by Cattell (1966). In order to, this criterion shows the plotting the given Eigen values of the factors against possible number components. It will show the same number of components as per the number of variables. For the number of factors to extract, we have to look at the point at which the plot begins to level off or at the point of "elbow", that means sharp drop from the vertical to horizontal direction. It is shown in the following figure.

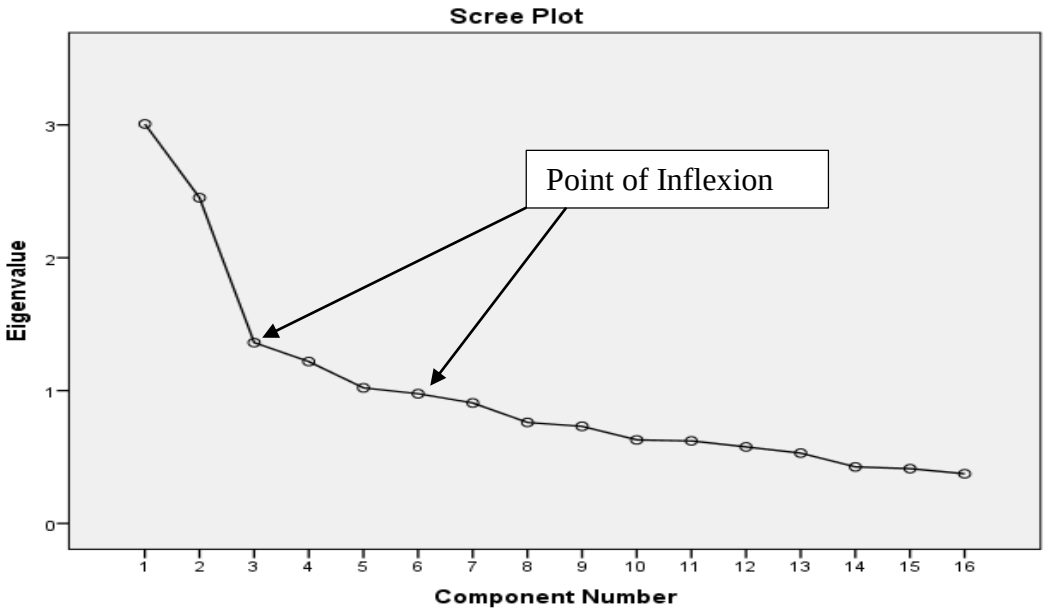

Figure 4.7 Scree Plot

Sometime the plot will level off or change the direction from vertical to horizontal two times, that means after first level off, the plot shows a stable plateau and again it changed, its direction. The point of elbow at which, changed the direction called as point of inflexion. It is assumed that factors beyond the elbow are require number of factors. Again, some researcher suggests that the Scree plot tends to keep one or more factors more than Eigen value criterion (Hair et. al. 2003). For large sample it is not recommended.

4.3.8 (III) Prior Criterion

In other words, this is called as judgmental criterion or previous research method. It is another suggested method for determining the number of factors on priori base. It suggests that if we have hypotheses about the number of factors should be underline

from the data set, then it will probably a good number of factors to be extracted (Habing, 2003). As in earlier studies, almost four to seven factors were used, as ideal. So in this study five factors were opted for extraction, which was initially hypothesized.

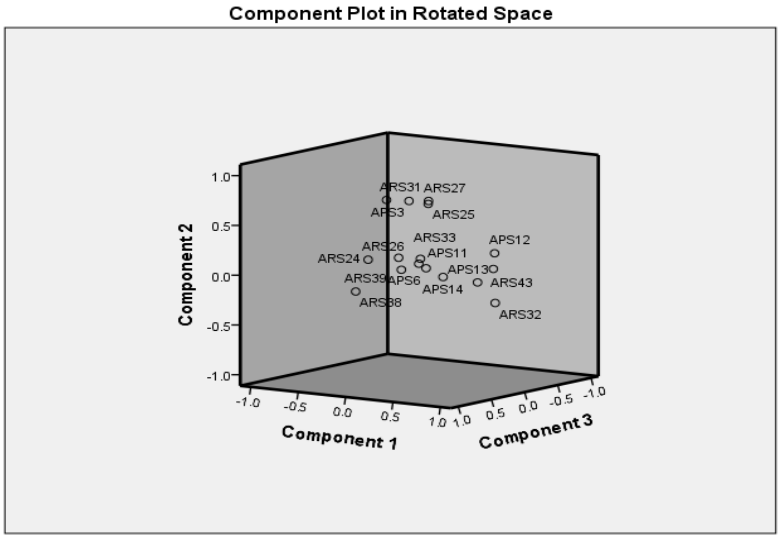

Figure 4.8 Component Plot in Rotated Space

4.3.9 Method for Factor Extraction

There are a number of factor extraction methods based on their statistical concept, but the two most commonly used are principal component factor analysis (PCA) and common factor analysis (FA).Usually mostly principal component factor analysis is used with a certain purpose in place of common factor analysis (Floyd & Widaman, 1995 & Hair, Anderson, Tatham, &Black, 1998). In case of PCA, the factors can be extracted in a way that to represent the variance among the items in the scale are economically as possible with the minimum number of meaningful dimensions as possible. Again PCA will maximize all the variance in the items, irrespective of whether it is common to a factor or unique to an item. The items which having little variance to explain to be deleted that means to reduce the number of items in the factor. Again the objective of the analysis is to data reduction with focusing minimum number of factors account maximum portion of total variance in the original variance.

Whereas common factor analysis, is to account the underlying factors for a set of items. It uses a matrix of correlation to identify a set of latent factors that explain the correlations among the variables. It also uses communality of the items on the main diagonal.

Table 4.6

Communalities of the Factors

Communalities		
	Initial	Extraction
There was good transport facilities to the airport (APS3)	1.000	.530
In-flight services with aircraft was up-to-date (APS6)	1.000	.571
The airport has good no. of electronic display boards (APS11)	1.000	.542
The airport has retail outlets (APS12)	1.000	.606
The airport has good restaurants (APS13)	1.000	.644
The airport has quality eatables (APS14)	1.000	.629
Appearance of the airline employees were decent (ARS24)	1.000	.626
The airline has adequate number of staff (ARS25)	1.000	.620
The employees were friendly with passengers (ARS26)	1.000	.580
It was easy to contact the staff for any problem (ARS27)	1.000	.651
The airline keeps informing to passengers, about when services will be performed (ARS31)	1.000	.614
The airline provides variety of eatables (ARS32)	1.000	.677
The airline provides quality eatables (ARS33)	1.000	.641
The airline made you feel safe (ARS38)	1.000	.564
The airline provided services as promised (ARS39)	1.000	.501
Airline sent messages prior to passengers' mobile about journey related information (ARS43)	1.000	.562

Note: Extraction Method: Principal Component Analysis.

Although, it has been shown that PCA and FA produce similar results (Velicer & Jackson, 1990; Velicer, Peacock, & Jackson, 1982), some cases FA have been shown superior to PCA and vice versa (Gorsuch, 1990; Tucker, Koopman, & Linn, 1969; Widamen, 1993), FA will be conducted with more restrictive assumption, uses only latent factors and also more theoretical base. Apart from that FA has confined from *factor indeterminacy* that means for any respondent, various factor scores can be calculated from a single factor model (i.e. no unique solution is found). Another one, it uses communality for shared variance. Sometime this communality is not estimable or invalid (i.e. value is greater than 1 & less than 0), so it will difficult to delete the item.

So in the current study, principal component factor analysis has used to reduce the data through the minimum number of factors to explain maximum variance (Netemeyer et al., 2003).

4.3.10 Method of Rotation

After the extraction of factors, to make them more interpretable that means more meaningful, the factor should be rotated. As the simple structure among the factors is a basic goal of EFA, it occurs, when each item loads highly on a few factors as possible. For this suitable rotation method is necessary. There are two commonly known of rotation method such as orthogonal rotation and oblique rotation. Where orthogonal rotation keeps factors independent and uncorrelated and oblique rotation allows factors to correlate each other. VARIMAX is the most common method for orthogonal rotation for EFA as it maximize the variance explained by variables within factors. This will emerge to produce a smaller number of variables loading highly each other. So it will produce a simple structure to interpret well (Conway and Huffcut, 2003; Field, 2005). Hence, in this study, VARIMAX process of orthogonal rotation is preferred and used because it minimizes the correlation across factors and maximizes for variables in the factors.

4.3.11 Interpretation of Factor Matrix

EFA is meant to make a simple structure which is meaningful for further analysis. So EFA is used to reduce the number items in the process before going to confirm the factors hypothesized structure. Initially, the researcher may retain all items subjected to finalize for the final study. Many items of them are less and even redundancy in the structure. So in the end, the researcher should retain the items or factor only if they interpret in a meaningful way. Hence EFA is ultimately a combination of empirical and subjective approaches for data analysis until a sensible solution.

The current study uses to determine a simple factor structure by using basically three criteria. First one, is factor loadings. Second one is item cross loading and the third is communalities (Netemeyer et al., 1996; Lastovicka et al.1999 & Hair et al., 2008). In case of first one, if an item has factor loading ± .30 to ±.40 are minimally acceptable and greater than ± .50 are considered practical significance. Here we have considered factor loadings more than ±.40 of item for further consideration. And minimum two items should be in a construct for multivariate analysis. Again, if it is extremely high cross loading, which creates trouble for consistency and validity of the structure. So in this case loading less than .40 and greater than .90 are not considered (Netemeyer et al., 1996 & Garson 2008).

Again Tabachnick & Fidell (2001), if there is more and frequent cross-loading will contribute to intercorrelations in factors that means it require oblique rotation and if lesser cross-loadings will form a good simple structure. So we have to delete the items with cross-loadings less than .15 differences from an item's highest factor loading. But in the study, we have considered minimum difference 0.20 to delete the items (Hair et. al., 2008). In this process, we have deleted seven items in our study as these are not fit the mentioned criteria.

In the last case about communality, after rotation it is useful for item deletion. Communality shows the proportion of item variance accounted for by the factors. Again, it is the squared multiple correlation of the item, predicted from the set of factors in solution. So with low communalities are not correlated well with one or more of the factors in the solution (Tabachnick & Fidell, 2001). So a minimum limit of communalities is 0.40 and if sample size be increased, further it may decrease (Hair et. al., 2008). In this study, we have deleted 8 items as the communalities are less to .40.

4.3.12 Extracted Factors

Appropriate labeling to the extracted factors, which should be a fair representation of the included variables is the concern for the research reporting. The variables having higher loadings should consider as important as and influenced to label the selected factors, which cannot be done with software packages. So we have examined all the important items in the specific factor wise and considered emphasis was placed on those items with higher the loading to assign a name to factor that reflects the loading of variables. Hence, by considering the nature and intention inside the items, expert opinion, academician's suggestions and earlier literatures, the five extracted factors were labeled. These are *Available and Accessibility services* (ASF1), *Staff services* (SSF2), *Courteous and behaviors of employees* (CTF3), *Food and Beverage services* (FBF4) *and the last one is updated technical services* (UTF5). It is shown in the following figure below.

Table 4.7

Final Extracted Factors

Variables	Dimensions				
	1	2	3	4	5
Factor 1: **Availability & Accessibility Services(ASF1)**					
ARS32 The airline provides variety of eatables	.777				
APS13 The airport has good restaurants	.751				
APS12 The airport has retail outlets	.727				
ARS43 Airline sent messages prior to passengers' mobile about journey related information	.722				
Factor 2: **Staff Services(SSF2)**					
ARS27 It was easy to contact the staff for any problem		.746			
ARS25 The airline has adequate number of staff		.720			
ARS31 The airline keeps informing to passengers, about when services will be performed		.719			
APS3 There was good transport facilities to the airport		.656			
Factor 3: **Courteous and Behavior of employee (CTF3)**					
ARS26 The employees were friendly with passengers			.654		
ARS38 The airline made you feel safe			.612		
ARS24 Appearance of the airline employees were decent			.568		
ARS39 The airline provided services as promised			.465		
Factor 4: **Food and Beverages Services(FBF1)**					
ARS33 The airline provides quality eatables				.790	
APS14 The airport has quality eatables				.747	
Factor 5: **Updated Technical Services (UTF1)**					
APS11 The airport has good no. of electronic display boards					.726
APS6 In-flight services with aircraft was up-to-date					.671

Note: Factor Loadings based on Principal Component Analysis: Varimax Rotation with Kaiser Normalization and Rotation converged in 6 iterations

4.3.13 Reliability of 'FliQual' Predictive Model

Reliability, which means consistency or repeatability in the measure is the degree of inter-item correlation within the construct rather than inter constructs (between the constructs). In other words, it is the extent to which measures are correlated (Straub et. al., 2004). It is an assessment of the degree of consistency between multiple

measurements of a variable (Hair et al., 2008). There are four forms to test the reliability of the measurement such as, (i) test-retest method, (ii) the split halves method, (iii) alternative form reliability method and (iv) internal consistency reliability method. Among these above methods first three have their own limitations like reliability is estimated by considering two alternative forms of measurement or survey instruments on two occasions on the same group of responses (Saraph, et. al. 1989 & Netemeyer et al., 1996). The last and most commonly used measure of reliability is internal consistency that applies to the consistency among the variables in summated scale. And it requires only an administration once upon a time. According to Nunnally, 1970; Churchill, 1979 & Netemeyer et al., 1996, rationality for this internal consistency reliability is to measure require only a single administration of the items to respondents by assuming the availability of multiple measures for measuring a construct. So the Cronbach's alpha coefficient is the most widely used measure to assess the internal consistency of the all scales. The generally agreed lower limit for Cronbach's alpha is 0.70 and it may decrease to 0.60in exploratory study and if sample size increases (Cronbach, 1951 and Straub et al., 2004). And if an item will increase the reliability value may increase further. It is also noted that if more value is not necessarily good. Very high Cronbach's alpha (i.e. > .95) may suggest common method bias of the study. So this Cronbach's alpha value should not be >.95. Again the earlier research suggests that in a construct, with three or four items will provide good convergent validity (Harvery et al., 1985). And according to Hinkin (1988) & Worthington & Whittaker, (2006) smaller in item is greater in confidence, but factor with large number of items have higher reliability.

In the present study, the reliability of the five extracted factors of "FliQual" are shown in below tables from 4.3 to 4.8. Here using SPSS-20 version internal consistency of reliability test was performed individually for the items in the factors. The factors such as 1, 2, and 3 have high Cronbach's alpha values .757, .795, and .814 respectively. And factors 4 and 5, the Cronbach's alpha values are .625 and .651. That means factors 1, 2 and 3 contribute largest contribution in explaining the overall variance in the data and remaining other two contribute less to overall perceived service quality for air passengers' because earlier factors explain more variance.

4.3.14 Validity of 'FliQual'

The validity of a measure is the extent that a scale or set of measures correctly represents the concept of interest (Hair et al., 2008). That means the degree to which it measures what is intended to measure. Simply, the validity of a test is the extent to which it measures what it claims to measure. A measure is valid to the extent that inferences made from are appropriate, meaningful, and useful (APA, 1985). Reliability is a necessary but not sufficient indirect effect of validity. Construct validity is viewed to which a measure truly reflects the concept of study or the extent to which variables used to observe co-variation in and between constructs to be studied (Calder, Phillips, & Tybout, 1982). The basic objective of valid test is to generate and develop valid items and to provide of quality measure.

According to Haynes et al. (1999) and Trochim (2002), various types of validity can be grouped into three types. First is Translation validity and further divided as (i) Content validity & (ii) Face validity.

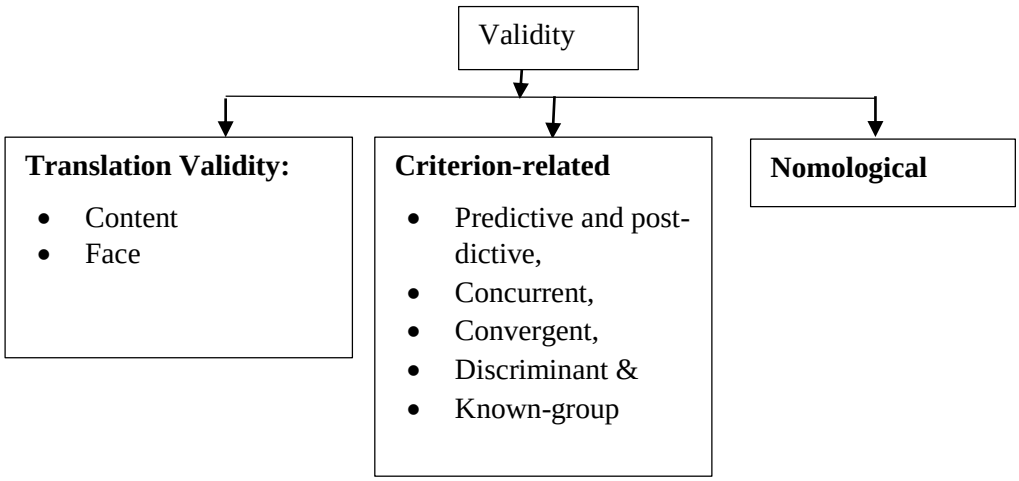

Figure 4.9 Types of Validity
Source: Haynes et al. (1999) and Trochim (2002)

Here we will not test all the types of validity, but those are essential and key to produce valid items have to discuss. Again, it is out purview to test all types by considering the process, intention and appropriate to each of this study.

Face validity can be tested after a measure has developed to apply further. It ensures that nothing is wrong with completing instrument or measure (Bernstein, 1994). It is also helped about what a respondent may infer about what an item is intended to

measure. It also enhances the use of the instrument by correcting to proper reading level, clarity, and appropriate formats. Here we confirm the face validity by designing the instrument properly through incorporating expert opinions, earlier literature, academicians' suggestion, family, friends and other reference (Kaplan & Sacuzzo, 1993-s). Content validity is to ensure the items the content wise encompassed by the factors. It will be manifested from the initial stages of scale process like item generation, refinement of items and so on. This validity we test in theoretical prospective of the item particular concern to items wording, response formats and other instruction (Haynes et al., 1999; Haynes et al., 1995; Netemeyer, Pullig, & Bearden, 2002; Robinson et al., 1991). So it is similar to face validity. If we consider the theoretical concept as a necessary condition, the sufficient condition for content validity is $Content\ Validity = \frac{\sum E}{\sum A + \sum B + \sum C + \sum D}$ where E = 5 i.e. strongly agree; A = 1 is strongly disagree. So content validity (C.V.) = .813 > .5 satisfied (Martuza, 1977; Bausell, 1986).

For the discriminant validity, the chi-square test was administered for this measure. It was conducted for all the five dimensions and the test was significant at the p = .001, that means all the six factors are distinct. So it is the indication of discriminant validity. And also for discriminant validity the item of one factor is not highly correlated with item of another construct (Churchill & Iacobucci, 2002). Other criterion type's validity for this measure were established by sizable correlating (shown in Table 4.8) between the constructs. Whereas convergent validity was established by finding that there are highly correlated within the measures in a construct. That means independent measures of the construct converge (Bearden et al. (2001). Other conditions are existence of cross loadings and correlation are > .4 established.

Again, Known-group validity address about, which how a measure differs in prediction between groups with their low and high mean score. This type of validity was established from the different mean scores across the independent sample. That means here we have found different average mean scores by taking different sample groups. In case of nomological (law like) validity, is the extent to which the measure fits "lawfully" into a network of relations that is called a nomological network. (Cronbach & Meehl, 1955 cited in Netemeyer et al., 1996). It is based upon search of factors and

measure in terms of formal hypothesis derived from the earlier approach (Netemeyer et al., 1996). So it will be established in hypothesis testing and SEM section.

Table 4.8
Correlations between the Five Factors and the Criteria

Extracted Factors	Unique Factors			
	Loyal	Punctuality	Pre-post airport	Safety & security
Availability- accessible (ASF1)	. 631	.592	.081	.351
Staff services (SSF2)	.489	.476	.423	.495
Staff courteous (CTF3)	.502	.537	.563	.526
Food & Beverages (FBF4)	.604	.641	.491	.096
Updated technical (UTF5)	.402	.087	.236	.452

Note: $p < .01$

After ensuring the necessary reliability and validity of the measure, finally we have established a five factor structure. It is in 4.7 table final factor matrix of the predictive model.

4.3.15 Multiple Regression Analysis

Here multiple regression is used to determine the effect of the various factors towards the overall air passenger perceived quality. In other word, how well the various factors enable to predict service quality and also to find the relative importance of the factors. As multiple regression is a widely dependence technique used for prediction and explanation to the researcher. Here prediction involves the extent to which the regression variates or independent factors can predict the air passengers' perceived service quality. And explanation will test the regression coefficients for each independent variables and their per rate effect to the service quality (Hair et al., 2008). For this, we have established a regression model using the five extracted factors as independent variable and the overall air passengers' perceived service quality as dependent construct. And summated scale was determined through averaging all scale scores, factor wise to mitigate the standard error, though it accommodates in SEM process.

Here multiple regression analysis was run to test the relationship between overall passenger service qualities with dimension wise contribution. From the model summary table 4. 9, shown that the model is relatively significant at 95% confidence interval. The coefficient of determination R is found in marginal high, hence the model is well defined and all the variates together explain more than 73 percent of variance in the service quality. Again the adjusted R^2 is .578 (*P<.05)* and shows that the almost all five factors contributing significantly towards the predicate air passenger perceived service quality and additional included factor only contribute 57 percent (if any).

Again the Durbin-Watson approaches (≈2) such as 1.9473 met a certainty for independent errors and confirms that the independent variables can decide the level of overall service quality of air passengers'.

Table 4.9

Model Summary: Effect of Six Factors on Service Quality

Model	R	R square	Adjusted R square	Std. error of the Estimate	Durbin-Watson
1	0.731	0.534	0.578	0.679	1.9473

Again on table 4. 10 ANOVA shows that the model is statistically fits of the data and significant at 5 percent level of significance with p = .000 and F= 4.312 which shows that ratio of improvement in prediction from the fitting model relative to inaccuracy still exist in the model.

Table 4.10

ANOVA: Effect of Six Factors on Service Quality

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	7.039	5	1.408	4.312	.000*
Residual	204.063	625	.327		
Total	211.102	630			

Note: n=631, *p < .05

Furthermore, the regression coefficient of five independent factors has explained in the hypothetical explanation. Here the model shown that there is no collinearity between the factors. Hence the multicollinearity problem solved as the value of VIF is greater

than 0.2 and less than 5 for all the factors. Again, all the independent factors except updated technical services are statistical significant contribution to the assessment of overall air passenger service quality.

4.3.16 Importance of the Factors

After with statistical significance of the various independent factors, we ranked in order to either with standardized non-standardized coefficient values. So based on their standardized coefficient value we arranged their importance towards the predicate. Here availability and accessible services (ASF1) is the most important dimension followed by food beverage service (FBF4). Next is staff services in different stages of flight journey, then their courteous towards and formalities and followed by updated technicality is matter to the passengers'.

Table 4.11
Relative Importance of the Dimensions

Dimensions	Standardized Coefficient	Rank
Availability & Accessible (ASF1)	.242	1
Food & Beverages (FBF4)	.185	2
Staff services(SSF2)	.160	3
Staff courteous (CTF3)	.138	4
Updated technical services(UTF5)	.106	5

4.3.17 Results of Hypotheses Testing

Hypothesis 1

There is significant impact of availability (ASF1) on overall air-passenger service quality (APPSQ).

There is a significant effect of ASF1, $t(629) = 3.23$, $p < .001$, with variety of eatables and it has more impact than other variables. Again supported result of messaging as, $F(1, 629) = 14.29$, $P = .00$, and a significant for varieties, $F(2, 628) = 12.50$, $p = .00$. It significantly predicted service quality scores, $b = .167$, $t(629) = 3.238$, $p < .001$. Restaurants also explained a significant proportion of variance in service quality scores, APS13 = .074, $F(2, 628) = 12.50$, $p < .001$. Again Average independent error is 1.22 having a safe and satisfy to established rule.

Hypothesis 2

There is the significant impact of supporting staff services (SSF2) on air-passengers' service quality (APPSQ).

The sample as a whole was relatively (M = 14.26 (20), SD = 1.15). The average service quality through this dimension is 14.26 (SD = 1.15). Except transport facility (APS3) other variables like easy contact, adequate staff and informing to passengers about services are negative correlate to service quality, i.e. the variables were strongly correlated, r(627) = .057, p < .01.

There is significant effect of SSF2, *t* (627) =2.59, *p*< .001, with transport system and it has more impact than other variables. Again supported result of service quality as, *F (*1, 629) =1.49, *P*=.17, and a significant for others, *F* (4, 626) = 4.26, *p* = .02. They are significantly predicted service quality scores, *b* = .177, *t* (627) = 2.595, *p*< .001. Again Average independent error is 1.426(Durbin-Watson) having a safe jone. Hence there is significant impact of SSF2 to APPSQ.

Hypothesis 3

There is the significant impact of staff behavior on air passenger's perceived service quality (APPSQ).

Except decent appearance of employee (ARS25) other variables viz. friendliness of employee, safety feeling, and promised services are positive correlate to air passengers' perceived service quality, i.e. The variables were strongly correlated, *r*(627) = .060, *P* > .01.

Again supported result of service quality as, *F(*1, 629) =1.611, *P(*.186)> .05, and others like, *F* (2, 628) = 1.421, *p* (= .242)>.05 and *F* (3, 629) =.609, *P* (=.435)> .05. Hence, they do not significantly predict overall service quality scores, b_0 =13.89, *t* (627) = .917, *P*>.001. Again, the assumption of independent error is 1.490 (Durbin-Watson) having a safe limit and certainly met. Hence there is no significant impact of CTF3 to APPSQ.

Hypothesis 4

There is the significant impact of food and beverage services (FBF4) on air passenger's perceived service quality (APPSQ).

Here both the variables viz. quality eatables provided by the airline (ARS33) and quality foods in the restaurants at the airport (APS14) are high positive correlate to air passengers' perceived service quality, i.e. The variables were strongly correlated, $r(628) = .108$ & $.090$, $P < .05$.

Again supported result of service quality as, $F(2, 628) = 4.575$, $P(.011) < .05$, and first one , $F(1, 629) = 7.395$, $p (= .007) < .05$. Hence, they are significantly predicted overall service quality scores, $b_0 = 13.434$, $b_{i=1\&2} = .174$ and .108 etc. Here $t(627) = 1.98$, $P < .05$. Again, the assumption of independent error is 1.496 (Durbin-Watson) having a safe and certainly met. Hence there is significant impact of FBF4 to APPSQ.

Table 4.12
Results of Hypotheses (Based on Dimension) Testing

Hypothesis	**Standardized Coefficient**	**P* value**	**Testing of Hypothesis**
H1: There is significant impact of availability eatables and basic usable (ASF1) on passenger service quality (APPSQ)	.242	.001	Accepted
H2: There is significant impact of staff services (SSF2) on passengers' service quality	.160	.013	Accepted
H3: There is significant impact of staff behavior on air passenger's perceived service quality	.138	.360	Not accepted
H4: There is significant impact of food & beverages services (FBF4) on passenger's perceived service quality	.185	.048	Accepted
H5: There is significant impact of updated technical services (UTF5) on passenger's service quality	.106	.886	Not accepted

Note: N = 631, *p < .05

Hypothesis 5

There is the significant impact of updated technical services (UTF5) on air passenger's perceived service quality (APPSQ). The Supported result of service quality as, $F(2, 628) = .025$, $P > .05$, and first one , $F(1, 629) = .030$, $p > .05$. Hence, they are not significantly predicted over all service quality scores, $b_0 = 14.256$, $b_{i=1\&2} = .010$ and .012

etc. Here $t(628) = .144$, $P > .05$. Hence there is not significant impact of UTF5 to APPSQ.

4.3.18 Conclusion

First section to the of the chapter emphasizes on providing a base for developing the 'FliQual' predictive model. Either for scale modification or adoption or formation, exploratory factor analysis has extreme contribution. It is the foundation for theory testing or theory building, mostly shown in quantitative case. The exploratory factor analysis with principal component analysis enables to this study, to form a simple five factor structure for experienced service quality for air passengers'. The multiple regression analysis is used to examine various hypothesized statements about the significant impact of all extracted constructs towards air passengers' overall service quality. In the next section, the finding structure of this exploratory factor analysis will be confirmed.

SECTION 2

DEVELOPMENT OF 'FliQual' MEASUREMENT MODEL

4.4 Introduction

As we know the result cannot reveal valid conclusion unless the experiment with valid measurement. Confirmatory factor analysis (CFA) results are combined with validity tests, so this section will demonstrate the quality of the measures and how the validity of instrument model can be tested using CFA and SEM. CFA is a way to test, how well measured variables represent a smaller number of factors. It is a tool that enables to either confirm or reject our pre-conceived theory. It is a statistic tells us how well our specification of the factors matches the reality (i.e. actual data set). It is called measurement theory. CFA is used to provide a confirmatory assessment of the measurement theory. Structural equations models (SEM) involve both to measurement theory as well as structural theory, whereas CFA deals with only a measurement theory. A measurement theory identifies how well measured variables logically and systematically represent a factor involved in the theoretical model (Hair et al., 2008). This theory requires a construct first be defined, so investigators supposed to know the prior number of factors and the included variable loadings. Hence EFA will push sufficient insights by exploring the data set and provide necessary inputs about how many factors needed to best represent the present data.

Constructs characterize certain concept, which cannot be measured directly, because it can't be observed straight. So it can be measured indirectly through observed variables. Hence a measurement model deal with this latent variable will be analyzed through CFA. Again CFA will hypothesized to unmeasured co-variance between each probable couples of constructs. It assumes that there is a direct impact from the indicators and from the errors, but there are no any hypothesized causal effects attended these constructs.

In the preceding section, EFA was used to develop 'FliQual' predictive model with five latent factors through 41 observed variables. In his section this structure will be confirmed and tested using confirmatory factor analysis for each and all dimensions for the purpose of further analysis. In earlier portion, CFA model is performed for all its five dimensions of air passengers' with its repeatability and validity. In the next part,

three alternatives of 'FliQual' models such as first order, second order and third order were developed and also tested with various fit indices to identify the best fit model for the further structural model development. Further, for the generalization of the model, it crosses validated through multi-group analysis.

4.4.1 Preliminary Observation of the Data

In order to study the above structure in depth, confirmatory factor analysis was conducted by using the second sample group S_2 = 631s through a sophisticated statistical technique called structural equation modelling (SEM) with statistical software AMOS. (Analysis of Moment Structure)-20 version. As pre-requisites, the study were assessed normality, linearity and its outliers of the data set.

4.4.1 (I) Estimation of Normality

It is a most commonly used type of continuous frequency distribution. It refers to a continuous distribution of a random variable with its mean, median and mode equal. In other words, it is the variation of the individual variable. So it is a common assumption for multivariate test, because for the large variation of the variable in the data set produced invalid results for any kind of test (Tabachnick & Fidel, 2001 and Hair et. al., 2008). In the figure, the designated curve is bell shaped, symmetric about the mean called as normal curve or error curve (Banday & Shah, 1998). Normality can be measured through Kourtosis, Skewness and also Kolmogorov and Shapiro (K-S) method for normality of data set (Field, 2005; Tabachnick & Fidell, 2001; Hair et. al., 2008).

In the table 4.20 shows the result of Kurtosis should be more while Skewness is less for well normalization of data (Field, 2005). It results reveal that mean statistical value across all dimensions is about three, and value of kurtosis (positive values) and skewness (negative values) indicates that all the variable are normally distributed. Further, K-S test (Field, 2005) was conducted to test normality of the data. Hence the results portrayed that all the variables are significant, it may be for large sample apart from the little deviation from the normality. On the basis of assumption, and central limit theorem explains that if the data set with large samples (>30) implies, the data set is normality. Because larger sample sizes help to reduce the detrimental effect of non-normality (Hair, et.al. 2008; Sekaran, 2006 &Cooper &Schindler, 2006).

4.4.1 (II) Linearity Test

Linearity, we mean that an assumption of correlation analysis, that the collection of data can be represented by a straight line. In other words, the model predicts the values that fall in a straight line so that constant unit change in the slope of the dependent variable for a constant unit change of the independent variable. It as an implicit assumption of all the multivariate techniques such as regression analysis, factor analysis, structural equation modeling ((Hair et al., 2006) etc. Common methods to measure linearity are Pearson's correlations or through a scatter plot (Tabachnick & Fidell, 2001; Field, 2005 & Hair et al., 2008). In the current study, Pearson's correlation method was adopted and found the results that all the concerned variables are significantly and positively correlated each other. Again the study was inspected visually, and found its linearity.

4.4.1 (III) Identification of Outliers

The observation which has unique characters and distinct from all other observations called as outliers. Basically, it found an unusually high or low value of a variable or a unique combination of values about the range of variables that observation stands out from the others. These outliers can be identified in three prospective such as univariate, bivariate and multivariate detection. In univariate case, observation of each variable will examine and select outliers, those cases are falling in the outer range (maximum or minimum) of the distribution (Kline, 2005 & Haier, et. al, 2008). While in case of multivariate detection, outlier are the one or more extreme values of two or more variables. In this study, we only concentrated to the multivariate detection and most common method to detect the outliers is Mahalanobis D^2 measure. It measures each observation's distance in multidimensional space from the mean center for all. The study reviewed with AMOS output only and did not found any extreme outlier. It is noted that if any serious outlier will be found, then it is up to the researcher whether, to exclude or not form the study.

4.4.1 (IV) Homoscedasticity of Variables

It assesses the variance explained by the dependent variable with independent variables. It is the assumption of a dependence relationship between variables. Homoscedasticity refers to the assumption that dependent variable exhibit equal levels of variance across the range of the predictor variable (Hair et. al., 2008). That means "*equal spread of*

*variance across independent variables (*Field, 2006*). "* It is essential because explained variance by dependent variable should not be concentrated in a limited number of values. If the variance (dispersion) is unequal across the values of the predictor variables, the relationship is called "heteroscedasticity". Heteroscedasticity will cause for better prediction, standard errors, and hypothesis tests.

Table 4.13

Test of Homogeneity of Variance

Dimensions		Levene Statistic	df1	df2	Sig.*
ASF1	Based on Mean	8.229	6	624	.101
	Based on Median	7.374	6	624	.210
	Based on Median and with adjusted df	7.374	6	588.135	.062
	Based on trimmed mean	8.120	6	624	.103
SSF2	Based on Mean	3.512	6	624	.002
	Based on Median	2.384	6	624	.028
	Based on Median and with adjusted df	2.384	6	576.618	.028
	Based on trimmed mean	3.392	6	624	.003
CTF3	Based on Mean	2.611	6	624	.117
	Based on Median	1.624	6	624	.138
	Based on Median and with adjusted df	1.624	6	570.710	.138
	Based on trimmed mean	2.633	6	624	.016
FBF4	Based on Mean	10.346	6	624	.000
	Based on Median	5.881	6	624	.000
	Based on Median and with adjusted df	5.881	6	549.469	.000
	Based on trimmed mean	10.606	6	624	.000
UTF5	Based on Mean	.615	6	624	.718
	Based on Median	.281	6	624	.946
	Based on Median and with adjusted df	.281	6	617.460	.946
	Based on trimmed mean	.552	6	624	.768

Note. P < .05

To overcome heteroscedasticity, problem, we have to follow the data transformation and make non-normality to normality data because the assumption that most times homoscedasticity is the result of normality ((Field, 2006; Tabachnick and Fidell, 2007). Homoscedasticity can be measured graphically through Box plot in case of bivariate, but in multivariate case it can be measured by Leven's test of homogeneity of variance.

The results shown that most of the variables ensured that the assumption of homogeneity has not violated and significance. It is also sensitive to sample size likely to K-S test, so that it can be significant if sample size may increase (Field, 2006).

Hence from the table 4.13, found that for the factors ASF1, CTF3 and UTF5 the variances were equal for overall passenger service quality (APPSQ), $F(6, 624) = 8.229$, $F(6, 624) = 2.611$, and $F(6, 624) = .615$, $p < .05$, but for the factors like SSF2, and FBF4 scores the variances were significantly different for APPSQ, $F(6, 624) = 3.512$ and $F(6, 624) = 10.346$, $p < .05$.

4.4.2 'FliQual' Measurement Model

Confirmatory factor analysis was conducted on each of the underlying factors to confirm the factor structure and unidimensionality of each.

4.4.2.1 CFA for Availability and Accessible Service (ASF1)

The factor has described about the availability of necessities and this service should be accessible by passengers. In case of availability, it is the range of services included such as airline have official as well as other online seat booking portals with necessary information.

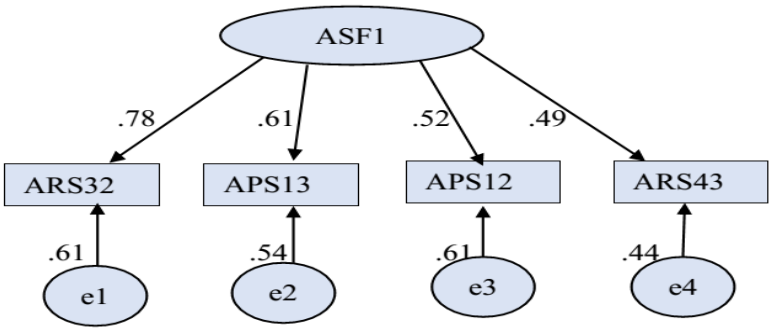

Figure 4.10 CFA of Availability and Accessible Services

And proper communication facilities to the airports with easy access, others like escalators, carrier wheels, retail outlets restaurants with a variety of eatables, refreshment, variety of eatables in flight etc.

All facilities should be easy to access, user friendly, and reasonable price is related to the accessible services. Here this dimension was measured with four items such as airline provide variety of eatables (ARS32), airports with good restaurants (APS13), it has number of retail outlets (APS12), sending updated messages (ARS43) to passengers

by airline etc. The following table shows the factor loadings, average variance extracted (AVE) and construct reliability (CR) of the availability and accessibility service factor.

Table 4. 14
CFA Results of Availability and Accessible Services

Variables	Factor Loadings	Squared Loadings	AVE	CR
ARS32	.78	.608		
APS13	.61	.372	.68	.82
APS12	.52	.270		
ARS43	.49	.240		

Here all the variables of the factor have significant (at 0.001) loadings, where the lowest loading of ARS43 is 0.49 and highest for ARS32 is .78. And AVE and CR is .68 and .82 respectively, which means it cross the threshold limit of .50 and .70 for AVE and CR, respectively (Hair, et. al. 2008). Hence it indicates that this factor has convergent validity and proper reliability.

4.4.2.2 CFA for Staff Service (SSF2)

This dimension is described about employees involved services, such as adequate number of employees to serve the passengers, their readiness and skill to handle any kind of problem of the passenger's. Apart from, employees are the real asset of the organization, they will actively participate in the service providing process. In spite of availability of higher level infrastructure, quality service with skilled employees, if they will not serve properly & in time quality service will lose its value. So in this factor we have analyzed about four attributes such as easy to contact employees for the seek any services (ARS27), Airlines are having adequate employees (ARS25), employees keeps informing to passengers about when service will perform (ARS31), and employees used to guide about to and fro communication facilities about airport (APS3).

The figure 4.11 is the CFA model for the dimension staff services and all the included items have a significant loading apart from the APS3. We can remove APS3, for better factor loading, but for the importance of the item for the study, we are not deleting. The various fit indices of the dimension as shown in table 4.15.

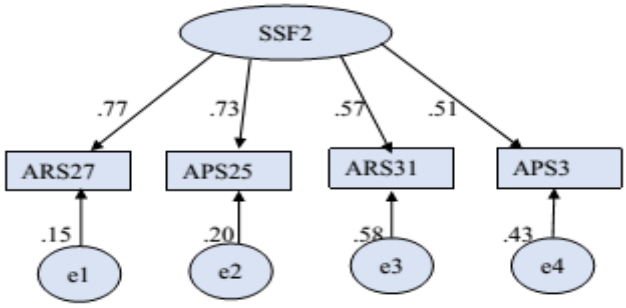

Figure 4.11 CFA for Staff services (SSF2)

Table 4.15

Fit Indices of Staff Services

$\chi 2$	df	GFI	AGFI	NFI	CFI	IFI	TLI	RFI	RMSEA
24.57	6	.972	.950	.975	.979	.967	.936	.925	.0431

Note: ***probability level = .001, p=.000

Here the absolute fit indices as GFI is .972 is the above recommended level 0.90 and RMSEA is 0.431 satisfy the minimum condition. Again the incremental indices are also good fit such as NFI (.975) and CFI (.979) being he above recommended value of 0.90. And also normed Chi-square values 21.57. Again in the next table 4.16 shows that standardized factor loadings, its replicability (CR) is .80 and validity through AVE (0.52).

Table 4.16

CFA Results of Staff Services

Variables	Factor Loadings	Squared Loadings	AVE	CR
ARS27	.77	.592		
APS25	.73	.532	.52	.80
APS31	.57	.324		
APS3	.51	.260		

4.4.2.3 CFA for Employees' Courteousness (CTF3)

This dimension is related to employees' behavior expected at working place. It is very important for an organization to gain competitive advantage in a perfect market, where competitors are similar to every angle. It is well-mannered behavior and treat others with due respect. Preceding factor cared about what kind of service could be offered from an employee, whereas this dimension shown how the service should provide.

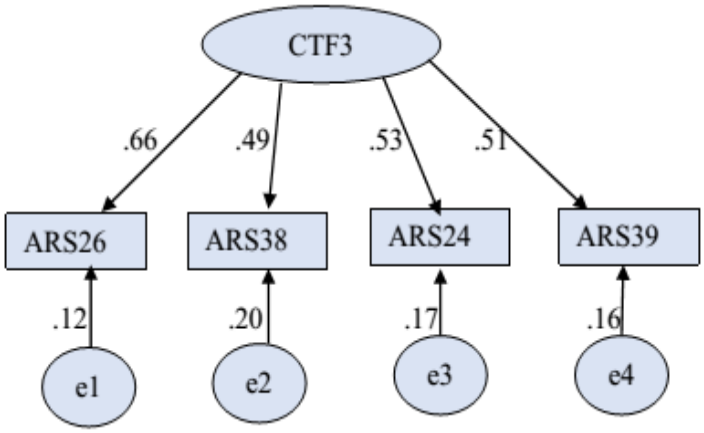

Figure. 4.12 CFA for Employees' Courteousness (CTF3)

This dimension comprises about four attributes such as employees' friendliness towards passengers at every level of the journey (ARS26), airlines effort to make confident about safety to on-board passengers (ARS38), the appearance of the employee on the duty (ARS24), and the last one is providing services in time as it was promised and scheduled (ARS39). The above figure 4.12 shows the schematic representation of the CFA model for employee's courteousness.

Various categories of fit indices of the above CFA model are in the acceptable level and loadings of all the indicators is significant apart from the indicators ARS38 that means rising confidence to a passenger about their safety is 0.49, but for its contribution for further study, we have not discarded from the concern model after frequent review. Following table 4.17 shown about fit indices of the model.

In terms of replicability and validation of the model, here average variance extracted and composite reliability with the standard factor loadings of the dimension is shown in the table 4.18 are significant and sustain with the threshold limit.

Table 4.17

Fit Indices of Employee Courteousness

$\chi 2$	df	GFI	AGFI	NFI	CFI	IFI	TLI	RFI	RMSEA
33.68	7	.968	.939	.841	.852	.858	.796	.725	.0412

Note: ***probability level = .001, p=.000

Table 4.18
CFA Results of Employee Courteousness

Variables	Factor Loadings	Squared Loadings	AVE	CR
ARS26	.66	.435		
ARS38	.49	.240	.50	.71
ARS24	.53	.280		
ARS39	.51	.260		

4.4.2.4 CFA for Food and Beverage Services (FBF4)

Refreshment is the human nature that makes individuals more active and involved in work by release from hectic and bored life pattern. But relative to the flight journey, the service added value to passengers' cost, make them satisfied, a superior experience. This service ranges from quality of eatables to the variety with reasonable price. The current study explains about four more attributes related to this construct such as the airline providing quality eatables (ARS33), the restaurant of airports offered high quality foods (APS14), it was good restaurant in airports (APS13), and airline used to offer a variety of eatables on board (ARS32). Out of these, due to less factor loading of AS13, it was discarded in simple factor structure. Again, after frequent review of CFA model for this dimension ARS32 was discarded for its less contribution to the food services for passengers. The final CFA model for this dimension is shown in the bellow.

Because this model is under- identified, various fit indices and factor loadings are not measured. Again, as the two attributes is unidimensional and this construct is under identified itself so when it will be integrated with overall model it may significant model with all together (Hair, et.al. 2008). This CFA model of the dimension has proper convergent validity as well as construct replicability.

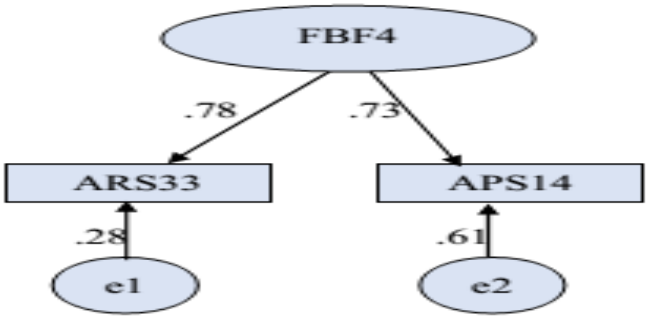

Figure. 4.13 CFA Model for Food and Beverages Services (FBF4)

4.4.2.5 CFA for Updated Technical Services (UTF5)

This service is the showcase about technical savvy for passenger services. It measures at what level the airlines and airport using updated technology to provide in-time and quality services. Implementing superior technology in case of security measure, booking facilities, baggage handling will raise the confidence of passengers'. So that they will fly in the same airlines and become a loyal passenger.

In this dimension four variables were included in earlier stages of the process. This service is, basically the part of airport or pre-flight related services. These attributes such as security system of the airport was with sophisticated technology (APS6), Airport has good number of electronic display boards (APS11), functionality of laptop and mobile chargers were good (APS17) and the in-flight services of aircraft was up-to-date (ARS37).

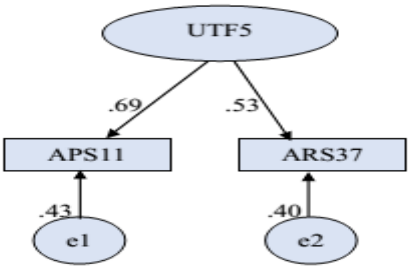

Figure 4.14 CFA Model for Updated Technical Services (UTF5)

After reviewing and refining out of that it retained only two attributes like APS11 and ARS37 for this construct to measure up to date technical related services to the passengers. The CFA model for this factor is in the following figure 4.14. As per the above model this one is under- identified, various fit indices and factor loadings are not measured. For the CFA model of the above dimension has proper convergent validity and composite replicability.

4.4.3 'FliQual' First Order Measurement Model

In the preceding section we have discussed about the confirmatory factor analysis for each factor of the predictive model. For the further assessment of convergent and discriminant validity of all the measures, an integrated (overall) measurement model with all the five dimensions needs to confirmatory factor analysis. According to Hair et al, (2008), the final model is the one where all the construct are free to correlate each other. First order measurement model for five factor structure 'FliQual' comprises 16

observed variables. The schematic representation of the model is in figure 4. 13. Various fit indices of all the five dimensions were estimated. An examination of the overall fit statistics can be shown in the table 4.19 below. The model has a good fit with a value of $\chi 2$/df ratio 4.68, which indicates that the model is acceptable. Different types of fit indices are used to estimate the three types of fit indices such as absolute fit measures like the Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), and the Root Mean Square Error of Approximation (RMSEA).

Table 4.19

Model Fit Summary of First order CFA for 'FliQual'

		Absolute fit measures (how well researcher's theory fit the sample data)			Incremental fit indices (How well the model fits relative to alternative one)				Parsimony fit indices (How the model is best among the set of competing models)		
χ2	*df*	GFI	AGFI	RMSEA	NFI	TLI	CFI	RFI	PGFI	PNFI	P close
440.364	94	0.921	0.877	0.076	0.770	0.754	0.807	0.810	0.886	0.790	.0701

Note: ***probability level = .001 (p= .000).

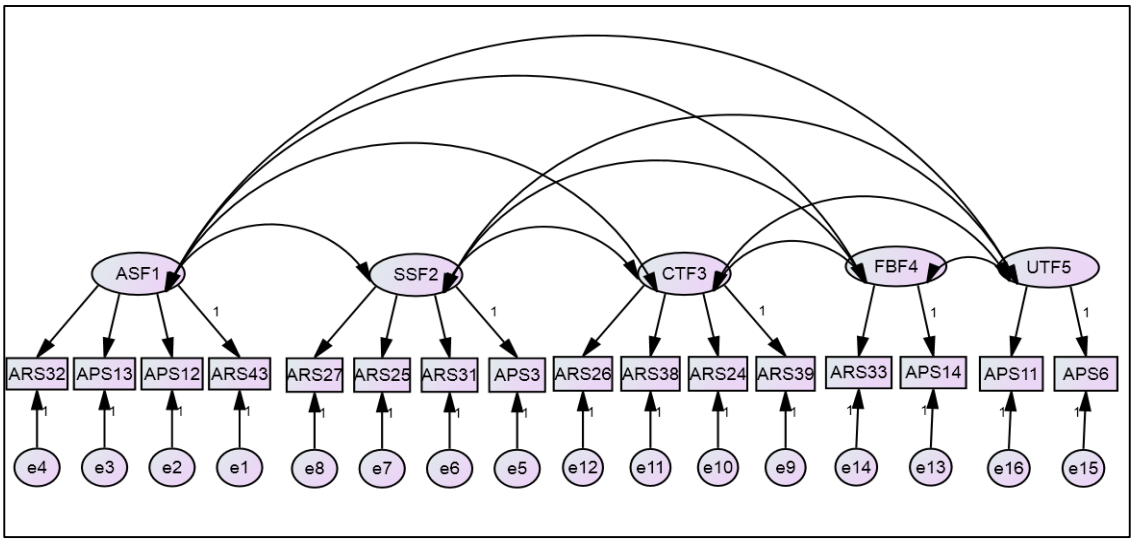

Figure 4.15 First Order Hypothesized Model for 'FliQual'

Incremental fit indices like Normed Fit Index (NFI), Tucker Lewis Index (TLI), Comparative Fit Index (CFI), and Relative Fit Index (RFI). At last type of fit indices called as parsimony fit indices that includes Parsimony Goodness-of-Fit index (PGFI), Parsimony Normed Fit Index (PNFI) and P Close is separate index, which can measure

about the closeness of model fit by testing one side of the hypothesis as the value of RMSEA < 0.05 is good model fit. In table 4.19 presents about the overall summary of the indicative model fit indices with significant values.

The implication of the 'FliqQual' model demonstrates a range of different fit characteristics and all of these are in the acceptable level fit index. In case of absolute fit indices such as GFI (0.921), AGFI (.877), and RMR (0.048) are satisfying the recommended threshold limit. The incremental in other words, it is called as comparative fit indices like NFI (0.770), CFI (0.807), and so on also indicates that are acceptable level of fitness.

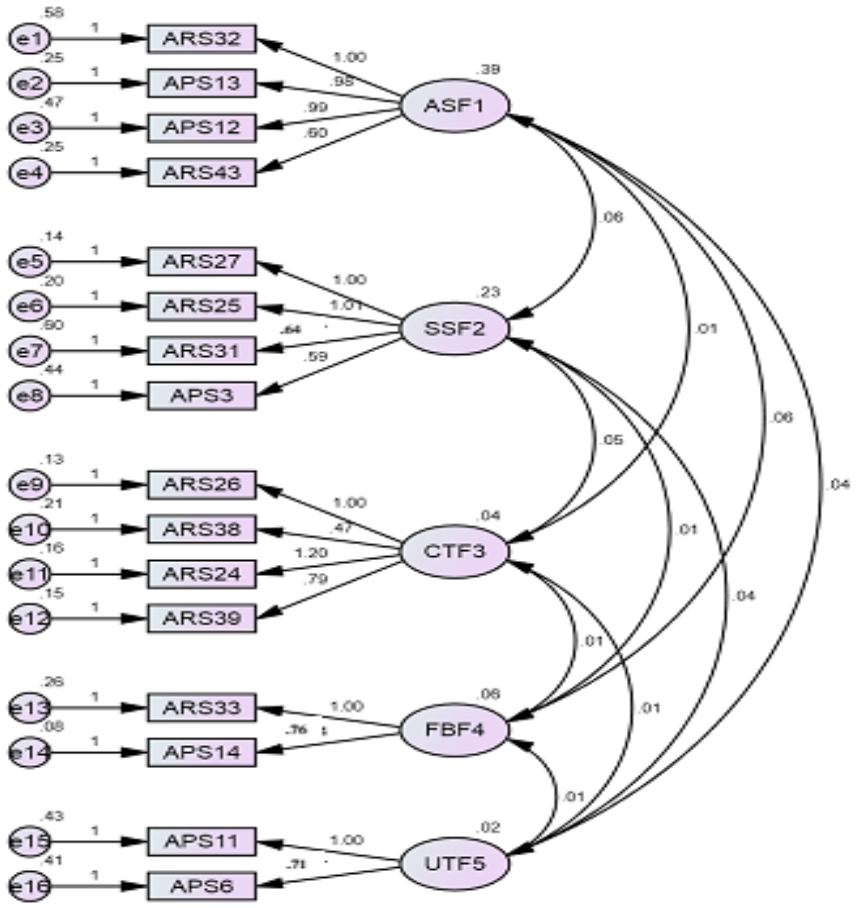

Figure 4.16 First Order Measurement Model for 'Fliqual'

Here the normed Chi-square (440.364) and degrees of freedom is 94 within the recommended range. Hence the overall results of this measurement model of this study appear to an acceptable fit. Various fit statistics of the model are shown in the above table.

4.4.4 Comparative Study on 'FliQual' Predictive and Measurement Model

Though, EFA was conducted with more than 41 items originally and retained only 18 attributes after 11 iterations and further it iterated and finally retained high loadings 16 variables. All loadings are satisfactory apart from a few such as airline provided services as promised (.565) and decent appearance of the employee (.568) for the construct courteousness of the employee (CTF3). The comparison about factor loadings for predictive model and measurement model is discussed in the table 4.20 below. It has seen that that factor loadings in the measurement model are relatively higher than the predictive model except few items. It implies that overall perceived service quality is explained by simple factorial structure.

Table 4.20

Comparison in Factor Loadings for 'FliQual'

Variables	Predictive Model (EFA)	Measurement Model (1st order CFA)
Factor 1: *Availability & Accessibility (ASF1)*		
ARS32 Variety in eatables items	0.777	1.000
APS 13 Good restaurants in airports	0.751	0.982
APS12 Retail outlets in airport	0.727	0.991
ARS43 Sending prior message to passengers	0.722	0.701
Factor 2: *Staff Services (SSF2)*		
ARS27 Easy to contact the staff for any problem	0.746	1.000
ARS25 Airline has adequate number of staff	0.720	0.976
ARS31 Informing to passengers when service e provided	0.719	0.979
APS3 Transport facilities to the airport	0.656	0.591
Factor 3: *Employee Courteousness (CTF3)*		
ARS26 Employees friendliness with passenger	0.654	1.000
ARS38 Make you Feel safe journey	0.612	0.468
ARS24 Decent appearance of employees	0.568	0.998
ARS39 Airline service as promised	0.465	0.789
Factor 4 Food and Beverages (FBF4)		
ARS33 Airline provides quality eatables	0.790	1.000
APS14 Airport has quality eatables	0.747	0.999
Factor 5 Updated technical services (UTF5)		
APS11Airline have good number of E-display boards	0.726	1.000
APS6 In-flight services of aircraft was up-to-date	0.671	0.996

Note 1.000 as regression weight fixed and it is unstandardized estimation.

4.4.5 Various Proposed 'FliQual' Models and Their Comparison

Though to study about the higher order measurement model is not always recommended and higher-order model is more parsimonious and consume less degrees of freedom, it is useful in case of complicated comparisons and place more weight on theoretical and pragmatic approach (Hair et al, 2008). In this study, we are proceeding to the higher order measurement model by expecting and assuming such as:

- higher- order measurement model may give better fit indices,
- higher order constructs may predict other theoretical concepts sufficiently,
- higher order model may explain better or equal predictive validity related to the lower order measurement model.

Apart from the above theoretical assumption, in the present study, we assume from the earlier literature that passenger service quality is a multivariable and higher order constructs and it is derived from the different components of air passengers' services such as airport services, airline services and pre-post airport various services.

To examine this approach a range of alternative models were developed and tested using a Structural Equation Modeling technique using AMOS to identify that the model is best fit characteristics (Doll, Xia and Torkzadeh, 1994; Wilkins & Herington 2009). In the process of developing a higher order measurement model, the first order factors will be act as indicators of the second order factor and similar, second order factors will be act as indicators of the third order factors and so on. This can be shown in the following figures.

Model I: The study proposed about the 'FliQual' as a single and first order factor with various attributes of air passenger service quality that are directly impacting on overall airline passenger service quality (APPSQ). According to Herington (2004), for this model we assume that there are high levels of correlation between the variables as they are measuring a single construct, air passenger perceived service quality (APPSQ). So we have not taken any other factors in between. This model is shown in the figure 4.17.

Model II: In the second order measurement model for 'FliQual' comprises five components such as available and accessible services, staff services, employee courteousness, food and beverages related services and updating technology to all the services. It is assumed that APPSQ will consist all the performance of all the six dimensions together. According to Parasuraman et al., (1988), there exists a single

overall service quality construct to measure perceived performance of all the sectors. The model can be followed in the figure 4.18 bellow.

Model III: In this proposed third order 'FliQual' CFA model has two second order construct such as employee form services (EFS) and availability and easy to access services (AAS) with each having two and three sub dimension respectively and all the second order dimension is correlated each other. And also air passengers' perceived service quality (APPSQ) is assumed to be a third order construct. Again in the model, five first order factors load onto the two second order constructs and these two second order factors load onto the third order factor APPSQ. This resultant figure is shown in the figure 4.19.

Here the results for single factor first order measurement model (M I), demonstrates that most of the fit indices fall outside the acceptable levels except $\chi 2$/df ratio (4.79). Other fit indices such as GFI (0.832), AGFI (0.776), and RMSEA (0.051) fall outside the acceptable threshold. Further about the various incremental or comparative indices also indicate that some are moderate or bad fit like NFI (0.513), and CFI (0.538) etc. Hence on the basis of moderate or poor fit, model may not be recommended.

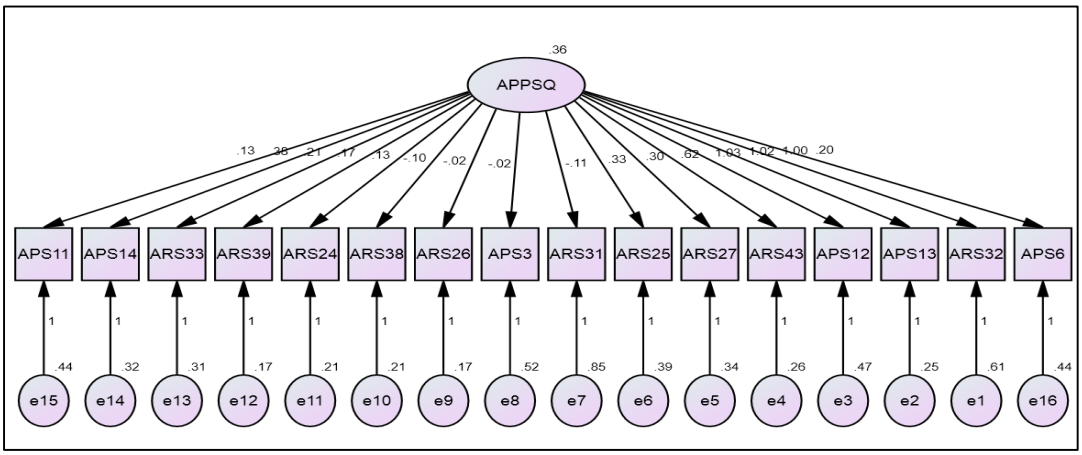

Figure 4.17 First Order Measurement Model with Single Factor for 'Fliqual' (MI)

The result of model II, the 'FliQual' second order measurement model was developed by considering as indicators to all the factors extracted from exploratory factor analysis or constructs of the first order measurement model.

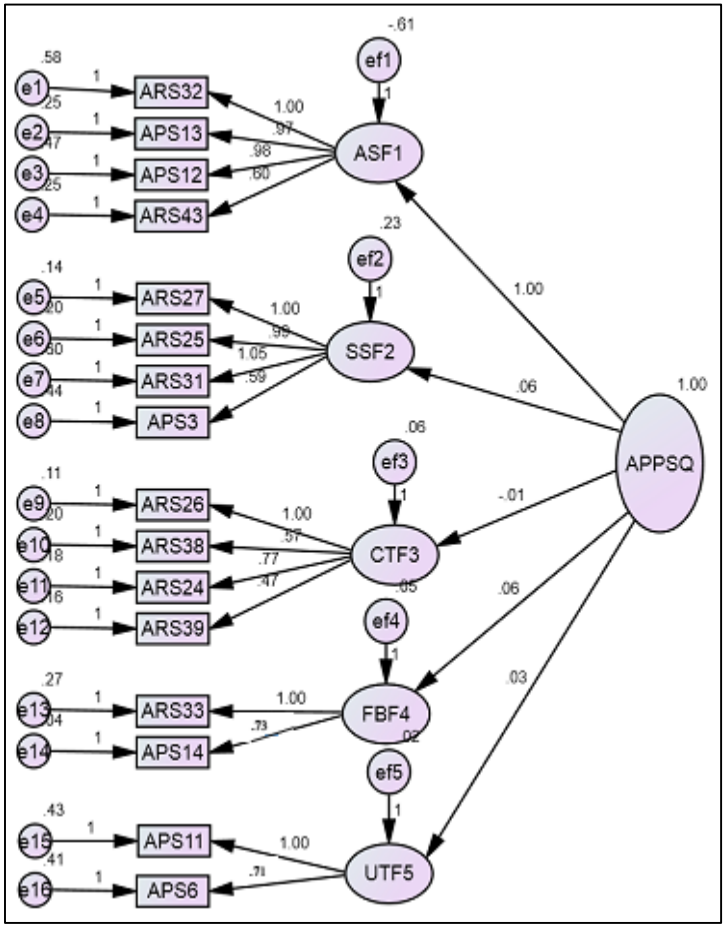

Figure 4.18 'FliQual' 2nd-Order CFA Model (MII)

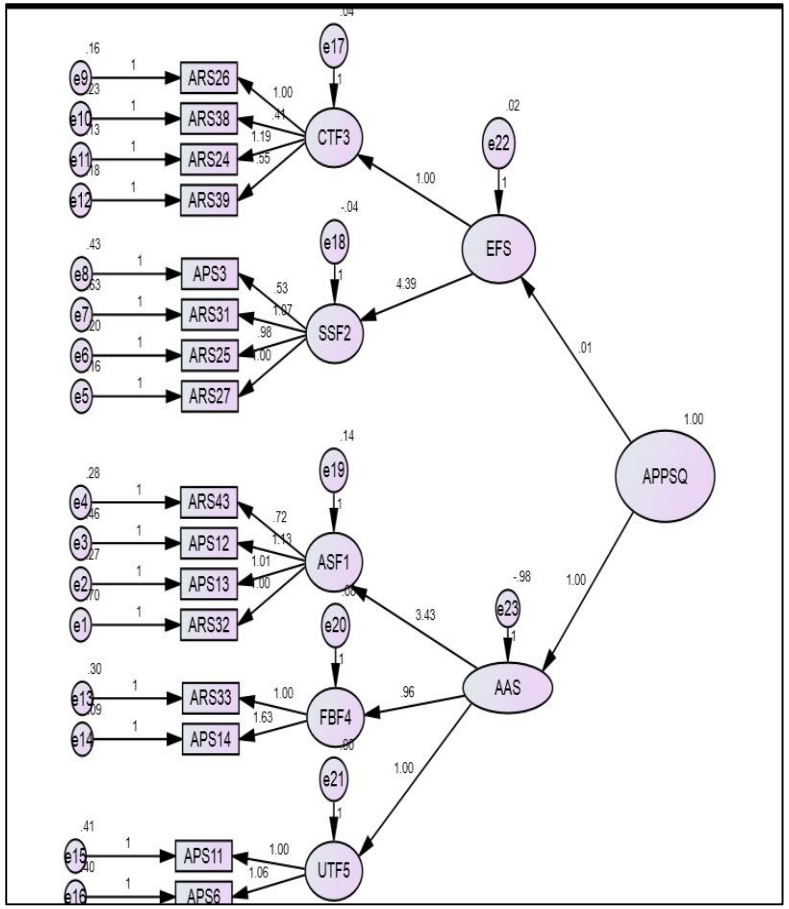

Figure 4.19 FliQual' 3rd-Order CFA Model (MIII)

So all the first order factors loadings are significantly loading onto the second order passengers perceived service quality (APPSQ). Here the ratio $\chi 2/df = 4.795$ is within the acceptable limit. The absolute fit indices such as GFI (0.904), AGFI (0.869) and RMSEA (0.044) are all within the acceptable limit. Again the incremental fit indices such as NFI (0.817) and CFI (0.903) are above the recommended level. So for overall fit indices of this model are acceptable with good fit.

Table 4.21

Comparison of Fit Statistics for 'FliQual'

Indices	**Model I (1st order)**	**Model II (2nd order)**	**Model III 3rd order)**
$\chi 2$	431.635	445.351	439.235
df	90.000	92.000	98.000
p	0.000	0.000	0.000
GFI	0.832	**0.904**	0.897
AGFI	0.776	**0.869**	0.698
RMSEA	0.051	**0.044**	0.046
NFI	0.513	**0.817**	0.753
TLI	0.461	**0.805**	0.712
CFI	0.538	**0.903**	0.799
RFI	0.543	**0.861**	0.698
PGFI	0.776	**0.869**	0.609
PNFI	0.776	**0.757**	0.615
P close	0.000	0.061	0.000

Note: probability level = .000 ***P < .001.

Again about the third order measurement model (M III) was developed by considering the second order factors as indicators o form wo constructs named as employee form services (EFS) and availability and easy to access services (AAS). He results for this model shows mixed type fit indices as some indices having good fit and some are poor. Here the absolute fit indices like GFI (0.897), AGFI (0.689) and RMSEA (0.046) are all outside the limit except RMSEA. Here though $\chi 2/df = 0.4.48$ a nearly acceptable level, but NFI (0.753) and CFI (0.799) are not in acceptable region. So this model is not recommend to accept. From the above table, we conclude from various fit indices that most of the fit indices for second order measurement model (M II) is relatively good fit than the other two models. For the purpose further analysis we have been carried forward to the second order measurement model (M II).

4.4.6 Reliability and Validity of 'FliQual' Model

A theory (model) cannot be established and well develop unless it has tested its reliability and proper validation. Evaluation of a model may not be finalized only on the basis of its range of fit indices, it is necessary to test its repeatability and validity. Testing of construct validity and reliability is essential as additional evidence. For this assessment of the second order measurement model, was conducted through multiple process like from reliability to a range of various validity tests.

Construct validity measures the extent to which set of measured variables actually reflects the construct, they are supposed to measure (Hair et al., 2008). Construct validity has established in this current study through face validity, convergent validity, discriminant validity and nomological validity.

4.4.6.1 Reliability of 'FliQual' model

It measures internal consistent among the variables based on their interrelationship. That means it is the extent about they (indicators) all measure the same thing. It measures to extend it is free from random error. Reliability was measured using construct reliability (or composite reliability). Construct reliability can be reported through either Cronbach's alpha value or composite reliability (CR). Here we used only CR as it is more reliable. The acceptable threshold for CR is ranges from 0.70 to 0.9 (Hair et al., 2008). It may further lower if sample size increases such as 0.6 to 0.9. In this study composite reliability is 0.763. Hence reliability of this theory is existed.

4.4.6.2 Face Validity and Convergent Validity

Face validity or content validity is the category of translation validity. We have already discussed about this in scale development section. Face validity was established at the stage of item generation through extensive reviewing of earlier literature, incorporating experts' opinion and including suggestions from various stakeholders and also considering insights from focus group discussions.

Table 4. 22

Convergent Validity of 'FliQual'

Construct/ Attributes	Loadings	P***	CR	AVE
Availability & Acceptability (ASF1)			.82	0.68
ARS32 Variety in eatables	0.633	.000		
APS 13 Good restaurants	0.777	.000		
APS12 Retail outlets	0.668	.000		
ARS43 Sending prior message	0.597	.000		
Staff Services (SSF2)			.72	0.67
ARS27 Easy to contact the staff	0.782	.000		
ARS25 Adequate number of staff	0.736	.000		
ARS31 Informing about service	0.551	.000		
APS3 Transport facilities	0.391	.000		
Employee Courteousness (CTF3)			.80	0.61
ARS26 Employees friendliness	0.467	.000		
ARS38 Make you Feel safe	0.193	.000		
ARS24 Decent appearance	0.500	.000		
ARS39 Airline service as promised	0.361	.000		
Factor 4 **Food -Beverages (FBF4)**			.61	0.51
ARS33 Quality eatables in Aircraft	0.442	.000		
APS14 Airport has quality eatables	0.886	.000		
Factor 5 T**echnical services (UTF5)**			.62	0.53
APS11Number of E-displays	0.205	.000		
APS6 Up- dated services	0.299	.000		

Note. ***P<.001 level of significance; AVE= Average variance Extracted; CR=Construct Reliability

Convergent validity is measured through three different ways, such as factor loading (standardized coefficient) of the five factors, the average variance extracted (AVE) and construct reliability (CR) for each latent construct to check whether there is similarity between measures of theoretical related constructs (DeVellis, 1991). In the table 4.22, it is shown that all the indicators are significant for 0.001 level of significance that means the indicators are significantly related to the concern constructs. In the following table it shows that all the average variance extracted (AVE) to each construct is greater than or equal to 0.50 which further support the convergent validity. And also composite

reliability is above 0.6 and greater than AVE (Bagozzi and Yi, 1988; Fornell and Larcker, 1981).

4.4.6.3 Discriminant Validity

Discriminant validity is checked, whether two constructs differ each other not. It is the extent to which a construct is really distinct from others. According to Fornell and Lacker (1981), discriminant validity can be assessed through comparing the average variance extracted (AVE) with the squared inter- construct correlations (SIC) related to each construct respectively.

Table 4.23

Discriminant Validity of 1st order 'FliQual' Model

	Estimation	Shared Variance	P	AVE
ASF1<-->SSF2	.059	0.125	.000***	.68
ASF1<-->CTF3	.012	0.024	.038*	
ASF1<-->FBF4	.063	0.146	.000***	
ASF1<-->UTF5	.041	0.091	.007*	
SSF2<-->CTF3	.054	0.138	.000***	.67
SSF2<-->FBF4	.008	0.116	.014*	
SSF2<-->UTF5	.035	0.073	.004*	
CTF3<-->FBF4	.006	0.056	.048*	.61
CTF3<-->UTF5	.011	.032	.045*	.53
FBF4<-->UTF5	.013	.0126	.037*	.51

Note. * p <.05 & ***p < .001

In the current study AVE method has used and if the AVE of each construct is greater than its shared variance with another construct, then discriminant validity is existed. That means if maximum shared variance (MSV) and average shared variance is less than the average variance extracted (ASV) for each then discriminant validity supported. That means, Variance extracted > (correlation) ^{2}; hence MSV & ASV < AVE then this validity is supported. Shared variance is the amount of variance that a variable (factor) is able to explain in another variable (factor). The result is presented in the table 4.23.

Hence, from the above table 4.23, shown that the AVE values of all the services quality factors are greater than the inter construct correlations, which express that the discriminant validity is existed of the constructs. Again in terms of ASV, MSV and AVE is in the following table 4.24, and supported to the discriminant validity.

Table 4.24
Discriminant Validity in Terms of MSV, ASV & AVE

Factors/ Description	ASF1	SSF2	CTF3	FBF4	UTF5
CR	.82	.78	.80	.61	.62
AVE	.68	.67	.61	.51	.53
MSV	.401	.591	.60	.42	.491
ASV	.18	.34	.41	.25	.40

4.4.6.4 Nomological Validity

It is the extent to which the correlation among the construct are sense or not. The necessary condition for the nomological validity is that there must have at least two constructs, theoretical proposition should be there that to link between constructs. And in addition to that, it supported to the nomological validity if it has construct validity. Hence all the tests are obvious, so it is implied that this validity is supported.

Again for the sufficient condition for this validity was checked, by examining whether the Pearson product-moment correlations between the construct make sense. It is on the table 4. 25 and shows that all the correlations are positive and significant, that means nomological validity is supported.

Table 4. 25

Construct Correlations with Significance Level for Nomological Validity

	Path		Estimate	P*** value
ASF1	<-->	SSF2	.200	.000
ASF1	<-->	CTF3	.102	.000
ASF1	<-->	FBF4	.398	.000
ASF1	<-->	UTF5	.481	.000
SSF2	<-->	CTF3	.597	.000
SSF2	<-->	FBF4	.069	.000
SSF2	<-->	UTF5	.542	.000
CTF3	<-->	FBF4	.121	.000
CTF3	<-->	UTF5	.404	.000
FBF4	<-->	UTF5	.367	.000

Note. *** P < .001

4.4.6.5 Criterion Validity

It refers to the extent of effective in estimating a test performance on some outcome measure. That means it is the extent to which the constructs measured are associated with the pre-specified outcome. This measure can be obtained in later date. In the current study multiple regression analysis for dependent variable APPSQ was conducted for this validity.

Table 4.26

Reliability and validity of Model I, II and III

Model	Composite Reliability (CR)	AVE	MSV	ASV
M I	0.81	0.61	0.52	0.41
M II	0.71	0.53	0.42	0.301
M III	0.73	0.59	0.0.51	0.43

The multiple regression equation for overall ‘FliQual’ model fitted with F=4.312 in 95 percent confidence interval i.e. significance level 0.05. And all the five dimensions were positive and significantly related with overall service quality can be shown in above table 4.26.

4.4.7 Replication and Generalization of 'FliQual' Model

With the good model fit indices, proper validity and reliability of the 'FliQual' measurement model multigroup analysis (test of measurement invariance) was conducted to test the extent of generalization across different demographic characteristics such as gender, class of flight journey, their frequency of journey, age group and profession etc. Here we studied about across gender and frequency of journeys by grouping the responses of respondents in terms of gender (in the form of male and Female) and frequency of journeys (less than & equal to five times and more than five times) to all the variables.

It is genuine practice to test the invariance or stable of research instruments to generalize across different demographic traits. For the 'FliQual' invariant test, we have considered in the second order measurement model (as its best fit) across the gender and frequency of journey by splitting into four groups in each trait respectively with necessary test related to invariance test (Hair et al., 2008 and Byrne, 2001). To test the cross validation in this study, we have considered two forms of cross validation process such as loose cross validation and tight cross validation with a different purpose (Hair et al., 2008).

4.4.7.1 Loose Cross Validation

It is the precondition for multigroup analysis that, whether respondents have a good fit with the measurement model across the demographic characteristics or not. For this purpose loose cross validation is a necessary test to look into most of the fit indices of measurement model in terms of demographics. The cross validation for the measurement model was done with sample male (n1= 397) and female (n2= 234) independently for gender. And for the frequency of journey such as less than and equal to five times (n= 456) and more than five times (n=175) separately. The following table 4.27 shown about the results of range of fit indices with these demographic traits.

The 16 variables and five dimension 'FliQual' model were estimated by CFA for all the sample splits. The results indicated that all the baseline comparison of fit indices are above acceptable levels and good fit. Again the coefficient alpha is above 0.70 among items within the individual scales and significant path loadings. In the table 4.27

most of the fit indices value are similar or approximately same for the 'FliQual' measurement model.

Table 4.27

Fit Indices of various demographic profiles

Description	Gender		Frequency of Journey	
	Male	Female	≤ 5 times	>5 items
$\chi 2$	249.324	302.158	267.831	231.673
df	76	76	76	76
$\chi 2$/df	3.369	3.975	3.524	3.048
GFI	0.904	0.911	0.913	0.847
AGFI	0.875	0.868	0.813	0.769
NFI	0.816	0.832	0.786	0.849
TLI	0.793	0.802	0.763	0.782
CFI	0.831	0.823	0.913	0.904
RFI	0.868	0.912	0.837	0.865
RMSEA	0.043	0.039	0.035	0.046

Note. *** Probability level = .001, p < .001

4.4.7.2 Tight Cross Validation

Among many typical tests are available for multigroup analysis, the loose cross validation test is the least rigorous, whereas the tight cross validation test (called as factor loading, interfactor covariance, error variance equivalence test) is the most rigorous and reliable test whereas the configure invariance or factor structure equivalence test is the moderate rigorous (MacCallum and Austin, 2001). And In case of earlier one separately test will be conducted across the sample structure, but in case of tight cross validation test will be conducted simultaneously with the sample. In case of loose cross validation test if CFA model is a good fit, then cross validation is provided. But in case of tight cross validation test, an insignificant $\Delta\chi 2$ suggest that, there is full of tight cross validation exist. Here we have used only one demographic traits like gender to minimize the complexity about the multigroup analysis. For this test, we have used two new fit statistics such that $\Delta\chi 2$ and Δdf, where insignificant $\Delta\chi 2$ suggests that any added constraints have not worsened fit and so full of tight cross validation exist. Again $\Delta\chi 2$ is the difference between total factor loadings and total factors of different groups. The resultant table is shown in the table 4.28 below.

Table 4.28

Measurement Invariance for Males vs. Females

Groups	**χ2**	**df**	**Δχ2**	**Δ df**	**RMSEA**	***p***
Male	249.3	76	-	-	.007	Significant*
Female	302.1	76	-	-	.009	Significant*
TFE	389.0	254	-	-	.032	Significant*
FLE	415.2	293	71	23	.058	Insignificant
FCE	494.5	301	89.6	21	.061	Insignificant
EVE	579.3	307	123.8	38	.039	Insignificant

Note. *at .05 significant level, Δχ2= difference in χ2 values between models; Δdf = difference in number of degrees of freedom between models;

In addition to that we have found the total factor structure equivalence (TFE), factor loading equivalence (FLE), factor covariance equivalence (FCE), error variance equivalence (EVE) etc. Hence, from the above table, Δχ2 is insignificant in terms of FLE, FCE, and EVE so that the model is full of tight cross validation exist and added constraints have not worsened fit.

4.4.8 Conclusion

In this section we have tested measurement theory using confirmatory factor analysis. It means that theory developed in terms of predictive model in the previous chapter has been tested through CFA. All the factors along with their respective variables are examined. Finally, the 'FliQual' confirmatory model (second order measurement model) was developed by incorporating first order factors into a second order construct (APPSQ). This final model with 16 items and five dimensional "FliQual' was tested and cross validated across gender and frequency of journeys using multigroup analysis. By using this CFA model, the structural model would be developed to test hypothesized relationships.

SECTION 3

DEVELOPMENT OF 'FliQual' STRUCTURAL MODEL

In the previous section we have discussed about how to test the measurement theory to measuring concept in proper reliable and valid ways. The theory was tested, how the indicators are related in a construct and each other's based on model fit and construct validity. But it is limited in its ability to test the nature of the relationship between he constructs. So structural equation modelling (SEM) is a sophisticated statistical method to explain the relationships among multiple variables and examine the structure of interrelationships expressed in a series of multiple regression equation. It estimates a series of separate, but interdependent, multiple regression equations simultaneously by specifying he structural model. It runs simultaneously several multiple regression equations, and combine the relationship in the pathway. It comprises stipulations of models, which make causal presumptions (Fabrigar, Porter & Norris, 2010).

In his section the structural model was developed to identify the relationships between the constructs such as air passenger perceived service quality (APPSQ), punctuality (PUNS), passenger loyal (LOYAL), safety and security services (SSSR) and pre-post airport services (PPAS). In the early part of this section, CFA for each latent construct was observed, then all these were combined with developed overall measurement model of latent constructs. Next this measurement model was taken in the structural model to test the causal relationships between the constructs.

4.5. 1 Confirmatory Factor Analysis of Latent Constructs

4.5.1.1 CFA of Passengers' LOYALTY

The construct airline passenger's loyalty was measured with four variables. These items of airline service have a good loyalty program to recognize, as a frequent flyer (LTS45), I would continue my travel by this airline even if the fare increased somewhat in the future (LTS46), Considering the price, I received good value for money (LTS47), and I would like to recommend this airline to others (LTS48) etc.

From the table 4. 29 shows that the average variance extracted (AVE = .68) and composite reliability (CR = 0.84) are satisfactory of the constructs. That means it shows that this construct has convergent validity.

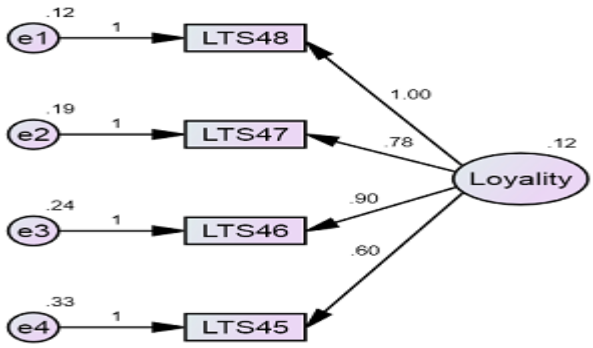

Figure 4.20 CFA model for passengers' LOYALITY

Table 4.29
CFA Results of Passenger's LOYALITY

Variables	Factor Loading	Squared Loading	AVE	CR
LTS47	0.783	0.613		
LTS46	0.897	0.804	0.68	0.84
LTS45	0.600	0.362		
LTS48	1.000	1.000		

Table 4.30
Fit Indices of Passenger's LOYALITY

$\chi 2$	df	GFI	AGFI	NFI	CFI	IFI	TLI	RFI	RMSEA
18.303	5	.985	.926	.936	.941	.942	.824	.807	.011

Note. Probability level = .001, P= .000

From the table 4.30 shows that all the fit indices of this construct are above 0.90 except TLI and RFI, but value crossed the moderate threshold 0.80. And the RMSEA value is .011 which satisfy the condition. Hence this construct passenger LOYAL- model is good fit.

4.5.1.2 CFA of Punctual Services (PUNS)

This three item scale measured the punctuality of airlines in terms of departure, landing and other services. In this scale originally four variables were involved and after review the model and high standardized residuals of the variable necessary messaging to the passenger were discarded from the model. So it reduces to three items scale, such as the airline provided required documents regarding the services which are useful in time (ARS29), the aircraft was arrived in time as per scheduled (ARS36) and last one is the flight departed in time as promised (ARS28). The final model is presented in the figure 4.21 below.

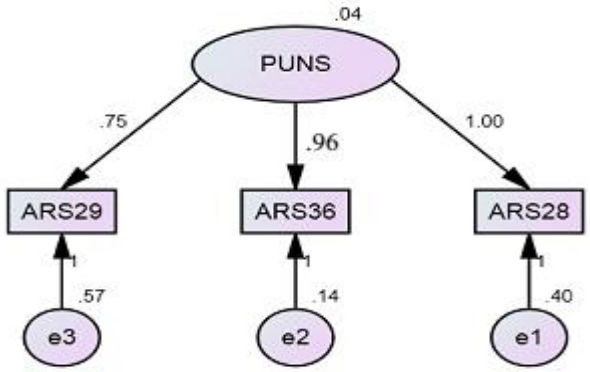

Figure 4.21 CFA model for Punctual Services

In the table 4.31 shown that the present figure has significant factor loadings from 0.75 onwards. It also shows that the average variance extracted and construct reliability values 0.63 and 0.76 respectively.

Table 4.31
CFA results of Punctual Services

Variables	Factor Loading	Squared Loading	AVE	CR
ARS29	0.748	0.559		
ARS36	0.963	0.927	0.63	0.76
ARS28	1.000	1.000		

It indicates that the model has good validation and reliability. Again in table 4.32 explain about various fit indices of the PUNS model and model of the fit indices are above threshold. Again, all the fit indices have crossed the acceptable limit that shown in the following table.

Table 4.32
Fit Indices of Punctual Services

$\chi 2$	df	GFI	AGFI	NFI	CFI	IFI	TLI	RFI	RMSEA
15.436	4	.961	.923	.987	.972	.965	.899	.868	.013

Note. Probability level = .000

4.5.1.3 CFA of Pre-post Airport Services (PPAS)

This scale comprises three items that measured about various services related to before starts of airport services in time of going to board in the aircraft and after deplaning and departing from the airport. This service as similar to post purchase services as well as decision to experience the particular services. This three item scale comprises such as the official portal was user friendly (BK1), portal and as well as counter employees were provided up-dated information to respond the passengers' questions and the last one is carrier wheels were available as and when the passenger required (APS9). The resultant figure for the pre-post services is in the following figure 4.22.

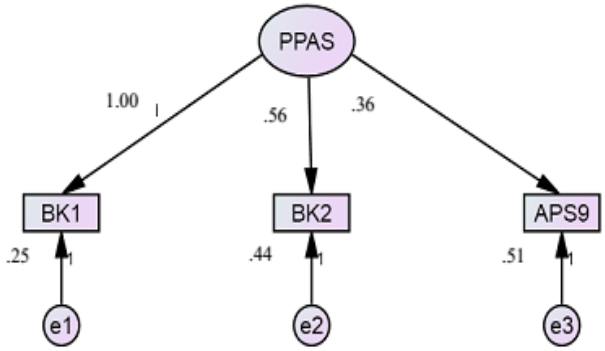

Figure 4.22 CFA model for Pre-post Airport Services

In this model, all the factor loading is significant except the availability of carrier wheels (APS9), but due to its importance for the study we did not delete from the concern model. So results reduce some fit indices and also loading to the factor as well. Here the factor loadings are from .36 onwards and its average variance extracted as well as construct reliability such as 0.49 and .63 respectively. The resultant table for factor loadings and AVE with CR for pre-post airport services is in the table 4.33 and fit indices are in the table 4.34 respectively.

Table 4.33

CFA results of Pre-post services

Variables	Factor Loading	Squared Loading	AVE	CR
BK1	1.000	1.000		
BK2	0.567	0.321	0.49	.63
APS9	0.369	0.135		

Table 4.34

Fit Indices of Pre-post services

χ2	df	GFI	AGFI	NFI	CFI	IFI	TLI	RFI	RMSEA
19.205	5	.989	.977	.974	.983	.948	.796	.768	.054

Note: Probability level = .000, P < .001

In the above table all indices are above the ruled limit except TLI, and RFI. But these two are satisfies the moderate limit. Hence the model in identifiable.

4.5.1.4 CFA of Safety and Security Services (SSSR)

This three item scale measured safety and security services for airline passengers. It originally included more than five items. And after revising two times by considering low factor loading as well as high standardized residuals, two items were discarded and the final model was shown in the following figure 4.23.

This scale is included, three items such as the airport has good announcement system (APS10), airport having good security system (APS5) and last one is airport has good waiting facility (APS7). The following table 4.35 presents the average variance extracted (AVE = 0.58) and construct reliability (CR = 0.71) of the factor. It indicates that the construct safety and security services (SSR) has convergent validity and construct reliability.

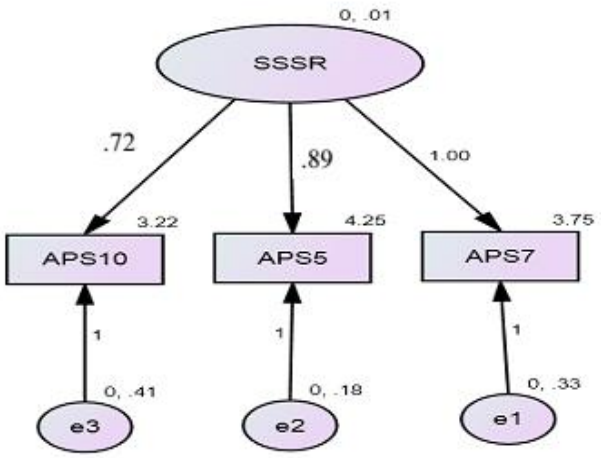

Figure 4.23 CFA model for Safety and security Services

Table 4.35

CFA results of Safety and security Services

Variables	Factor Loading	Squared Loading	AVE	CR
APS10	0.716	0.512		
APS5	0.891	0.793	0.58	0.71
APS7	1.000	1.000		

The following table 4.36 shows that the fit indices of safety and security services and most of the fit indices are the above 0.90 except RFI. And the RMSEA value also just the above threshold such as 0.06 is sufficiently fit.

Table 4.36

CFA results of Safety and security Services

$\chi 2$	df	GFI	AGFI	NFI	CFI	IFI	TLI	RFI	RMSEA
17.331	4	.904	.897	.877	.948	.863	.713	.678	.064

Note. Probability level = .000

4.5.2 Measurement Model of Latent Constructs

The measurement model of all latent construct was developed by comprising the results of the measurement model of each latent construct such as air passengers' perceived service quality (APPSQ), passengers' loyal services (LOYAL), punctuality by airlines and employee to solve passenger problem (PUNS), pre-post airport services (PPAS) and safety and security services by the airline (SSR). We observed both standardized and unstandardized estimation of the AMOS output and results shows that few of the indicators are less loading towards their respective constructs and model looks like over identified.

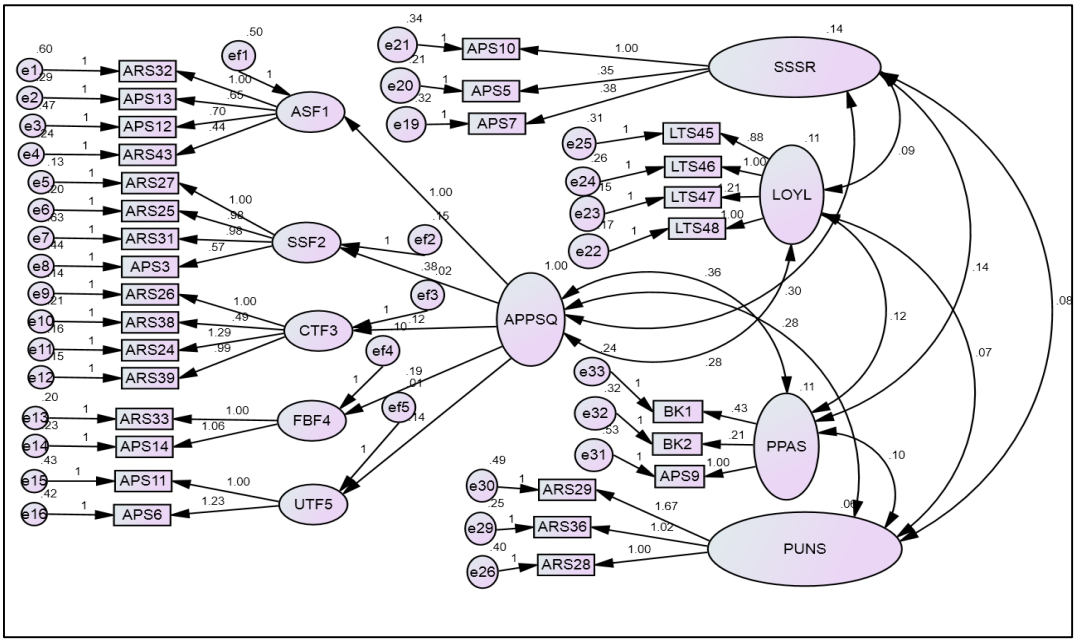

Figure 4.24 Measurement Model for Latent Constructs (Unstandardized Estimation)

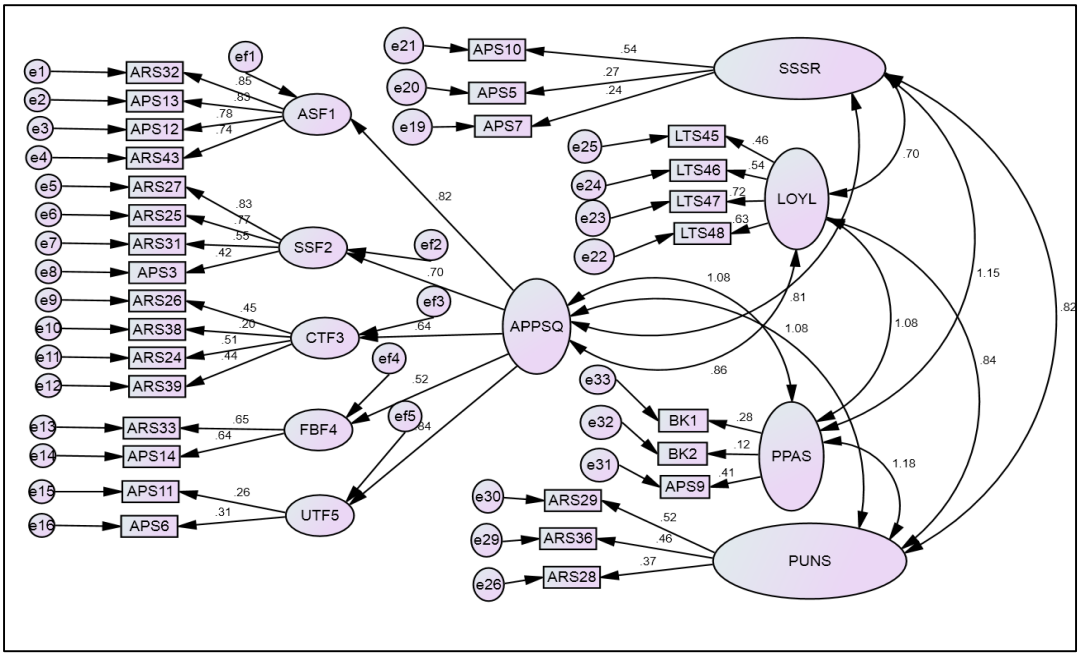

Figure 4.25 Measurement Model for Latent Constructs (Standardized Estimation)

And some cases, high standardized residual, but due to the importance of the indicators about the objective of the present study and under identified model, hence we did not delete these items even though, their non-deletion impacting to overall model identification. The figures 4. 24 & 4.25 show the schematic representation of the final model of all latent constructs in terms of unstandardized and standardized form of estimation.

Table 4.37

Model Fit Summary of Measurement Model of Latent Constructs

χ2	df	χ2/df	GFI	AGFI	NFI	CFI	IFI	TLI	RFI	RMSEA
1668.896	363	4.597	.954	.894	.917	.921	.813	.905	.661	.043

Note. Probability level = .001, p = .000

Table 4.38

Results of Measurement Model of Latent Constructs

Regression Paths			Standardized Weights	P***	AVE	CR
Passenger Perceived Service Quality						
ASF1	<---	APPSQ	0.817	.000		
SSF2	<---	APPSQ	0.702	.000		
CTF3	<---	APPSQ	0.639	.000	.52	.69
FBF4	<---	APPSQ	0.517	.000		
UTF5	<---	APPSQ	0.839	.000		
LTS48	<---	LOYL	0.628	.000		
LTS47	<---	LOYL	0.718	.000	.59	.76
LTS46	<---	LOYL	0.538	.000		
LTS45	<---	LOYL	0.461	.000		
ARS29	<---	PUNS	0.518	.000		
ARS36	<---	PUNS	0.460	.000	.58	.73
ARS28	<---	PUNS	0.371	.000		
APS9	<---	PPAS	0.413	.000		
BK2	<---	PPAS	0.121	.000	.47	.70
BK1	<---	PPAS	0.280	.000		
APS7	<---	SSSR	0.244	.000		
APS10	<---	SSSR	0.539	.000	.46	.72
APS5	<---	SSSR	0.271	.000		

Note. Probability level ***p < .001, AVE= Average variance Extracted; CR=Construct Reliability

Again for the model fit assessment, of this measurement model for all latent constructs explain that here number of exogenous and endogenous variables are 39 and 34 respectively. Again the distinct sample moments are 435 and estimated parameters 72, hence degrees of freedom in the study 363 and due to value of $\chi 2 = 1668.896$, so value of $\chi 2/df$ is 4.37 that is in the acceptable limit. The resultant fit indices of the measurement model show that most of the fit indices are above the threshold and value of RMSEA is less than 0.05, it implies that the theory fits the model. It is shown in the above table 4.37.

4.5.3 Validity and Reliability of the Measurement Model of Latent Constructs

The validity of the measurement model of latent constructs is estimated based upon the convergent validity and nomological validity. In the table we have observed that the model has significant standardized loadings of latent constructs, the average variance extracted (AVE), and construct reliability (CR) on an individual basis. So all the have significant standardized loadings and AVE values ranges from 0.46 to 0.59. Whereas the construct reliability values are also above almost 0.69 for all the concern constructs. Hence it indicates that the constructs have convergent validity. The overall validity of the model is shown in following table 4.39.

Table 4.39
Reliability and Validity of the Measurement model

Reliability and Validity of the Model		
Reliability	Validity	
Composite Reliability	Average Variance Extracted(AVE= .63)	
.74	MSV	ASV
	.57	.43

4.5.4 Multicollinearity Test

The measurement model of latent constructs will be considered to form structural model. That means this measurement model will be converted into the structural model based upon their hypothesized relations discussed in chapter three. The process for this conversion from the measurement model into the structural one, all the latent variables will be changed into either exogenous or endogenous variables, and covariance relationship (double headed arrow) will be replaced into regression relationship (single headed arrow) between the variables. For better structural model, multicollinearity test is prerequisites among the independent variables. So multicollinearity (if any) among variables can be identified by examining the correlation matrix for the independent variables, their tolerance and variance inflation factor (VIF). At first, correlation matrix for five independent variables such as passenger perceived service quality (APPSQ), passenger loyalty (LOYAL), punctuality services (PUNS), pre-post airport services (PPAS) and safety and security services (SSSR) was tested to identify whether it was high correlations (above 0.90 or above) or not to indicated substantial collinearity. In table 4.40 shows that the Pearson correlations among the independent variables are

sufficiently below .90 that ensure lack of collinearity. Hence, from the above table, we conclude that most the collinearity is average and less than 0.90, so they are lack of collinearity. So there is no multi collinearity problem this mode. Again, it is noted that as most collinearity is very less, it is not needed to do further study using tolerance value and VIF for the multicollinearity check (Hair et al. 2008).

Table 4.40
Correlation Matrix of Independent Variables

Variables	APPSQ	LOYL	PUNS	PPAS	SSSR
APPSQ	-				
LOYL	0.855***	-			
PUNS	0.084***	0.839***	-		
PPAS	0.083***	0.079***	0.180***	-	
SSSR	0.810***	0.698***	0.823***	0.150***	-

Note. *** Significant at p < .001

4.5.5 Identification of Competing Structural Model

For the purpose of finding good competing models, we have purpose three identified competing structural models by considering the possible relationship between five constructs such as Passengers' perceived service quality (APPSQ), Loyalty services (LOYAL), Punctuality service by airlines (PUNS), Pre-post Airport services (PPAS), and Safety and Security services (SSSR). The possible competing models can be shown in the figure 4.24 below.

- The first competing models labeled as "Direct path model" (**M1**), which shows the direct relationship between APPSQ and other four constructs like LOYAL, PUNS, PPAS, & SSSR.
- The second competing model named as "Indirect path model" (**M2 & M3**) that represent their indirect relationship of APPSQ on loyalty through PUNS and PPAS, indirect relationship with APPSQ on PPAS through PUNS and SSSR and so on. We will test here the indirect relationship those have already hypothesized.
- In the third model we called as "Research models" (**M4 and M5**) that shows a more practicable sense about the reality in their relationships. Here we can cover almost all the core relationships among the concern constructs. This model comprises all the possible direct and indirect paths from the passenger service quality to the other four constructs.

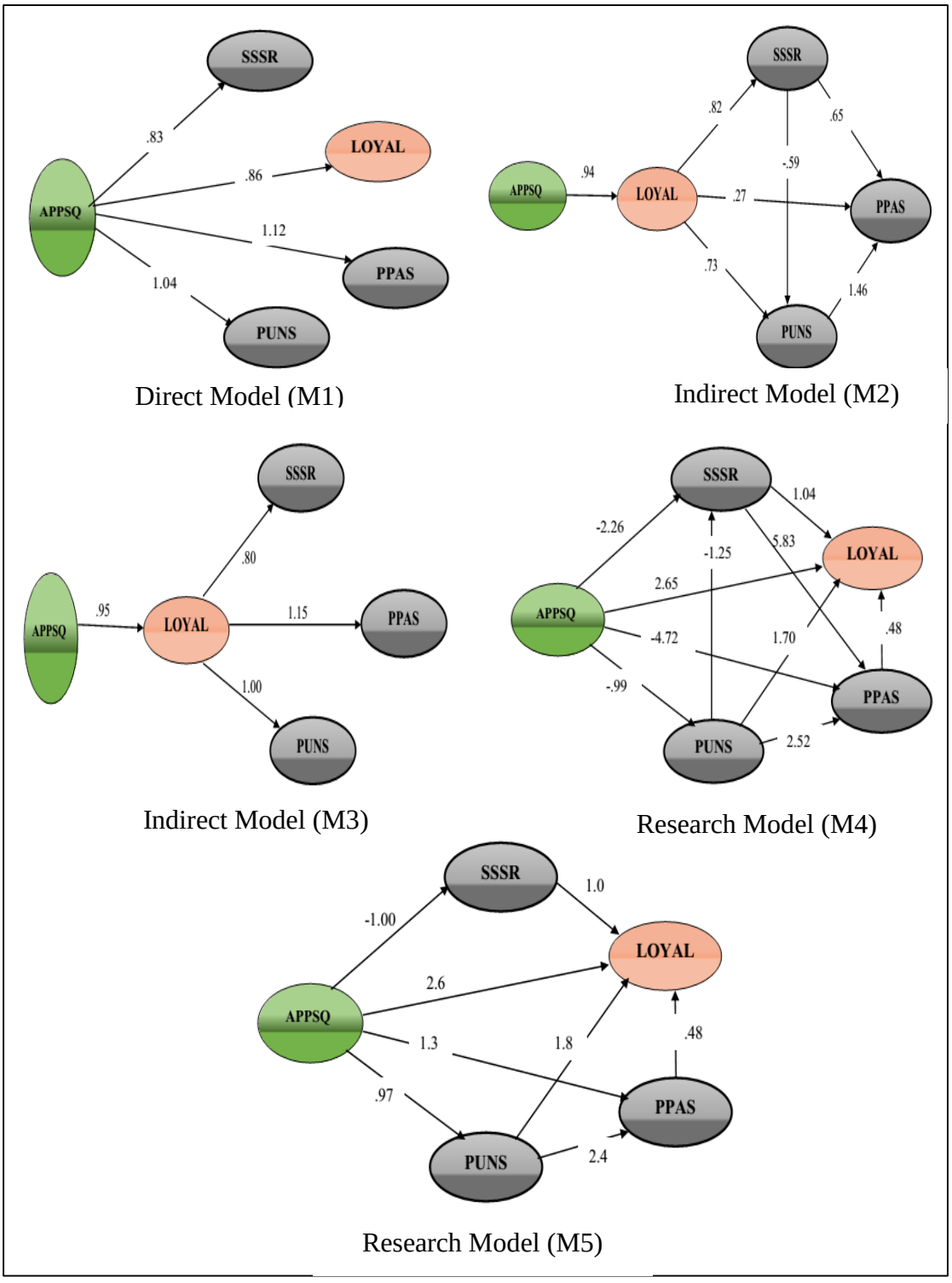

Figure 4.26 Competing Models

All the model are purposed and tentatively, based on earlier theory.
Source of Construct Extraction:
Loyal services: Legeza (2001), Guy *et. al*. (2012*)*, Lai & Chen (2011), Rizan (2010)
Punctuality: Teichert, *et.al*. (2008), Wang et al. (2007)
Safety and Security: Tripp and Drea (2002), Sexton, *et.al. (2000)*
Pre-post airport Services: Hammad, *et. al*. (2009), Tsaur (2001)

These five competing models were identified from the earlier literature which explain different types of causal relationships. The best fit model will be identified by comparing these five purposed models here through their various model fit indices. We assumed here that the proposed research models (M4 & M5) would perform well relative to other two models by showing better fit indices.

4.5.6 Competing Models Review

This is a direct structural model (M1) consists of only direct relationship with passenger perceived service quality to punctuality services, passenger loyalty, pre-post airport services and safety and security services. Here most of the paths are significant loading and have positive relationships. The schematic representation of this model can be shown in the figure 4.25. And the table 4.41 explain about various fit indices, where all the indices are above threshold, RMSEA value is 0.045 and $\chi 2/df$ is 4.55. Hence the model is identifiable and good fit.

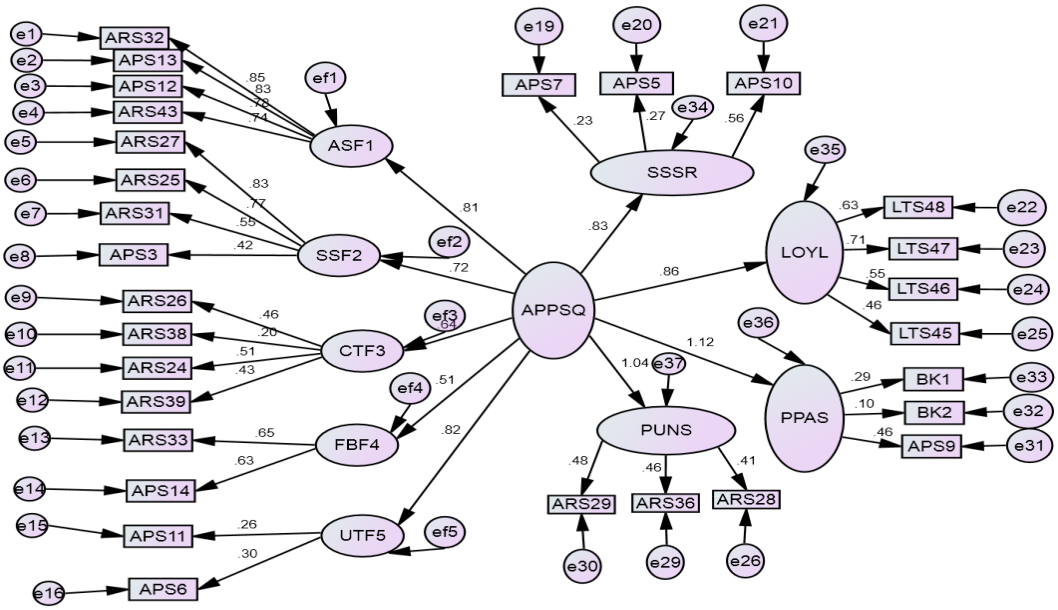

Figure 4.27 Direct Path Model (M1)

In second purposed model named as First indirect model (M2) and second indirect model (M3) based on their relationships between APPSQ and SSSR, PPAS & PUNS through loyalty. In case of first indirect model the relationships between APPSQ and other variables is only through the variables loyalty. While in the second indirect model that means the model (M3) exists the relationship between APPSQ and other variables

through the SSSR, PUNS, Loyal and PPAS each other respectively. Here mediation like structure is exists. This schematic representation can be shown in figure 4. 26. And its statistical fit indices are explained in table 4.41. In this indirect model (M2) all the fit indices are crossed acceptable limit such as GFI (0.834), AGFI (0.802), and its RMSEA value is 0.049. And here all the factor loadings are positive and significant. So this model (M2) is identifiable and moderately fit. Again in case of second indirect model (M3), all the loadings are positive and significant. The schematic representation is in the figure 4.26.

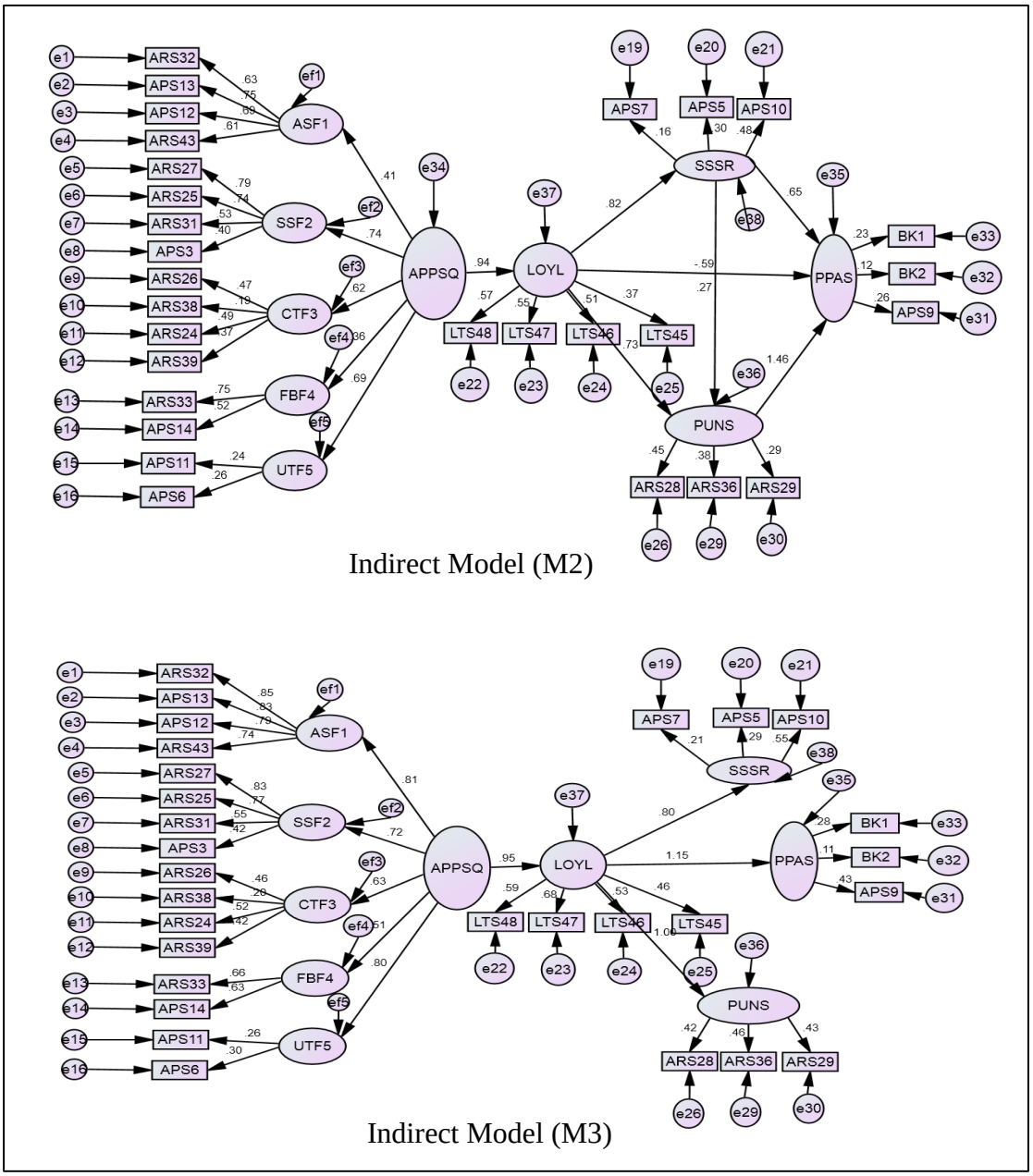

Figure 4.28 Indirect Path Model

And all its fit indices are crossed the moderate threshold such as GFI (0. 828), AGFI (0.828) and value of RMSEA 0.056. Again the value $\chi 2/df$ is 4.62 satisfy the fixed limit 5. In overall the model is good fit. Its fit statistics can be shown in table 4.41 below. So the model is model fit and significance for service quality.

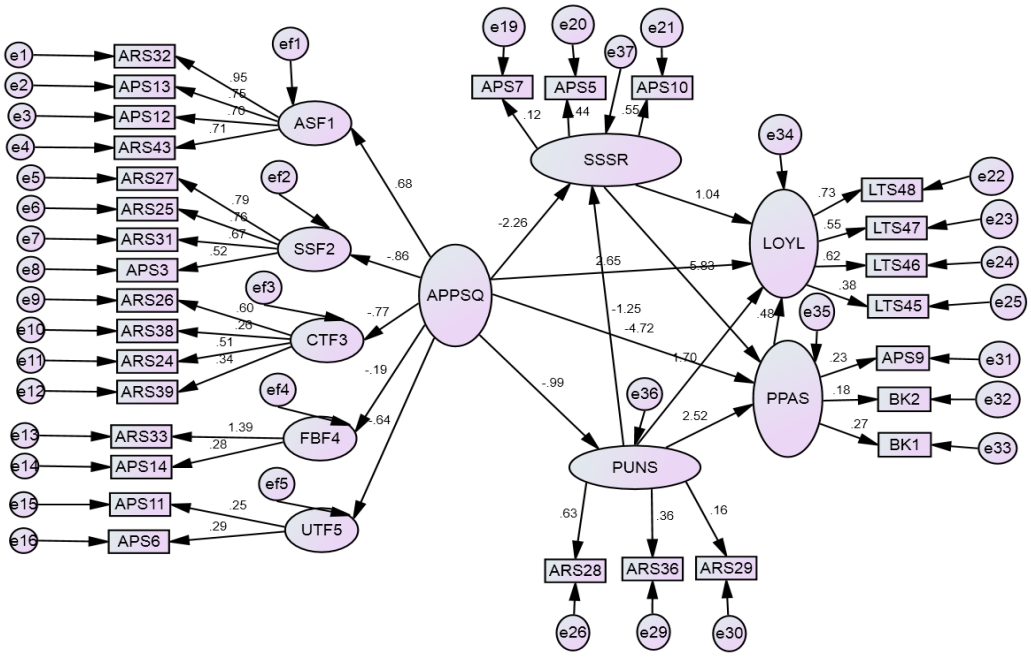

Figure 4.29 First Research Model (M4)

The study proposes two research models (M4 and M5) which is close to final structure that consists of all the possible direct and indirect relationships between the constructs. The important objective of this model is to develop a comprehensive multi- level with the hypothesized relationship model that cover direct and indirect association between the passengers perceived service quality, punctuality, loyalty, pre-post airport services and safety and security concern services. In figure 4.27 shows the schematic presentation of the first research model (M4) and second model (M5) in figure 4. 28. The table 4.41 shows the all the statistical fit indices. In case of first research model (M4) the value of $\chi 2/df$ is 5.20 just above the threshold 5 and GFI (0.914), AGFI (0.880) and the value of RMSEA (0.052). Here, though the model is identified, loadings are significant, but some loadings are negative. Hence the model is moderately fit, identifiable and but not recommend for further study. But in case of the second research model, we proposed not make so complexity in almost all the variables. In this we dropped two more relationships which are insignificant and less chances of impact to

each other. Again the study is considered a direct and indirect relationship with those constructs have theoretical as well as genuinely relations for the better fit of the model.

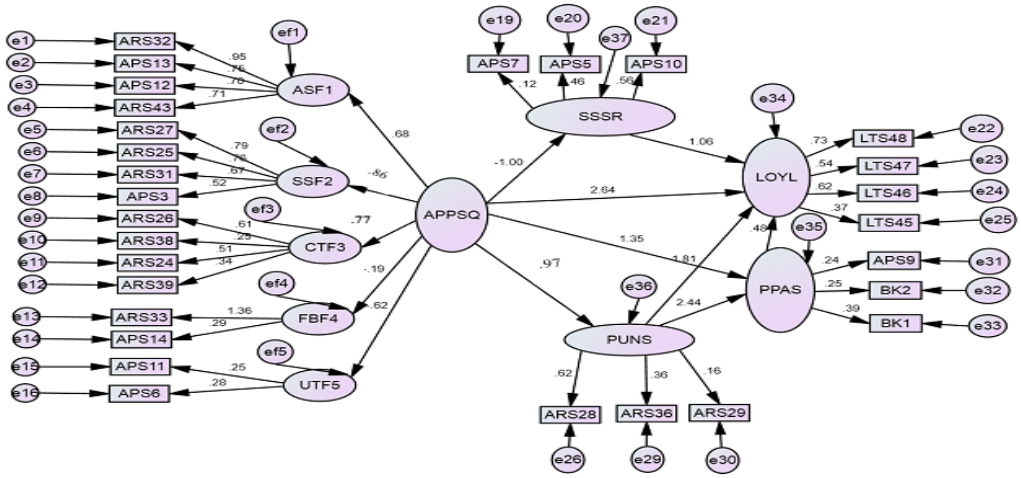

Figure 4.30 Second Research Model (M5)

The revised model shows the good loadings, significant and positive contribution each other through mediating and moderating between and within variables respectively. Here higher loading to overall passenger service quality is from loyal, next pre-post airport service then it is punctuality services and safety and security service. The final model is shown in the figure 4.28 with all significant and positive loadings each other. Again, its fit statistics is figured out that most of the fit indices are above acceptable limit and its $\chi 2$/df value is 4.93 is in below threshold i.e. 5. And other fit indices such as GFI (0.951), AGFI (0.977) and RMSEA (0. 042). Hence the model is having good fit and significant.

4.5.7 Selection of Best Competing Model

Table 4.41 presents the comparative study of all the competing models above. From this table we observed that all the models good model fit indices except the second indirect model (M3), though it has moderate model fit. Again, this table shows that research model has comparatively better model fit indices than other three models. Again to find the best competing model many scholarly articles suggest that it has three ways, such as either through observing only parsimony fit indices (like PGFI, PNFI, and P close) or over a range of fit statistics or through the various changes in fit indices (such as $\Delta\chi 2$, Δ df, ΔCFI and a minimum of RMSEA) (Har et. al., 2008; Saraph, et. al. 1989 & Netemeyer et al., 1996).

Table 4.41
Fit Statistics for 'FliQual' Structural Models

Indices	Model 1	Model 2	Model 3	M4	M5
$\chi 2$	1679.766	1472.857	1708.229	1921.956	1821.401
df	369	365	369	369	369
p	0.000	0.000	0.000	0.000	0.000
GFI	0.928	0.834	0. 828	0. 924	**0. 951**
AGFI	0.997	0.802	0. 797	0. 880	**0. 977**
RMSEA	0.045	0.049	0.056	0.052	**0.042**
NFI	0.851	0.706	0.743	0.748	**0.884**
TLI	0.767	0.730	0.758	0.784	**0.885**
CFI	0.807	0.868	0.698	0.834	**0.908**
RFI	0.806	0.762	0.697	0.698	**0.832**
PGFI	0.702	0.700	0.702	0.787	**0.887**
PNFI	0.601	0.745	0.794	0.839	**0.840**
P close	0.000	0.000	0.000	0.000	0.000

Note. Probability level = .000

In this study, we are using first two methods to choose a best competing model due to the last change in fit indices are obvious. The above table 4.41 is given a detail picture of most of the fit indices, where the second research model (M5) shows the better result in fit indices relative to the other four models. So we can conclude that model is a best competing model one. Again by considering to second method for best competing models, through parsimony fit indices the table 4.56 shows that all the parsimony fit statistics of the second research model are having good fit indices like PGFI (0.887), and PNFI (0.840) etc. Hence we can say that the last model that means the second research model is the best competing models among all the five discussed models. Therefore, to use the last method is not necessary and it may further clarity of the study to choose the competing one.

Table 4.42
Parsimony Fit Statistics

How the model is best among the set of competing models			
Models	PGFI	PNFI	P close
Model(M1)	0.702	0.601	.000
Model(M2)	0.700	0.745	.000
Model(M3)	0.702	0.794	.000
Model(M4)	0.787	0.839	.000
Model(M5)	**0.887**	**0.840**	**.000**

4.5.8 The Research Model (M5)

From the above explanation about the comparative interpretation, the study found that the proposed second research model (M5) is the best competing one before the other models.

Table 4.43
Results for Structural Research Model

Paths			Unstandardized weights	Standardized weights	p
PUNS	<---	APPSQ	.432	.969	***
SSSR	<---	APPSQ	-.103	-1.00	.016
PPAS	<---	APPSQ	.246	1.349	***
PPAS	<---	PUNS	1.000	2.444	--
ASF1	<---	APPSQ	1.000	.681	--
SSF2	<---	APPSQ	-.455	.860	***
CTF3	<---	APPSQ	-.199	.766	***
FBF4	<---	APPSQ	.150	-.191	***
UTF5	<---	APPSQ	-.105	.624	***
LOYL	<---	APPSQ	1.000	2.642	--
LOYL	<---	SSSR	1.000	1.064	--
LOYL	<---	PPAS	1.000	.482	--
LOYL	<---	PUNS	1.535	1.809	***
ARS32	<---	ASF1	1.000	.947	--
APS13	<---	ASF1	.487	.747	***
APS12	<---	ASF1	.518	.698	***
ARS43	<---	ASF1	.358	.706	***
ARS27	<---	SSF2	1.000	.789	--
ARS25	<---	SSF2	1.024	.758	***
ARS31	<---	SSF2	1.254	.670	***
APS3	<---	SSF2	.743	.523	***
ARS26	<---	CTF3	1.000	.607	--
ARS38	<---	CTF3	.457	.254	***
ARS24	<---	CTF3	.923	.505	***
ARS39	<---	CTF3	.547	.335	***
ARS33	<---	FBF4	1.000	1.363	--
APS14	<---	FBF4	.223	.288	.182
APS11	<---	UTF5	1.000	.250	--
APS6	<---	UTF5	1.144	.284	.006
LTS48	<---	LOYL	1.000	.726	--
LTS47	<---	LOYL	.752	.539	***
LTS46	<---	LOYL	.994	.621	***
LTS45	<---	LOYL	.611	.373	***
APS9	<---	PPAS	1.000	.235	--
BK2	<---	PPAS	.778	.245	***
ARS29	<---	PUNS	.280	.161	***
BK1	<---	PPAS	1.107	.389	***
ARS28	<---	PUNS	1.000	.621	--
ARS36	<---	PUNS	.445	.361	***
APS5	<---	SSSR	.559	.456	***
APS10	<---	SSSR	1.000	.562	--
APS7	<---	SSSR	.174	.120	.007

Note. *** Significant at Probability level .001; as the regression weights are fixed at 1

This model comprises all possible direct as well as indirect causal relationships between the constructs. So our framed hypothesis were tested by using this research model (M5). We will discuss about our hypothesis on next section of this chapter. The table 4.43, presents the standardized and unstandardized regression coefficients of paths between the constructs. It is observed that all the estimates are significant at p = .001 level except few paths such as passenger perceived service quality of safety and security services (SSSR), and also with staff services (SSF2). So passenger service quality has an indirect effect on safety and security services (SSF2), and also staff services (SSF2) either through the other variables.

4.5.9 Total Effect of APPSQ, PUNS on Passenger LOYAL

The following table 4.44 shows the total effects (direct and indirect) of various construct such as APPSQ, PUNS and SSSR on passenger loyalty (LOYLITY). In order to the structural model, passenger perceived service quality (APPSQ), and punctuality has both direct and indirect effects on passenger loyalty (LOYL). The total effect is estimated by summing the direct and indirect effects.

Table 4.44
Indirect Hypothesized Relationships

Path	Through	Effects	Estimate	P
APPSQ→LOYL	PUNS	Indirect effect	1.75	.000
	SSSR	Indirect effect	.97	.000
	PPAS	Indirect effect	.64	.000
		Total effect	6.00	.000
PUNS→ LOYL	PPAS	Indirect effect	1.17	.000
		Total effect	2.98	.000
APPSQ→PPAS	PUNS	Indirect effect	2.36	.000
		Total effect	3.71	.000

Note. *** Significant at Probability level .001

In terms of total effects, passenger perceived service quality (6.00) has a larger effect on student loyalty than punctuality (2.98). In case of indirect effect, the total effect of APPSQ on LOYAL, which mediating through PUNS is larger than other constructs such as SSSR and PPAS. Hence the result suggests that higher quality passenger service (6.00) provided by the airlines will make customer more loyal and also maintenance of punctuality (2.98) of will make impact toward the loyalty of the passengers. Again total

service quality (3.71) will also have a positive impact towards the punctuality through (mediating) the pre-post airport services.

4.5.10 Results of Hypothesis Testing

In the present study, the remaining eight hypotheses H6 to H13 are formed from the above structural model. This model comprises all the hypothesized relationships among the latent constructs. First four hypotheses H6- H9 are related to the direct relationship between air passenger perceived service quality and safety & security measure, loyalty program by airlines, pre-post airport services and punctuality. Next two hypotheses refer to the effect of punctuality on loyalty services by the airlines and pre-post airport services. One hypotheses is related to the effect of safety and security measure towards the loyalty. And the last one hypothesis is related to the effect of pre-post airport services to the loyalty of the passengers. We discussed here all hypothesized relations are detail follow.

Hypothesis6 (H6): Passenger service quality has significant impact on loyalty (LOYAL) program offered by airlines.

As shown in the table 4.43, the path between passengers perceived service quality and loyalty program has standardized coefficient 2.64 which is significant at .001 level of significance. .Hence the hypothesis, 'passenger service quality has significant impact of loyalty (LOYAL) program offered' is supported

Hypothesis 7 (H7): Passenger service quality (APPSQ) has a significant impact of safety and security measure (SSSR) taken by authorities

As the result of the structural model are mentioned in table 4.43, this hypothesized path from passenger perceived service quality to the safety and security measures is insignificant at p = .001 and the standardized regression weight is -1.00. Therefore the hypothesis "passenger service quality (APPSQ) has significant impact of safety and security measure (SSSR) taken by the authorities" is not supported.

Hypothesis 8 (H 8): Passenger service quality has significant impact on pre and post airport services (PPAS).

As per the result shown in the table 4.43, the path between passengers perceived service quality (APPSQ) and pre-post airport services has standardized regression weight is 1.34 and it is significant at p < .001.Hence passenger service quality has significant impact on pre-post airport services is supported.

Hypothesis 9 (H 9): Air passenger service quality has significant impact of punctuality (PUNS)

The resultant figure which is shown in the table 4.43, the hypothesized path between passenger service quality and punctuality has standardized regression weight is 0.969 with $p < .001$. Therefore, the hypothesis Passenger service quality has significant impact of punctuality (PUNS) is strongly supported.

Hypothesis 10 (H 10): ***Punctuality has significant impact on loyal services.***

In the table 4.43, the regression path between punctuality and loyal services is significant at $p < .001$ and its standardized coefficient 1.80. Hence the hypothesis Punctuality has significant impact on loyal services is supported.

Hypothesis 11 (H 11): ***Punctuality has significant impact on pre and post airport services***

In the table 4.43, given about the hypothesized path between punctuality and pre-post airport services have standardized regression coefficient 2.44 at $p = .001$ level. Hence the hypothesis 'punctuality has significant impact on pre and post airport services' is supported.

Hypothesis 12 (H 12): Safety measure has significant impact on loyal of passenger

The table 4.43 given about the hypothesized path between safety and security measure has standardized regression weight 1.06 at $p < .001$ significance level. Therefore the hypothesis safety measure has significant impact on loyal of passengers is supported.

Hypothesis 13(H 13): Pre and post airport service s has significant impact on the loyalty of passengers

In this hypothesis, we will find the direct effect of pre-post airport services on passenger's loyalty for the airline. In the table 4.43 shows that the regression path from pre-post airport services to passenger loyalty is significant ($p < .001$) with a standardized regression weight of 0.48. Therefore the hypothesis that pre-post airport services has significant impact on passenger loyalty is supported.

Hypothesis 14 (H 14): Air passengers' perceived service quality (APPSQ) has a significant indirect impact on loyalty (LOYL) through punctuality (PUNS).

Here the result of structural model shown in table 4.44, the indirect path from APPSQ to LOYL through PUNS is significant at p < .001 with standardized regression weight of 1.75. Therefore the hypothesis passengers' service quality has indirect impact on loyalty through punctuality is supported.

Hypothesis 15(H 15): Punctuality (PUNS) has indirect effect on loyalty (LOYL) through pre-post airport services (PPAS).

In the table 4.44 explain that the indirect path from punctuality to loyalty through the pre-post airport services (PPAS) is significant at p < .001 with standardized coefficient of 1.17. Hence the hypothesis, punctuality (PUNS) has an indirect effect on loyalty (LOYL) through pre-post airport services (PPAS) are supported.

Table 4.45

Results of Hypotheses Testing

Hypothesis	Relationship	Standardized Path Estimate	Significance (P Value)	Testing of Hypotheses
H6	APPSQ- LOYAL	2.64	.000	Supported
H7	SSSR-APPSQ	-1.00	.016	**Not Supported**
H8	PPAS-APPSQ	1.34	.000	Supported
H9	PUNS-APPSQ	0.96	.000	Supported
H10	PUNS-LOYL	1.80	.000	Supported
H11	PUNS-PPAS	2.44	.000	Supported
H12	SSSR-LOYL	1.06	.000	Supported
H13	PPAS-LOYL	0.48	.000	Supported
H14	APPSQ→PUNS→LOYL	1.75	.000	Supported
H15	PUNS →PPAS→LOYL	1.17	.000	Supported

Note. ***P < .001

4.5.11 Conclusion

In this section, the study is evaluated 'FliQual' structural model. For this, the individual measurement model for each latent construct was developed in early part. By considering this model, the study developed overall measurement models comprising all the five constructs such as passenger service quality, punctuality, loyality, security measure and pre-post airport services with proper validity and repeatability. Again in the process, five competing models, which involves different forms of relations among the constructs were identified from the previous literature. From these five competing models the study is identified the best fit model by comparing them using model fit statistics (sufficient condition) and particular to parsimony fit indices (necessary condition). The second research model (M5) which implied better fit was used to test the proposed hypothesis (H6-H15). All the hypothesis were supported except the direct effect of safety and security service to overall service quality. Hence passengers' perceived service quality has direct effect of punctuality, pre-post airport services and also it has direct effect on passengers 'loyalty. In the next section we will discuss about the evaluation of "FliQual" using fuzzy approach.

SECTION 4

SCALE COFIRMATION WITH FUZZY APPROACH

In the previous section of the chapter, we have discussed about structural evaluation of 'FliQual'. For this, the study has examined thoroughly its structural theory through overall measurement model to best competing research model. In this section the study is evaluated to 'FliQual' using fuzzy approach. In the process, the study used to all the extracted factors from EFA in the first section of the second category. The considered factors will be fuzzified by using triangular fuzzy numbers through the fuzzified scale. By taking all the fuzzified responses the study initiated to use the fuzzy Delphi method to evaluate "FliQual' and ranked all the factors with their importance from the passengers' point of view. After running a few iterations of this, finally it defuzzified the fuzzy numbers to convert and report on crispy form. In addition to this, we converted all the factors into the fuzzy triangular number.

4.6.1 Introduction

The study is based upon simple fuzzy approach and its application to find out level of service quality in air transportations in view of passengers' perception. In precisely the basic concept of fuzzy set is that generalization of the classical or crisp set. Fuzzy set theory is a composed of a systematized body of mathematical tools, which are suitable to handle incomplete information, unharness of objects in any situations, the gradualness of preference profiles in a simple way (Dubois and Prade, 2000). Membership functions which enable the viewer to a class that extend to categories, where there is no clear-cut boundaries and met with linguistic information.

According to Ganesh (2011), it is an extension of the concept of a classical set. In a classical set, a universal set U is defined by a characteristic function from *U* to {0, 1}, whereas a fuzzy set on a domain *U is* defined by its membership function from *U* to [0, 1]. A fuzzy set defined by a function that maps objects in a domain of concern to their membership value in the set. This function is called as the *membership function* (Yen and Langari, 2011). The membership function of a fuzzy set A is denoted as $\mu_{A,}$ and membership value of *x* in A is denoted as $\mu_A(x)$. A fuzzy set A is defined by an ordered pairs of binary relation,

$$A=\{(x, \mu_A(x)) \mid x \in A, \mu_A(x) \in [0,1]\} \quad (1)$$

4.6.2 Fuzzy Algebraic Operation

The basic arithmetic operations on fuzzy numbers have been proposed in previous literatures. This can be discussed below. Assumed P and Q are two triangular fuzzy numbers. Then the fuzzy arithmetic operations are follows:

I) the addition of fuzzy number:

$$P \oplus Q = (l_1+l_2, m_1+m_2, u_1+u_2) \quad (2)$$

Where, $l_1, l_2, m_1, m_2, u_1, u_2$ are real numbers.

II) The subtraction operation on P and Q

$$P - Q = (l_1-l_2, m_1-m_2, u_1-u_2) \quad (3)$$

III) The division operation on P and any real number x

$$P/x = (l/x, m/r, u/r) \quad (4)$$

IV) Multiplication of triangular fuzzy number Θ

$$P \Theta Q = (l_1 \Theta l_2, m_1 \Theta m_2, u_1 \Theta u_2) \quad (5)$$

V) Multiplication of a triangular number by a real number is also a fuzzy triangular number

$$P \Theta r = r (l \Theta r, m \Theta r, u \Theta r) = (rl, rm, ru) \quad (6)$$

VI) Fuzzy averages

$$AV_{1j} = (1/n) \Theta (P_{1j} \oplus P_{2j} \oplus P_{3j} \dots P_{nj}) \quad (7)$$

Where, n = no of respondent

j = for attribute or item or variable

$$= \frac{(l_{ij}, m_{1j}, u_{1j}) \oplus (l_{2j}, m_{2j}, u_{2j}) \oplus (l_{3j}, m_{3j}, u_{3j}) \oplus \dots\dots \oplus (l_{nj}, m_{nj}, u_{nj})}{n}$$

$$= \frac{(\sum_{i=1}^{n} l_{ij}, \sum_{i=1}^{n} m_{ij}, \sum_{i=1}^{n} u_{ij})}{n} \quad (8)$$

So fuzzy average triangular can be written as (Buckley, 1985)

$$AV_{ij} = (1/n \sum_{i=1}^{n} l_{ij}, \ 1/n \sum_{i=1}^{n} m_{ij}, 1/n \sum_{i=1}^{n} u_{ij}) = (lA_{ij}, mA_{ij}, uA_{ij}) \quad (9)$$

4.6.3 Fuzzy Delphi Process

The fuzzy Delphi method was introduced by Kaufman and Gupta (1988). It comprises the following steps (Bojadziev and Bojadziev, 1995). It is a typical multi- experts' estimation procedure for combining views and opinions.

***Step* 1**: Experts E_i, i= 1…n, are asked to provide the possible realization variables of a certain services of the business: named as the least the level of services 'l', the most

level of services 'm', and the expected or highest level of service 'u'. The data given by the experts E_i are presented in the form of triangular numbers

$$P_i = (l_i, m_i, u_i),\ i = 1 \ldots n \quad (10)$$

***Step* 2**: First, the average (mean) $P_{ave} = (lA, mA, uA)$ of all P_i is computed.

Then for each expert E_i is the *deviation* between P_{ave} and P_i is computed. It is a triangular number defined by

$$P_{ave} - P_i = (lA - l_i,\ mA - m_i,\ uA - u_i)$$

$$= (1/n \sum_{i=1}^{n} l_{ij} - l_i,\ 1/n \sum_{i=1}^{n} m_{ij} - m_i,\ 1/n \sum_{i=1}^{n} u_{ij} - u_i) \quad (11)$$

The deviation $P_{ave} - P_i$ is sent back to the expect Ei for reexamination.

Step 3: Each expert E_i presents a new triangular number

$$Q_i = (s_i, t_i, r_i) \quad \text{where, } i = 1, \ldots., n. \quad (12)$$

This process starts with step-2 and repeated. The triangular average Q_{ave} is calculated according to the above formula with the difference that now l_i, m_i, u_i are substituted correspondingly by s_i, t_i, r_i. If necessary, new triangular numbers $R_i = (x_i, y_i, z_i)$ are generated and their average R_{ave} is calculated. The process could be repeated again and again until two successive means P_{ave}, Q_{ave} and R_{ave} … become reasonably close.

Step 4: At a later time the forecasting may be reexamined by the same process if there is important information available due to new findings.

4.6.4 Steps Followed in the Fuzzy Process

The study has established following steps to find, the importance of different services offered by the airlines. These are followed.

Step 1: Identifying the different services offered by the airlines from earlier literature available. Collected items were validated from the experts of the discipline.

Step 2: Principal component analysis was used to generate different dimensions' of service quality. Discarded the variables, those are less factor loading and shares cross loaded with other items simultaneously to factors.

Step 3: Fuzzifying the remaining variables those are high factor loading toward the respective factors, once only included in a single factor.

Step 4: Defuzzifying them with COA method/ MOM, to get the importance of variables, both factor as well as item wise.

Step 5: To confirm the relative importance of services each other either factor wise or item wise can be calculated by using the Fuzzy Delphi techniques. But here the study to confirm this might be out of purview.

4.6.5 Expert Consultations

The evaluators were asked to give their opinions and each linguistic variable can be indicated by a triangular fuzzy number within the scale range 0 to 1. So the evaluators can subjectively assume their personal perception range with linguistic variable to each item. In order to establish the membership function for each linguistic expression term, the researcher asked them to specify the range from 0 to 1.Then these scores were later formed in triangular form. By using above operation (2) to (12), the study has scaled the linguistic expression of its questionnaire, in triangular format as below (Chou et al, 2011) in the table 4.46.

Table 4.46
Conversion of Likert's Point to Fuzzy Form

Linguistic variables	Fuzzy scale in triangular form
Highly satisfied	(0.8, 0.9, 1.0)
Satisfied	(0.6, 0.8, 0.9)
Neither satisfied nor dissatisfied	(0.4, 0.6, 0.8)
Dissatisfied	(0.2, 0.4, 0.6)
Highly dissatisfied	(0.0, 0.2, 0.4)

The description of the above table is similar as like "strongly agree" is same to "highly satisfied" and so on. By considering the above table, the respondents' crispy valuation is converted to triangular form and then the study found the average value of the each attribute by using (2) to (12). The relative importance of the service quality items is obtained by applying the fuzzy approach after converting each item to the fuzzy triangular number. The weights or importance of each of the variables are; announcement system (0.76), providing up to -date and accurate information (0.74), informing to passenger about when the exact service to provide (0.71), dissent appearance of the airline employees (0.68), enough space for passenger queue (0.65), make you confidence about safety, friendliness of staff towards the passenger and offering comfortable seats are having same importance to the passengers' (0.64), easy for passengers to contact the staff about their problem and availability of quality eatables inside the aircraft as well as airport with weight (0.63), first ten result service quality of the airlines.

Fuzzy approach is a sophisticated and high reliable for qualitative study with vague and imprecise information. Now we studied, on the basis of dimension wise in the following table 4.47.

Table 4.47

Triangular Fuzzy Number and Rank of Factors

Factor	Fuzzy number	Defuzzified	Rank
CTF3	(0.34,0.54,0.73)	0.54	3rd
FBF4	(0.36,0.58,0.75)	0.56	2nd
UTF5	(0.30,0.51,0.71)	0.50	5th
ASF1	(0.53,0.73,0.90)	0.72	1st
SSF2	(0.32,0.52 0.72)	0.52	4th

From the above table shows, courteous that means good behavior of airport staff, flight crews soothes the unease of air travel and make the trip pleasant and interesting (Tsaur, 2002). Here availability and easy to access various services is the primary construct (72%) for the economy class passengers'. The above design also reflects how food and beverages (FBF4) with 56%, in terms of departure as well as the arrival plays an important role for passenger to choose the particular airline. In next employee courteousness (54%) of services influences to decide for the specific flight journey.

Now we are using fuzzy Delphi technique to confirm the factors from the respondents. Before asking to respondents, to give their opinion for above service quality, the researcher used to clarify of intention, about factors and combining variables, and objectives of this study. The study has taken seven experts (such as three academicians, two employees and two scholars), concerning their expertise and interests, to evaluate service quality of the airline. The respondents were asked, to give their opinion in triangular format directly from the range 0 to 1, in the form of (L_i, M_i , U_i), i = 1… 7 and the study assumed $L_i < M_i < U_i$,

Where, L_i = is the least level of service quality should be available

M_i = most possible/ perceived services

U_i = expected services. The results are shown in the following table: 5,

Table 4.48
First Responses of Experts

Respondent (R_i)	L_i	M_i	U_i
R1	0.51	0.72	0.98
R2	0.55	0.81	0.95
R3	0.65	0.85	0.99
R4	0.63	0.80	0.95
R5	0.55	0.75	0.95
R6	0.68	0.71	0.98
R7	0.52	0.82	0.99

Now we can find the fuzzy average through (9), of the above seven respondents R1 to R7 which gives,

R_{ave} = (0.58, 0.78, 0.97)

The deviations (11) can be obtained through the difference between R_{ave} and R_i is given in the table 4.48 above. From this table it shows the divergence of each expert's opinion from the average. In short, the experts R2 and R5 are close towards the average, while others are not.

Table 4.49
Deviation in First Responses

R_i	R_{ave} - L_i	R_{ave} - M_i	R_{ave} - U_i
R1	0.07	0.06	-0.01
R2	0.03	-0.03	0.02
R3	-0.07	-0.07	-0.02
R4	-0.05	-0.02	0.02
R5	0.03	0.03	0.02
R6	-0.1	0.07	-0.01
R7	0.06	-0.04	-0.02

Note. R_i = Respondents, R_{ave} = Average of responses L_i = Lower value M_i = Middle value U_i = Upper value

As the word 'close' is a fuzzy word, a detailed study is required for clarity. It can be based on the concept of distance d_{ij} between two triangular numbers R_i and R_j .

Now here if the authorities are not satisfied with the average of service quality level (0.58, 0.78, 0.97) to ascertain, then the deviation in table: 4.49, will be given to each seven expert (the respondents) R_i for reconsideration and to give again their responses. The respondents are suggested new triangular number S_i on request that shown in the following table 4.50.

Table 4.50
Second Responses of Experts

Respondent (S_i)	L_i	M_i	U_i
S1	0.58	0.88	0.90
S2	0.61	0.89	0.93
S3	0.67	0.89	0.94
S4	0.65	0.83	0.97
S5	0.58	0.78	0.98
S6	0.71	0.83	0.99
S7	0.65	0.85	0.99

Again, we can find the fuzzy average through (9), of the above seven respondents S1 to S7 of table: 4.64, which gives,

S_{ave} = (0.63, 0.85, 0.95)

Again deviations can be obtained between S_{ave} and S_i using (11) in the above formulae is given in the table 4.65. Here the authorities may satisfy as R_{ave} and $S_{ave,}$ are very close, or approaching too close. After that fuzzy Delphi process stopped and accepts the triangular number S_{ave} as combined conclusion of experts' or specific respondents' opinions.

Table 4.51
Deviation in Second Responses

Respondent (S_i)	$S_{ave} - L_i$	$S_{ave} - M_i$	$S_{ave} - U_i$
S1	0.05	-0.03	0.05
S2	0.02	-0.04	0.02
S3	-0.04	-0.04	0.01
S4	-0.02	0.02	-0.02
S5	0.05	0.07	-0.03
S6	-0.08	0.02	-0.04
S7	-0.02	-0.88	-0.04

So here the result is either we accept that service quality level will be in the interval [0.6, 0.9], as the supporting interval of the triangular number S_{ave} which is mostly accepted by the passengers. We obtained the most acceptable level of service quality using defuzzification method (discussed in chapter- 3) is 0.81. Closeness between the two triangular fuzzy average numbers can be shown in the following figures 4. 31 and 4.32 details.

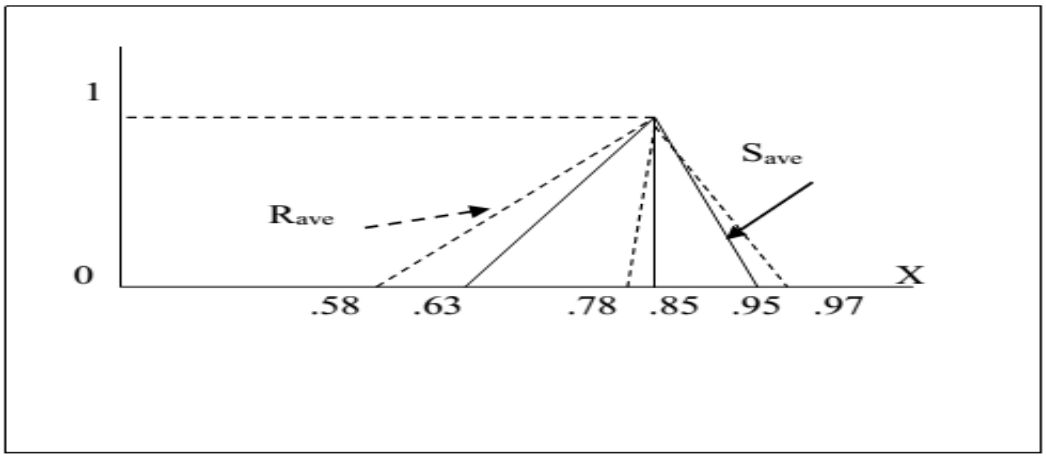

Figure 4.31 Responses Triangular Fuzzy Average

Here the dots line represents for first responses triangular fuzzy average (**R_{ave}**) plot, whereas bold line represents the second time respondents responses triangular fuzzy average plot. In the next figure 4.25 shows that the graphical representation of the above two responses.

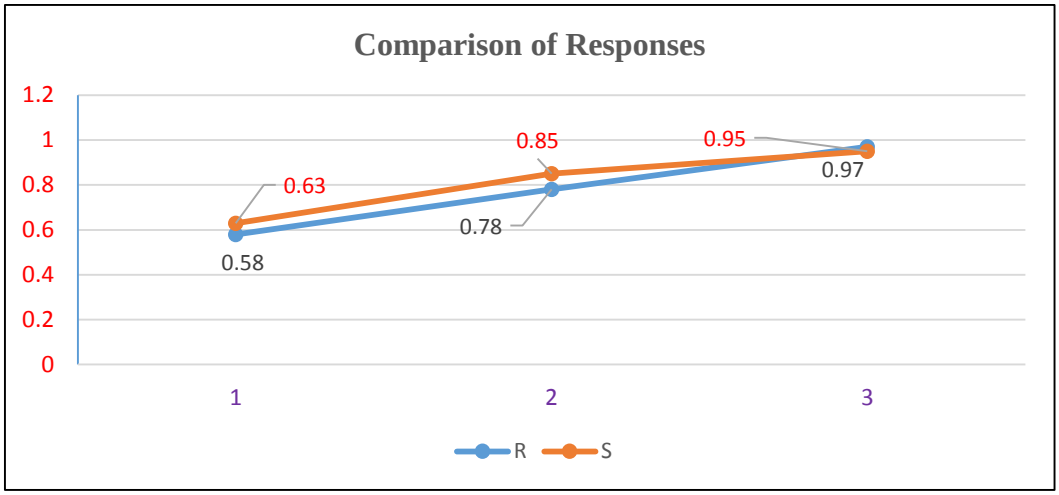

Figure 4.32 Closeness between Two Responses

4.6.6 Membership Functions

After confirming service level of all the factors using the fuzzy Delphi technique, the study considered these fuzzy interval levels to generate, its membership function of each one. These membership function was generated by using given formulae of Triangular Fuzzy Number (T.F.N.) and above algebraic operations (2 to 9) is shown in the following explanation.

Fuzzy Membership Functions of Different Factors

Available & accessible services (ASF1)

$$\mu_1(x) \begin{cases} 0 & \forall\ x < .5 \\ (x-.5)/.2 & \forall\ .5 \le x \le .7 \\ (.9-x)/.2 & \forall\ .7 \le x \le .9 \\ 1 & \forall\ x \ge .9 \end{cases}$$

Staff services (SSF2)

$$\mu_2(x) = \begin{cases} 0 & \forall\ x < .3 \\ (x-.3)/.2 & \forall\ .3 \le x \le .5 \\ (.7-x)/.2 & \forall\ .5 \le x \le .7 \\ 1 & \forall\ x \ge .7 \end{cases}$$

Employee Courteousness (CTF3)

$$\mu_3(x) = \begin{cases} 0 & \forall\ x < .3 \\ (x-.3)/.2 & \forall\ .3 \le x \le .5 \\ (.7-x)/.2 & \forall\ .5 \le x \le .7 \\ 1 & \forall\ x \ge .7 \end{cases}$$

Food & Beverages (FBF4)

$$\mu_4(x) \begin{cases} 0 & \forall\ x < .3 \\ (x-.4)/.4 & \forall\ .4 \le x \le .6 \\ (.8-x)/.2 & \forall\ .6 \le x \le .8 \\ 1 & \forall\ x \ge .8 \end{cases}$$

Updated Technical Services (UTF5)

$$\mu_5(x) = \begin{cases} 0 & \forall\ x < .3 \\ (x-.3)/.2 & \forall\ .3 \le x \le .5 \\ (.7-x)/.2 & \forall\ .5 \le x \le .7 \\ 1 & \forall\ x \ge .7 \end{cases}$$

Hence, from the above membership function, we can find to the every membership grade of the concern service interval. So that we can find the exact service level of every variable to individual airlines. Form the weights obtained, using the fuzzy Delphi method, it is observed that the attributes like ASF1, FBF4 are the most important attributes followed by CTF3 and SSF2 etc.

4.6.7 Conclusion

In this section the study evaluates various dimensions of the 'FliQual' using fuzzy approach. After extracting different factors from EFA, the study fuzzify all the variables then its concern dimensions. Fuzzification of respondents' responses was done in the form of triangular fuzzy number by using various fuzzy algebraic operations and triangular formulations. From the results of this process, the study obtained fuzzy dimensions, then it facilitated to use fuzzy Delphi method to confirm and ranked all the concerned constructs. In the ranked factors, the study explores some important findings such as Indian passenger are primarily concerned with availability and easy to access these various services with more reliable and quality concerned, followed by food and beverage services. These services make airlines distinct from other competitors. And also the study ensured, the same results were found by Chen et al., 2005. After this, the current study found that the acceptable level of overall service quality is 0.81 after defuzzification of fuzzified results and the service interval was [0.6, 0.9] in specific to Indian passenger. Furthermore, the study generates membership function of the core dimensions to obtain all the membership grade in fuzzy service quality functions. In the next chapter, the study will discuss about findings, conclusions, suggestions and limitations the study.

CHAPTER V

SUMMARY AND CONCLUSION

CHAPTER V
SUMMARY AND CONCLUSION

5.1 Introduction

The aviation Industry, generating 70 million employment across the world, and therefore playing a substantial role in the socioeconomic development in terms of regional and national integration, stimulates the investigator to initiate a study about the airline services. In India, where air transportation growth is twice more than the GDP growth and its dramatic increase in air traffic and cargo, the lack of study in this area has pushed the researcher to make a comprehensive study on air passenger service quality.

Frequent price war, huge loss of public flier-Air India, financial crash and withdrawing from services like Kingfisher airlines, extreme pressure mounted on Spice Jet. In consequence, the emergence of no-frill services, low cost carrier, increased aviation turbine fuel and parking fees posed as major challenge to the aviation sector. Furthermore, financial crunch, lack of infrastructure, public protest against expansion and undue political pressures, have boosted for the study. Knocked by the new entrants, prevailed sophisticated road and train services, passengers' augmented demand for valued service are the emerging challenges for the airlines.

The scope of the study has to identify various service attributes and its concern dimensions, makes easy to evaluate the air passengers' service level. Based on a range of literature reviews, focus group discussions and expert's opinion, and peers' suggestions, an integrated theoretical framework was developed and empirically examined across few demographic characteristics. Further, aset of hypothesized relationships were developed and tested with statistical significance.

As for the structure of the study, introduction of the research was emphasized in the first chapter, whereas in the second chapter, the study reviewed earlier contribution for the same work. Thus, this revision has helped to establish the research framework. The research methodology and data collection method were explained in chapter-3. In addition to that, chapter 4 provided in-depth qualitative and quantitative analysis. The current chapter presents a critical discussion of the results and conclusion drawn from the whole research process. Later it summarizes the research contribution, implications

along with the scope for the future research. The importance of the study was to identify various items of service quality and its constructs that are requisites for the airlines.

In the current study, the researcher applied positivist methodological approach where the research instrument such as the questionnaire was used as medium to obtain quantitative data set to test the various hypothesized relationships. For this purpose, data set was obtained from various air passengers' from three airports of three different cities, such as Hyderabad (Telangana State), Vishakhapatnam (Andhra Pradesh) and Bhubaneswar (Odisha) of India. Apart from that, for data sufficiency and minimizing non-sampling error, data were also collected from a few business establishments and leading institutions of the concerned cities after confirming their frequent flying. Totally 1137 valid subjects were acknowledged in this study after adopting different rigorous data cleaning procedures. Different statistically dependent, independent and both dependent and independent such as multiple regression, EFA &CFA and SEM techniques through various statistical packages like SPSS 20, and AMOS respectively were used to test the hypothesized relationships. In this chapter first objective wise research findings, theoretical contribution of the thesis in terms of gap and then practical and managerial implications of the study were discussed. This was followed by a description of the methodological and theoretical pitfalls of the research were looked at. At last some suggestions and future research platform are provided.

As it was discussed earlier, the primary objectives of the focus group discussions were to identify the various variables for air passenger service quality and here also that was implemented for the research tool preparation, therefore, a few participants had raised about the issues of upper class passengers. Considering all these, the study finalized some common services which are concerned to both business class as well as economy class passengers such as good toilet facilities, employees' behavior were incorporated to the study. Apparently, the current study is based upon the economy class, hence few issues like full course refreshment, flat TV screen, luxurious sleeping, seating facilities, and more leg space variables were discarded. After discarding the above variables all the retained findings were included in the instrument.

5.2 Research Findings

This part of the chapter reflects on the various objectives extracted from the research questions, which are discussed in the third chapter. The section explores the extent through which the objectives are achieved for the study to realize the particular outcome of each objective in the preceding sections.

Objective 1*:* To categorize air passengers' service quality dimensions and its attributes to construct "FliQual" instrument for measuring airline passengers' perceived service quality.

For this objective, the study was conducted through both qualitative quantitative approaches. It was incepted from reviewing the extensive literature, contextual and conceptual peer reviewed, in-depth interview with experts, focus group consultations. Moreover, a pilot testing was conducted to ascertain different variables of passenger service quality. It was followed by refining the identified attributes through the various data cleaning processes and further consultations with experts produced original 64 items related to air passenger service quality. Again, after administering pre-testing, retesting and further expert consultations the study finalized 41 items. Again, this resulted in the form of conceptualized, construct and develop of 'FliQual' tool. This instrument is enclosed in the Appendix of the thesis.

Objective 2: To develop "FliQual", a predictive model by identifying factors which measure air passengers' perceived service quality in Indian airlines and identifies individual service quality attributes which are significant contributions to their respective service quality dimension.

For this objective, a detailed explanation is presented in the fourth chapter of this thesis. We initiated, as large scale data collection across the three airports in three cities, which covered more than 5 percent of passengers' movement using the final questionnaire. In total, data collected as n = 1137 was split into two sample groups such as n1 (506) and n2 (631) based on their geographical accomplishment. Subsequently, the study conducted exploratory factor analysis (EFA) with the first group of sample to identify the critical factors, which measures passengers 'perceived service quality in Indian aviation industry. Factor analysis is a multivariate independent technique, which determine the underlying factors comprises a set of correlated items (Hair et al. 2003; Nannually & Bernstein 1994). As EFA is one of the most sophisticated method to

identify the constructs and its correlated variables, it is a pre-requisites to five key steps, such as pre-analysis checks, sampling adequacy, factor extraction, factor rotation and factor interpretation. Finally, a five factors with 16 items 'FliQual' predictive model emerged in the process. The description of the six factors is given below.

The second part of the objective is to identify significant contribution to the overall passenger service quality. To do it, a detailed discussion was framed in the second section of the fourth chapter. Multiple regression analysis a multivariate analysis technique which was used to assess this relationship between dependent variable "overall passenger service quality and other independent variables such as ASF1, SSF2, CTF3, FBF4 and UTF5, to test the hypothesized relationship framed on the predictive model (M1). All the hypotheses H1, H2, and H4 were supported except the hypotheses H3 and H5. Because the H3: There is a significant effect of staff behavior on passengers' perceived service quality; that means employees' behavior is not that much important for the Indian passengers'. Hence, this factor contributes less relatively to the other factors. Furthermore, hypothesis H5: there is significant impact of updated technical services (UTF5) on air passenger perceived service quality, shows that passengers need service from the airport and airlines, but they did not emphasize what technology the service providers are using. How they are providing at what quality is the considering factor for the passengers.

Objective 3: To confirm the identified air passenger perceived service quality variables and factors by developing 'FliQual' measurement models.

To achieve this objective, we measured all the five dimensions along with the service quality variables by using Confirmatory Factor Analysis (CFA). In section two of the fourth chapter, has demonstrated all the possible models developed for analysis. In the first case, the CFA model for all the five dimensions were constructed for air passengers service quality with proper reliability and validity to evaluate the fit between the observed and estimated covariance matrices. In the second case, three alternative possible models 'FliQual' first order, second order, and the third order model were developed and tested with a range fit indices to identify the best fit model and second order measurement model was chosen as a best measurement model for further analysis. At final, five dimensions with 16 attributes 'FliQual' measurement model was

identified, though few items were prone to discard, but the study did not consider them, keeping in view about its importance to the study.

Objective 4: To test the different relationships between air passenger perceived service quality and some of unique constructs such as punctuality, loyalty, safety - security services, & pre-post airport services using structural equation modeling.

To achieve this objective, the relationship between passengers' perceived service quality, and other considered constructs such as punctuality (PUNS), loyalty (LOYL), Safety measure services (SSSR) and Pre-post airport services (PPAS) were tested by evaluating the second research model presented in the third section of the of the fourth chapter. Initially, the CFA model for each of the constructs such as PUNS, LOYL. SSSR. and PPAS was developed and tested its reliability and validity, such as CR, and AVE etc. Thereafter, a combining model called as a measurement model for all latent construct was developed and tested its validity and reliability. By considering the validity and its reliability of the second order measurement model of all latent constructs, the study proposed five possible structural models called as Direct model (M1), two indirect models (M2 & M3) and two research models (M4 & M5), based on the type of relationships review of earlier literature. By using the various comparison methods such as comparing a range of fit indices and comparing parsimony fit statistics, the study chose second research model for the best fit structural model for further analysis.

Again the hypotheses, H6 to H15 were tested through the second research model (M5). The hypotheses comprise both direct and indirect relationships between the five constructs. Here all he hypothesized relationships were found significant except, H7: Air passenger perceived service quality (APPSQ) has significant impact of safety and security measure services (SSSR). Though it has a negative direct contribution towards the overall service quality, but it has a possible indirect effect through other constructs. Therefore, the study say that the overall service quality has significant effect on punctuality, loyalty, pre-post airport services and also punctuality has an indirect effect of loyalty through pre-post airport services.

Objective 5: To find the interval level of overall air passengers' perceived service quality using fuzzy approach.

To achieve this objective, the study initiated the fuzzification process to convert Likert's five point scale to the Triangular Fuzzy Number (T.F.N.) and fuzzify all the responses of respondents. This study followed various factors that were extracted in the EFA process of chapter-4. We collected all the extracted factors and convert them into fuzzy numbers and ranked each using defuzzification. To confirm the constructs and find the various service intervals, the study used Fuzzy Delphi iteration method. In this process, we consulted seven experts for their valuable evaluation and reevaluation. In final we reached closeness between the first and second round of consideration and stopped the process there. Hence the study obtained specific service interval level [0.6. 0.9], which means most of the service level should be provided in the range of 60 percent to 90 percent. A detailed explanation was given in the last category of the fourth chapter. In the last part of this section the study generated membership function of each core dimension of the EFA, so that every membership grade can be obtained by using this in the form of the triangular fuzzy number.

5.3 Implications of the Study

The research ensures, to offer some valuable implications with empirical evidence and comprehensive analysis. Thus, the study contributes to the body of knowledge in three salient features- such as Theoretical, Managerial and Methodological aspects which are given below.

5.3.1 Theoretical Implications

By reviewing the existing literature on service quality, a conceptual framework was developed by considering the various insights from the focus group discussion, expert opinions, peers' suggestions and pilot testing. The study was conducted in three airports in three cities such as Hyderabad, Vishakhapatnam and Bhubaneswar of the southeastern part of India. The framework for this was three parts such as airport services, on-board services and pre-post airport services including 15 demographic profiles. This was conceptualized on the basis of the earlier literature on service quality like Parasuraman, Zeithmal and Berry 1988; Groonors, 1984, Cronin and Taylor, 1992. As a result, of 16 items scale weas identified which were loaded with five service quality dimensions, which are significant indicators of air passenger service quality and their

satisfaction. In the current study, fifteen hypothesized relationships were tested and out of that all were accepted except three hypotheses that were insignificant effect of staff behavior towards the passenger service quality. Apart from the direct relationship, two indirect relations were tested and proved as significant such as the effect of overall service quality towards the loyalty through punctuality and other one is punctuality has significant impact on loyalty through pre-post airport services. Both hypotheses were supported.

The uniqueness of this study is the development of a range of comprehensive model that examine various factors, which influences the overall air passenger service quality. Though there were previous studies in the area of service quality, none have focused much for the airline sectors. Most of the studies are done in developed countries such as USA, France, Germany, Canada, Japan that almost all the studies were confined to the first world countries. Hence, these studies were based on their culture, needs and perception. It may not be true that, there were no studies in India, but whatever studies (Saraswati, 2001; Khan, Rajdutt, & Bansal (2005), Venkatesh & Nargundkar (2006); Goyal, 2008; Connell, & Williams (2006) are existing, have studied only descriptive statistics and a few others have used EFA. Hence, it is the gap in case of the Indian aviation Industry. Therefore the study can be claimed that it is the first of its kind that has used such a theoretical framework tested empirically and theoretically. Hence, various theoretical contributions emerges from this study.

As per the knowledge of the researcher, this study is the first empirical framework by synchronizing various existing concepts from three main theories such as Parasuraman's SERVQUAL, Cronin and Taylor's SERVPERF and Grönroos service quality model to estimate individual variables of passenger service quality in Indian context. Hence in the current study an integrated model was developed with the help of the indicators and concerned factors. SERVQUAL is very much service oriented, based upon the culture of developed countries, higher perception of air passenger service quality, high expectation. But in the Indian context, though transport is industry based, in India it is a social obligation for the government, so the perceptions of the Indian passenger will definitely vary from the first world countries. Furthermore, SERVQUAL is much humanistic, customer oriented, but most of the measures in the transport sector are mechanistic technically focused and objective. It leads to criticism to SERVQUAL approach. Hence, this study proposed an integrated model by comprising items from

SERVQUAL, the Indian public transport system, railways, Indian airlines as part and aviation industry, at large, to generate a pool of items for measurement.

In the second contribution, it is the first of its kind the data set was collected on their way as well as off the way to observe the passengers' actual perception. For this, the researcher tried to address the factors that influence passengers' service quality and their satisfaction with Indian airlines. Therefore, the study has combined all the core items after frequent refining such as pre-post airport services like booking facilities, flexibility, reasonable fare and various airport services and on board services.

In the third case, a study was conducted for Indian airlines, which is contributing to the sectorial knowledge, as it is the first comprehensive study to report with valuable insights from air passengers. In addition to this, the study contributed to the body of knowledge about the passengers' perceptions regarding various aspects of airline services. Though many studies have been found in different sectors, the study specific to the Indian Airlines, with a double to the county's GDP growth and it caters to the needs of 100 million passengers. Again, by taking into account the earlier studies, mostly taken place in developed countries like the USA, the UK, France, Japan, so this study has taken place in a developing countries on the basis of diversifying society such as multicultural, multilingual, and multi religious.

5.3.2 Managerial Implications

Indian airlines has been confronting various issues that we have discussed in the first chapter. Apart from the regulating pressure, fuel price increasing, new entrants, traffic congestion, and political trespass, the new issues related to the level of quality services of legacy carriers against the low cost carrier and no-frill services are the prominent to havoc the industry. There is the growth of new competitors as par with passenger demands, privatized the sector, global movement of passengers, middle class entrants, low cost carriers (LCC) with no-frill service but unfortunately there was no emphasis on quality of services for air passengers. Hence the major findings of the study have addressed as some managerial implication for government, management, and employees.

At first, the study emphasizes importance of airport, on-board (in-flight) and pre-post journey services. For that, factors were tested and results showed that these factors influenced the passenger service quality which is an important effort. Along with the

all the dimensions, their respective variables were studied. Hence it assessed the relative importance of accessibility and availability services (like a variety of eatables, good restaurant, various retail outlets etc.), employee behavior, staff -related services, food and beverages, technicality in services were assessed. Findings indicated that there were positive influences of all these factors to the dependent variable 'overall passenger service quality' (APPSQ). So, this finding was confirmed and contributed to the existing body of knowledge. Again, this conceptualization leads to the passenger satisfaction, which leads to the loyalty and ultimately it leads to profitability.

Subsequently, the study examined various core services such as, flight departure on time as promised, the airline has comfortable seats, the aircraft has a clean interior, crew members were friendly, the airline provides a variety of quality eatables, it has hygienic toilets, and the airline provided services as promised are the basic services for passengers'. By considering other items, more attention should be given to availability of various services as well as it should be accessible, punctuality makes the difference in perceptions of the passengers. Hence the management should well recognize the concerned factors that contribute more to the overall service quality, so they will be able to offer the best services that enhance passengers' loyalty that leads to passenger retention.

In the next concern about staff behavioral aspects, where passengers can lead satisfaction or dissatisfaction directly. As the airlines, maintaining a personal understanding with their class of passengers, this issue goes on unquestioned, but services in the case of economy class passengers should attend as promised. But in case of Indian passengers, the attributes such as varieties with accessible prices, minimum refreshment (if promised), easy to contact the employees make a great sense in their air journey.

In last, dynamic pricing policy which reflected in attributes like reasonable fares, should follow with a minimum gap between the passengers'. Though availability is not a problem, unlike to railways, maximum gap in flight journey will make passengers incompatible with the concerned airlines. The variable has long term impact for the loyalty and retention in specific airline. It poses a question to the passenger to reconsider the airline for their next journey. Hence, authorities should be cautious about this. However, the major implication of the study is concerned the availability with easy

access, staff service and food and beverage services followed by behavioral intentions. Again from the results of structural equation modeling, it was found that service quality plays a pivotal role to the loyalty punctuality and other latent constructs.

5.3.3 Methodological Implications

In methodological contribution of the study is that this research is the one among the few studies tests airlines passenger service quality in Indian perception. The study has made utmost efforts to fill the existing gaps of the air passenger service quality by identifying the significant indicators for airline passenger service quality in Indian context. Again the developed concepts show that the individual variables which have strong predictive commands to the respective service quality dimensions, can used for the any kind of study in other countries, particularly in the service sector.

The study also verified the existing developed scale and considered to develop its own scale to measure airline passenger service quality. This scale was validated and tested its reliability was meticulously tested. Again the results of structural equation modeling (SEM) explained that service quality is the key prerequisite for passenger satisfaction which leads to loyalty, it implies passenger retention. Hence the core relationship between service qualities, loyalty, and punctuality, safety and security measures and pre & post journey services have been well established with the service sector in India. Two types of relationships were established to measure their direct and indirect effects on each other's in the context of airlines passengers' perception.

5.4 Research Contribution

This study makes a number of contributions by evolving its understanding of theoretical perspective to transport industry in general, and Indian airlines, in particular. This study integrates the quality of passenger service quality, different variables, and dimensions of service quality derived from a number of sources such as literature review, experts' opinions, focus group discussions, and peer group suggestions etc. Moreover, the relationship between availability and accessible services, staff services, food and beverage facilities, employees' behavior and technology in the services has been specified. In addition to that, the existence of direct and indirect relationship between overall service quality and other unique factors such as punctuality, loyalty, safety and security measure and pre and post journey services are measured, will facilitate to the

extension and generalization of the study in future study. The major contributions are discussed below.

5.4.1 Contribution to Academic Theory

The contribution to the academic theory is in the development of 'FliQual' a multidimensional tool, that identifies specific variables and dimensions in air passenger perceived service quality measurement and its impact to overall passenger satisfaction. The theory development comes mainly under service sector in Indian airlines. Its structural theory, which measures its direct and indirect relationships between passenger service quality, loyalty, punctuality, safety & security services and pre and post airport services. This relationship adds a new contribution to the existing body of knowledge. The dimensions derived out of this research contribute to a greater understanding of the passengers' service quality in Indian airlines.

Again, its contribution in terms of academic practices, the research makes fusion type methodological approach to existing service quality research. It ranges from testing and validating the 'FliQual' theoretical model to confirmation of "FliQual' measurement model, and from measurement model to 'FliQual" structural model, from structural form to fuzzificaion, at last fuzzy to defuzzified were challenging and vigorous in each phase of the 'FliQual' development.

5.4.2 Contribution to Indian Airlines

The research findings provides a greater understanding and insights to passenger service quality in Indian Airlines. The changing nature of aviation industry influences the passengers' varying expectations, such as post liberalized era results in airlines facing higher services as new entrants come across; post 9/11 situation results in passenger searching for higher safety and security, further, the emergence of low cost carrier (LCC) results in passengers becoming price conscious and so on. As per the current study, service quality is the antecedent to overall satisfaction of the passengers' and it leads to the passenger loyalty and this loyalty to the passenger retention, which imply profitability of the airlines. Hence airlines should develop strategies for the service quality such as meeting the passengers' necessary service level interval [0.6, 0.9], so that it will enhance airline's image and will be able to retain and attract new passengers to the net.

This research again provides various insights to the corporate sectors as it is conceptualized, refined, construct bases, tested and retested using different multilevel sophisticated statistical techniques and provides a convenient measurement tool FliQual to measure air passenger service quality will be useful in the present competitive market. Hence the study might be one of very few in Indian context, which provides a new angle of understanding about air transportation.

5.5 Research Limitations

This study is not free from any kind of pitfalls in the face of other research, hence this research also has some limitations. So the limitation of the study falls under two types, such as theoretical and other one is practical limitations which are discussed below.

5.5.1 Theoretical Limitations

In the face of promising achievement, some limitations of the study were noted that could be addressed in future research. Testing various service quality variables, which are very important indicators of the air passenger service quality, but the case of exigency such as flight delay, cancellation, technical snag, flight missing, baggage missing and any other similar situations, are not considered in this study. These type of situational variables needs to be consideration.

Till now the Indian airlines are not updated to compete internationally, specifically with Qatar Airlines, Singapore Airlines, Emirates and other also. In order to compete with them, it is necessary to search a niche through which the airline can enter. As per a future estimation, there will be a rise in competition in Asia particular in India, so it is necessary to search service quality, which comprises Indian airlines. But in case of Indian passengers' it influences cultural and regional attributes which are not considered in the study. Hence, it needs to be explored the aspects from the variables based on culture and particular region.

At last, this study is one of the few studies, which developed a tool to measure airline passenger service quality and sample taken from only three airports based in three different cities, which only cover around 5 percent of total passenger movement in India, and as it is a high growth trajectory with 125 airports. Hence a large sample with representation of most of the major cities would strengthen and support the research findings.

5.5.2 Methodological Limitations

As research design followed by the researcher for this study, it is not possible without methodological limitations. So several limitations are noted below.

The survey was conducted using a single developed questionnaire at a single point of time. It was possible to collect the data using different tools at different points of time of the journey, such as before the journey, during the journey and after journey to avoid common method bias from the same respondents.

In the second case, the study is not a cross-sectional design type. Because the data was collected at a single point of time, thus making the researcher is unable to establish cause-and-effect relationship among the variables of the study. Hence, longitudinal designed study would be appropriate to collect cross- sectional study and will be able to find the causal relationships among the variables and to know the effect of before and after the journey of the passengers' perceptions.

Upon the third limitation, the study was based upon the overall Indian airlines, not distinguishing between the airlines. It is difficult to distinct the level of services from the operators to operators. Hence the study can be conducted across the airlines, between private and public players, low cost carrier and regular fliers. So for generalization of the study will be effective in addressing these issues.

In fourth limitation, the contextual effect in the responses because this study was undertaken on a voluntary participation basis among the passengers and respondents were given choice for completing the questionnaire any time. This response is not free from any situational or environmental factors when they responded.

Fifth limitations, it may be associated with the method of questionnaire administered. It means a single method has a common method bias which may have occurred in the future. In addition, obtaining data from a single source may be problematic for causal effect, as the measure is considered on one occasion only. So, multiple methods may be helpful to further clarify the plan of the research. Hence, the in-depth interview may is suggested to be followed to overcome this situation.

At last, reliability and validity issues may be come across, with information obtained were self-reported by the respondents. Due to this it may produce high correlations among measures, because the data shared common method variance and the error in measurement are correlated with each other (Park and Kim, 2009).

Apart from the above limitations, some additional limitation prevailed in the study such as Likert point's questionnaire: the study with five point scale it may be increased to seven or nine points so that common method bias can be reduced further. Furthermore, cooperation from the employees, civil aviation authorities is essential to access the respondents. But the researchers has struggled to access the subjects can be considered as yet another limitation.

5.6 Conclusion

These days our needs have turned complex, thus making it very difficult to fulfil all. About the new competitors, robust technology, high expectations, volatile market situation, global and knowledgeable passengers, lots of government restrictions and intangibility makes the service sector critical to cope. Despite preceding difficulties, service quality is the primary issues in the current scenario for passengers' services.

Measurement of service quality and its approaches for measurement are the crucial in this service dominated world. The study identified five dimensions to evaluate passengers' perceived service quality for Indian airlines. So it has been viewed as devices for improving passenger service quality. And also the study has identified some major positive direct and indirect relationship between passengers' service quality and other latent constructs such as loyalty, punctuality, pre-post journey services, and security & safety measures. Apart from the various quantitative findings, the following observations were explored through the qualitative process during data collection, personal observations, and tool development stages.

The following is the list of major areas of airline passenger service quality which needs immediate attention of the Indian airline authority, and the regulating agencies.

- Adherence to in time departure and landing of the aircraft.
- Rescheduling of flight (if any) time should be minimized.
- Easy and hassle free cancellation facilities.
- Prompt respond to baggage missing.

- Updated technical security check, so that passengers can save lot of time gaps.
- Loyalty programs to frequent flier.
- Passengers' need refreshment instead of decent approach and appearance form staff side.
- Availability of quality food and necessities with reasonable price and time in airport as well as inside the aircraft
- Reasonable fare, even as the airline has a dynamic pricing policy

The different part of Indian Airlines that have acclaimed operational efficiency, whereas low cost carriers like Spice jet, go air and tiger airlines, it has recorded on passenger amenities is really nothing to boost about except flying with a dry face. The airlines should revolve around the passengers not the airports and concern offices. The passenger should be seen as a consumer with privileges and prior not as a captive user with limited choices by the airlines. Even though the leading public sector like Indian airlines, are lagging behind the global competitors in terms of their basic facilities.

5.7 Scope for Future Research

The findings of the study contribute to the existing literature on service quality and transportation sector at large and Indian airlines in particular. By providing the individual variables and dimensions which are significant indicators for air passenger service quality will be useful for Indian airlines to improve the passenger service quality and make them loyal passenger. Hence there are many platforms for future study of the research community.

The current study examined direct relationships between the dependent variable as passenger service quality with many independent variables such as availability and accessible services, staff offered services, food and beverage services, employee behaviors and updated technology in the offered services. We have not tested their indirect relations with the dependent variables, relationship within these variables, and also we have not tested dependency and independents of the items related to the extracted above variables. So the researcher consideres it is a key issue for the future research to address this concern to examine the more relevant and sophisticated relationship between these relationships.

In this regard, future research can also develop a theoretical model related to the role of situational variables as well as with seasonal (demand season and off season) items.

The study investigated some direct relationship between passenger service quality with some variety of unique factors such as punctuality, loyalty, pre-post journey services, safety and security measure and few indirect relationships. But it is feasible to suggest that a variety of more complicated direct and indirect relationships be be tested.

Developed conceptual framework in this study should be investigated across different other leading airports and metro cities, which may support its further generalizability. Hence, more tests are necessary to strengthen its replicability and validity for other sectors.

This study also suggests to use in-depth interviews along with survey questionnaires that may imply more about individual perceptions on service quality variables.

As the course of action for the future research is to address the unanswered difficulties, so longitudinal studies may help to determine the hidden relationships about the time utility evaluation process. It means that future researchers could be examine the difference in passengers' perceptions of Indian airline service quality before the journey, during the journey and after the journey. Again, it will be able to get seasonal variation in passengers' perception on airline service quality.

The study has focused only on economy class passengers, if in future, any research could be test the possible different perceptions on the journey experienced. However, it can be studied across the gender, age, class, intention of journey, and other demographic characteristics to clarify more about passengers' perception on airline service quality.

Though the study is not exhaustive, more and more variables can be counted, which covers other aspects like Business class passengers', low cost carriers and also the the management perspectives of service quality can be taken into consideration. The impact of internal marketing, comparative study between foreign and domestic stakeholders, scheduled vs. nonscheduled airlines are some of the few untouched sectors, can be taken as for future research. Apart from that, in future study, the investigator can look into the comparison about the passenger perceptions with cargo customers to further distinguish it from diverse service in the same sector.

Moreover, in case of fuzzy evaluation of 'FliQual', the study has followed fuzzy arithmetic operations to fuzzifying the responses and all its extracted constructs, and

also the study has applied Fuzzy Delphi method to confirm the importance of the factors towards the overall service quality and to find the overall service interval for the passengers of Indian airlines. Since the objective of the airlines is not only profit making and also to meet expectations of the passengers' in terms of higher quality of services, hence, these are multi-objective oriented, so we can apply different multi criteria decision making techniques such as analytical hierarchy process (AHP) and technique for order preference by similarity to ideal solution (TOPSIS) for better clarifications to linguistic variables.

Finally, a large sample including diverse cultures, countries, ethnic groups, religions may provide more strength and support to further findings. Therefore, more studies are required to better understand passenger's perception to generate significant predictors of service quality to achieve perfection in service sectors. In addition, the researcher encourage to add more additional influencing factors to passenger services. The study can suggests to use recent mathematical modeling techniques to make it more dynamic and robust one.

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APPENDICES

APPENDIX A

Subas Ch. Mahapatra, Research Scholar
School of Management studies

Prof.B. Raja Shekhar, Research Supervisor
University of Hyderabad, Hyderabad

QUESTIONNAIRE FOR THE AIRLINE PASSENGERS

Dear Respondent,

I, Subas Ch. Mahapatra, Research Scholar, School of Management Studies, University of Hyderabad, pursuing my Ph.D. on the topic "**Service Quality in Indian Aviation Industry: A Study on Select Domestic Airlines**". Pursuance of this research involves conducting a survey regarding perceived airline Service Quality. Please indicate the level of importance of each statement for you. Your comment is highly important for the analysis, will be treated with anonymity as well as extreme confidentiality and under any circumstances will not be revealed to any individual or organization. Your valuable responses would help me in doing my research successfully. I, solicit your cooperation in this endeavor.

Instructions: Please tick the appropriate box/numbers and give necessary information wherever applicable

Booking Facilities

How did you book your ticket for your air travel (tick the following box, as appropriate for you)?

Official portal of the airline	☐	Online travel portal(like make my trip, clear trip etc)	☐
Booking counter at airport	☐	Through travel agent	☐
Other(specify)			

Please tick the number that indicates the level of importance of each statement for you:

Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Not Applicable
5	4	3	2	1	0

I. If you booked your ticket through the **official portal** of the airline, then tick the following response**:**

1. The portal was user friendly to book the ticket	5	4	3	2	1	0
2. Portal had up-to-date information to respond the passengers' questions	5	4	3	2	1	0

II. If you booked your ticket through the **booking counter** at airport of the airline then tick the following **response:**

1. The reservation staff were courteous.	5	4	3	2	1	0
2. The staff provided accurate flight information.	5	4	3	2	1	0

Airport Services

3. There was good transport facilities to the airport	5	4	3	2	1	0
4. The airport has escalators	5	4	3	2	1	0
5. The airport has good security system	5	4	3	2	1	0
6. Security staff members were courteous	5	4	3	2	1	0
7. The airport has good waiting facilities	5	4	3	2	1	0
8. The terminal has good space for passengers' queues at the counters	5	4	3	2	1	0
9. Carrier wheels were available as and when I required	5	4	3	2	1	0
10. The airport has good announcement system	5	4	3	2	1	0
11. The airport has good number of electronic display boards	5	4	3	2	1	0
12. The airport has retail outlets	5	4	3	2	1	0
13. The airport has good restaurants	5	4	3	2	1	0
14. The airport has quality eatables	5	4	3	2	1	0
15. The airport has convenient exit system for departing passengers	5	4	3	2	1	0
16. The airport has good toilet facilities	5	4	3	2	1	0
17. Functionality of laptop and mobile chargers were good	5	4	3	2	1	0
18. There were provisions for physical disabled passengers	5	4	3	2	1	0
19. The airport staff members were courteous	5	4	3	2	1	0
20. Premises of the airport was clean	5	4	3	2	1	0

21. While waiting at the airport, had you ever asked the airport staff for any help? (Please tick the box)

Yes, asked for help ☐	Did not find anyone to ask ☐	Did not feel well to take any help ☐

If, asked for help how you were satisfied the way your request was handled. (tick the **number** below)

Highly Satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	Highly Dissatisfied
5	4	3	2	1

Services in Aircraft

22. The supporting staff of the airline before boarding the aircraft were courteous	5 4 3 2 1 0
23. The aircraft was clean in its interior	5 4 3 2 1 0
24. Appearance of the airline employees were decent	5 4 3 2 1 0
25. The airline has adequate number of staff	5 4 3 2 1 0
26. The employees were friendly with passengers	5 4 3 2 1 0
27. It was easy to contact the staff for any problem	5 4 3 2 1 0
28. The flight departed in time as promised	5 4 3 2 1 0
29. The airline provided documents regarding the services which are useful	5 4 3 2 1 0
30. The aircraft has comfortable seats	5 4 3 2 1 0
31. The airline keeps informing to passengers, about when services will be performed	5 4 3 2 1 0
32. The airline provides variety of eatables	5 4 3 2 1 0
33. The airline provides quality eatables	5 4 3 2 1 0
34. The airline offered various magazines	5 4 3 2 1 0
35. The airline has hygienic toilets	5 4 3 2 1 0
36. The flight arrived in time as promised	5 4 3 2 1 0
37. The in-flight services of aircraft was up-to-date	5 4 3 2 1 0
38. The airline made you feel safe	5 4 3 2 1 0
39. The airline provided services as promised	5 4 3 2 1 0
40. The fare of the airline was reasonable	5 4 3 2 1 0
41. The amount charged for overweight baggage was reasonable (if applicable)	5 4 3 2 1 0
42. The airline provided good solution in case of missing baggage (if applicable)	5 4 3 2 1 0
43. Airline sent messages prior to passengers' mobile about journey related information	5 4 3 2 1 0

44. Had you ever taken accommodation provided by the airline if there is very long delay/cancellation of flight?

Please tick: Yes ☐ No ☐

If yes, please tick the following:

Very much satisfied	Fairly satisfied	Neither satisfied nor dissatisfied	Fairly dissatisfied	Very much dissatisfied
5	4	3	2	1

Passengers' Loyalty

45. The airline has a good loyalty programme to recognize, as a frequent flyer	5 4 3 2 1 0
46. I would continue my travel by this airline even if the fare increased somewhat in future	5 4 3 2 1 0
47. Considering the price, I received good value for money	5 4 3 2 1 0
48. I would like to recommend this airline to others	5 4 3 2 1 0

C

Demographic Profile

This section refers to your personal information which helps to validate the questionnaire. Your co-operation in providing this information will be greatly appreciated. **All demographic information will be kept 100% confidential.**

Please **tick / fill up** the blanks with the response wherever required.

1.Name(Optional)		
2.Gender: Male ☐ Female ☐		**3.**Age (in years):
4.Marital Status: Single ☐ Married ☐		**5.**Size of the family:
6.Annual income (Rs.):		
7.Educational background	Professional Course ☐ Graduate ☐ SSC ☐	Post Graduate ☐ Intermediate ☐ Others (specify) .....
8.Profession	Govt. employee ☐ Self employeed ☐ Student ☐	Private employee ☐ House wife ☐ Others (specify) .....

9. In which airline had you traveled last time?	
10. You have travelled was	From: To:

Traveled Information

11. Your purpose of travel	Business/work ☐ Tourist ☐	Visiting friends/relatives ☐ Others (please specify) .....
12. Who made the airline decision for you?	Yourself ☐ Travel agent ☐ Sponsor ☐	Secretary ☐ Family/Friends ☐ Others (please specify) .....
13. How many times, do you travel by flight in a year?	Once only ☐ 5-10 times ☐	Less than Five times ☐ More than 10 times ☐
14. Which Airline do you use frequently (please tick):	Indian Airlines ☐ Spice Jet ☐ King Fisher ☐ Go Air ☐ Jet Airways ☐ Indigo ☐ Jet Lite ☐ Others (please specify).....	
15. Reasons for choosing the particular airline(please tick):	Appealing sales promotion ☐ Reach destination fast ☐ Recommendation by family/friends ☐ Familiarity ☐ Cheaper fare ☐ No alternative flight ☐ Positive past experience ☐ Others (specify).....	

Please rate the overall satisfaction to each statement for you in a scale of **1 to 10** and write the number (1- Lowest grade and 10 – highest grade):

16. How did you rate the overall satisfaction you have received from the airline you travelled?	
17. How did you rate the overall satisfaction you have received from the airport?	

For any suggestions about overall development of services in air transportation:

_____

_____

_____

Thank You,

Forever, for giving your valuable time, for our better future

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APPENDIX B

LIST OF PUBLICATIONS

1. Mahapatra, Subas Ch. & Raja Shekhar, B. (2014). Developing a measurement model for Indian airport services perceived by air passengers. *International Journal of Innovative Research &Development*. III, 12 (Special Issue), 275-281.
2. Mahapatra, Subas Ch. & Raja Shekhar, B. (2014). Measuring services of air transport using fuzzy approach. *International Journal of Advances in Management, Technology & Engineering Sciences*, III, 8 (II), 56-60.
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10. Mahapatra, Subas Ch. & Raja Shekhar, B. (2012). Determining the optimal revenue management approach using lpp with reference to hotel industry. *International Journal of Research in Management, Economics and Commerce (IJRMEC),* ISSN: 2250-057X, Vol. -2 (11), 504-512.
11. Mahapatra, Subas Ch. & Raja Shekhar, B. (2011). No-Frills, No-Drills: an overview of service quality in indian context. *International Journal for Business, Strategy & Management.* ICBSM-365, Vol.-I (1), 1-7.