Evaluation of Perceived Service Quality and Loyalty of Medical Tourists to India

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BY

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CERTIFICATE

This is to certify that the thesis entitled, "**Evaluation of Perceived Service Quality and Loyalty of Medical Tourists to India**" being submitted by **Bikash Ranjan Debata** for the award of the degree of Doctor of Philosophy (Humanities and Social Sciences) of NIT Rourkela, is a record of bonafide research work carried out by him under our supervision and guidance. Mr. Bikash Ranjan Debata has worked for more than three years on the above problem at the Department of Humanities and Social Sciences, National Institute of Technology, Rourkela and this has reached the standard fulfilling the requirements and the regulation relating to the degree. The contents of this thesis, in full or part, have not been submitted to any other university or institution for the award of any degree or diploma.

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This thesis is dedicated to lord Jagannath, my son Avikshit and all who have inspired me.

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ABSTRACT

Medical tourism, a growing phenomenon in the world today, possesses a worthwhile potential for the economic development of any country. Globalization, development of information and communications technology (ICT) and adherence to international quality standards potentially result in a significant increase in the movement of patients and healthcare professionals across national boundaries. The emerging manifestation of healthcare is known as medical tourism or health tourism or medical travel. Patients in developed countries such as United States of America (USA), Canada, Western Europe, Australia and United Kingdom (UK) prefer cross-border healthcare for such specific reasons as low cost, avoidance of long waiting time, low insurance premium, affordability of international air travel, favorable economic exchange rates, customized services, Joint commission international (JCI) accredited hospitals, and an opportunity to combine vacation with treatment while maintaining privacy and confidentiality. The demand for medical tourism in India is experiencing a tremendous growth. A study conducted by Confederation of Indian industry (CII) reveals that India has the potential to attract one million medical tourists per annum contributing huge amount of revenue to the Indian economy. However, the Indian medical tourism sector faces various challenges such as an image of poverty and poor hygienic conditions, safety and security issues of the patients, xenophobia reflecting cultural as well as psychological barriers, inadequate health care standardization, Government restrictions and so on.

Since India attempts to position itself as one of the preferred global medical tourism hubs, a thorough understanding of means to attract, satisfy and retain medical tourists is extremely important. In such context, the medical tourist's perception of service quality is critical to healthcare organization's overall success. The perception of service quality is useful for the healthcare providers to identify various dimensions that lead to patient satisfaction. This research is primarily concerned with the study of service quality issues in the context of medical tourism. This may also be useful for the purpose of policy formulation on improving medical tourism service quality in India.

A study on medical tourism service quality and loyalty has been conducted at seven Indian hospitals providing healthcare services to medical tourists. Fifty two items of service quality and thirteen items of service loyalty are included in the questionnaire through review of related literature and discussion with a focus group. Five hundred and thirty four (534) useful responses were tested to examine the validity and reliability of the scale to ensure a quantitative and statistically proven identification of the responses. The test for quantitative variables was conducted by factor analysis on responses using the principal component method followed by varimax rotation to ensure that the variables are important and suitable for the model using SPSS 19.0. The exploratory factor analysis (EFA) is used to identify the underlying dimensions of medical tourism service quality (MTSQ) and medical tourism service loyalty (MTSL) for medical tourism in India. Next, confirmatory factor analysis (CFA) was used to confirm the factor structure of the constructs and validate EFA results. Finally, structural equation modeling (SEM) is employed to examine the hypothesized relationships.

A comparative evaluation on medical tourism challenges (enablers) has been made. Interpretive structural modeling (ISM) approach has been used to establish interrelationship among the system design requirements and is portrayed in a hierarchical diagraph. However, the enablers having strong direct impact in the direct relationship matrix can suppress hidden factors that may substantially influence the model under consideration. Therefore, Fuzzy matrix cross-reference multiplication applied to a classification (FMICMAC) is introduced to check the sensitivity between the enablers and finally the key-enabler is identified. Quality function deployment (QFD) is used to develop the system design requirements considering the service quality dimensions as voice of customers. In order to transfer best practices among medical tourism service providers, a benchmarking study is carried out using data envelopment analysis (DEA). Since the decision making units (DMUs) have the liberty of choosing the weights, they generally choose higher weight on the parameters in which they are doing well and neglect the parameters in which they do not perform well. In this process the efficient DMUs may be considered as inefficient DMUs. However, all the parameters are equally vital in case of medical tourism. To restrict this uncertainty, assurance region approach is employed by imposing additional constraints on the weights. The

study finally provides some useful guidelines for the decision makers and managers for improving service quality in Indian medical tourism settings.

Keywords: Medical tourism; Service quality; Service loyalty; Medical tourism enablers; Exploratory factor analysis (EFA); Confirmatory factor analysis (CFA); Structural equation modeling (SEM); Quality function deployment (QFD); Interpretive Structural modeling (ISM); Fuzzy Matrix Cross-Reference Multiplication Applied to a Classification (FMICMAC); Benchmarking; Data envelopment analysis (DEA); Assurance Region.

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GLOSSARY OF TERMS

3PL	Third Party Logistic
ADF	Asymptotically Distribution Free
ANOVA	Analysis of Variance
AR	Assurance Region
ASI	American Supplier Institute
BDRM	Binary Direct Reachability Matrix
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CRS	Constant Return to Scale
DEA	Data Envelopment Analysis
DMU	Decision Making Units
EFA	Exploratory Factor Analysis
FAHP	Fuzzy Analytic Hierarchy Process
FCs	Functional Characteristics
FDRM	Fuzzy Direct Relationship Matrix
FMICMAC	Fuzzy Matrice d'Impacts Croisés Multiplication Appliquée á un Classement
FPP	Fractional Programming Problem
FST	Fuzzy Set Theory
HMO	Health Maintenance Organizations
HoQ	House of Quality
IMTJ	International Medical Tourism Journal
IRDA	Insurance Regulatory and Development Authority
ISM	Interpretitive Structural Modeling
JCAHO	Joint Commission on Accreditation of Healthcare Organizations
JCI	Joint Commission International
KMO	Kaiser–Meyer–Olkins
LPP	Linear Programming Problem
LS	Least Squares
MICMAC	Cross-Impact Matrix Multiplication applied to Classification
ML	Maximum Likelihood
MTE	Medical Tourism Enablers
MTSQ	Medical Tourism Service Quality
M-visa	Medical Visa
NABH	National Accreditation Board for Hospitals & Healthcare Providers
NPD	New Product Development
NP-RDM	Non-proportional Range Directional Model
OECD	Organization for Economic Co-operation and Development
PCA	Principal Components Analysis
PubHosQual	Public Hospital Service Quality
QFD	Quality Functional Deployment
RMSEA	Root Mean Square Error of Approximation
RTS	Returns to Scale
SAs	Service Attributes
SEM	Structural Equation Modeling

SERVQUAL	Service Quality Instrument
SSIM	Structural Self-Interaction Matrix
TE	Technical Efficiency
TQM	Total Quality Management
TRIPS	Trade-Related Aspects of Intellectual Property Rights
VoC	Voice of the Customer
VoE	Voice of Engineering
VRS	Variable Return to Scale
WHO	World Health Organization
WTO	World Trade Organization

CHAPTER 1

BACKGROUND AND RATIONALE

1.1 Introduction

Medical tourism, a growing phenomenon in the world today, possesses a lucrative potential for the economic development of any country. According to a report by McKinsey and Confederation of Indian Industry in 2004, gross medical tourism revenue was worth USD40 billion worldwide. The report projects that the medical tourism industry will rise to USD100 billion by 2012. It has grown dramatically in recent years primarily because of the high costs of treatment in developed countries, long waiting lists, the relative affordability of international air travel, favorable economic exchange rates and the ageing of the often affluent post-war baby boom generation (Connell, 2006). According to World Health Organization in 2006, many "less developed countries" (LDCs) such as India, Thailand, Malaysia, South Africa and Costa Rica are promoting medical tourism as "First World Treatment at Third World Prices" (Bookman and Bookman, 2007). Medical tourists are generally residents of the industrialized nations of the world. But more and more, people from many other countries of the world are seeking out places where they can both enjoy a vacation and obtain quality medical treatment at a reasonable price. The increasing number of medical tourists seeks value for money during their treatment. Therefore, the medical tourism destinations offer not just cost effective services but a high quality of care. The quality of service has become a major source of competitive strength in building patient satisfaction and loyalty (Taylor, 1994). As a consequence, it is imperative for the medical tourism providers to understand the strengths and weaknesses of the services they provide to best serve the medical tourists' needs.

This chapter examines the medical tourism sector with particular emphasis on the role of medical tourist's perception of quality of services offered. This chapter is divided into five sub-sections. Section 1.2 highlights the Global scenario of medical tourism. This section describes the promising factors responsible for the growth of medical tourism worldwide. It also depicts how the Asian countries like Thailand, Malaysia, Singapore and South Korea are becoming preferred medical tourism hub in the globe. Section 1.3 presents Medical tourism in India; how medical tourism in India is experiencing tremendous growth; increase in the number of medical tourists to India; the competitive advantage of medical tourism for India; advantages and disadvantages of medical tourism in India. 1.4 provides a justification and need for this research work. Section 1.5 presents the summary of thesis chapters covered in this work.

1.2 Global Scenario of Medical Tourism

Globalization, privatization, technology advancement and development of international standards potentially result in a significant increase in the movement of patients and health professionals across national boundaries. The global nature of the cross-border healthcare industry is a recent phenomenon and has been developing rapidly. According to Hopkins et al. (2010), the emerging manifestation of health care is known as medical tourism or health tourism or medical travel. Medical tourism is a combination of healthcare services and tourism services. This combination seems to be securing relatively a new type of niche in tourism sector, where tourists primarily seek medical treatment abroad and later blend this with recreational activities (Debata et al., 2011). According to Bookman and Bookman (2007), medical tourism is traveling overseas with the objective of improving one's health. Many patients in developed countries such as USA, Canada and Britain prefer to cross-border healthcare because of lower cost, avoidance of long wait times, healthcare unavailability of certain healthcare provisions at home, success rates of recovery, personal attention, long supervised recovery and an opportunity to combine vacation with treatment while maintaining privacy and confidentiality (Mohamed, 2008; Chakraborty, 2008).

There are further forces that are expected to drive the future growth of medical tourism worldwide. One of such vital reasons is lack of insurance coverage in developed countries. In USA, the number of uninsured or underinsured Americans is estimated to be more than 50 million and this number might increase due to the current deteriorating state of the economy (Kulkarni, 2009). The niche segment of medical tourism thereby caters to the uninsured population across the globe. Moreover the advantage of medical tourism lies in provision of world-class healthcare at substantially less cost. For instance, open heart surgery costs about USD70000 in Britain and up to USD150000 in the United States but it costs between USD3000 and USD10000 depending on complication in a best hospital of India (Neelankantan, 2003). Table 1 compares costs for medical tourism services in Asia with US costs (hospital stay only). Resulting in the emerging growth of medical tourism intermediaries (e.g. Medical Tourism Expos and Star Hospitals network), electronic medical tourism guides (e.g. treatmentabroad.net) and specialized e-journals (e.g. International medical travel journal-imtjonline.com) witnessed due to the amalgamation of information technology (IT) into tourism and healthcare are also remarkable empowering forces.

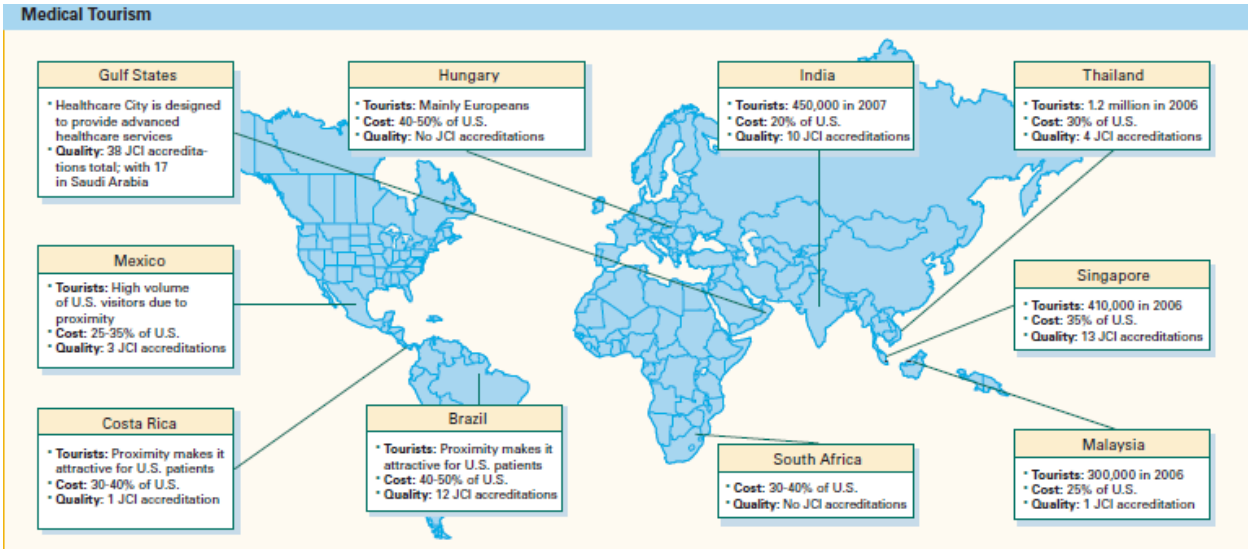
Table 1.1 Comparison of cost of medical tourism treatment in USA and Asian countries (in USD)

Procedure	USA	India	Thailand	Singapore	Malaysia	Percentage of US cost			
						India	Thailand	Singapore	Malaysia
Heart Bypass	130,000	10,000	11,000	18,500	9,000	8%	8%	14%	7%
Heart Valve Replacement	160,000	9,000	10,000	12,500	9,000	6%	6%	8%	6%
Angioplasty	57,000	11,000	13,000	13,000	11,000	19%	23%	23%	19%
Hip Replacement	43,000	9,000	12,000	12,000	10,000	21%	28%	28%	23%
Hysterectomy	20,000	3,000	6,000	6,000	3,000	15%	23%	30%	15%
Knee Replacement	40,000	8,500	13,000	13,000	8,000	21%	25%	33%	20%
Spinal Fusion	62,000	5,500	9,000	9,000	6,000	9%	11%	15%	10%

Source: ABILITY Magazine at http://www.abilitymagazine.com/pbb.html.

Several health insurance companies in the developed countries are remarkably initiating service packaging of treatment abroad with recreational activities in order to attract and convince their customers to avail medical tourism services in developing countries. Although privatization of healthcare and cost are promising factors for the growth of medical tourism, accreditation of the healthcare system has remained to be one of the important considerations among the tourists and been growing rapidly since the 1980s (Shawl et al., 2010). Medical tourists seeking treatment are concerned about the safe quality of healthcare and tend to compare this to those available in their mother country. To provide a guarantee of service quality for medical tourists across the globe, the US joint commission international (JCI), a renowned international accrediting agency for healthcare, fulfills the accreditation role. This accreditation attracts potential medical tourist worldwide and ensure quality healthcare facilities during their treatment.

George and Nedelea (2009) described countries such as India, Thailand, Mexico, Singapore, Brazil, Philippines etc. are actively promoting medical tourism. Figure 1.1 depicts several countries marketing medical tourism worldwide. A report (Deloitte, 2008) reveals that 2.9 million of patients have taken medical tourism facilities in 2007 with a turnover of USD 30-40 billion. The report also describes that the global medical tourism market is growing very fast at yearly rates of 15-20 percent. The report also indicates viable average growth at an annual rate of eighteen percent between the years 2008-2012. Medical tourism is a fast growing industry in the Asian region (Connell, 2006).



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Source: (Deloitte, 2008), Note: JCI is Joint Commission International

Figure 1.1 Medical tourism worldwide

The Asian countries of Thailand, Malaysia Singapore, South Korea and India are attracting a combined 1.3 million medical tourists per year worldwide and the number is increasing annually. According to Gupta (2007) medical tourism sector in Asia by 2012 is projected to generate revenue of worth more than USD4 billion. Among these countries, Thailand is the most favored destination since 1970s. The country has emerged to be the largest medical tourism market in Asia for its competent services, lower cost along with a vacation at beautiful beach resorts. The medical tourism sector in Thailand specialized in sex change operation and later moved into cosmetic surgery (Connell, 2006). In the year 2006, Thailand had 4 JCI accredited hospitals attracting the medical tourists worldwide. In the same year, USD1.1 billion revenue was generated from the medical tourists which accounts for 9% of the total revenue generated by the tourism in the country. In 2007, 15 million tourists generated revenue worth USD 1.5 billion (Tattara, 2010). The growth of medical tourists to the country is pegged annually at 37%. The average cost for treatment is thirty percent of that of the US cost.

The Malaysian medical tourism sector came to limelight in the wake of the Asian economic crisis and the need for economic diversification. It has become the preferred Asian destination for Europeans and Americans (Connell, 2006). According to him, the healthcare sector established cosmetic surgery and alternative medicine ranges of service to the medical tourists in 1998 when the local patients were unable to afford private health care. In the year 2007, Malaysia attracted 3,00,000 medical tourists across the border. In particular, to attract the

muslim medical tourists, Malaysia promotes Islamic practices among its health-care providers (Awadzi and Panda, 2005). The country has one JCI accredited hospital with cost of treatment being less than 25% of the comparable USA cost (Table 1).

Singapore claims to be Asia's leading medical hub with advanced research capabilities as well as nine hospitals and two medical centers with JCI accreditation (Tattara, 2010). Many medical tourists come from Malaysia, Indonesia, South Asia, the Middle East and China. Medical tourists from developed nations are beginning to choose Singapore due to affordable and cost effective health care services in a clean cosmopolitan city. Singapore represents a modern country employing an array of modern healthcare providers, technology, medical-research centers and is a distinctive spot hosting international medical tourism events in addition to its superb infrastructure and entertainment facilities (Helmy, 2011). Moreover, Singapore has its own international patient service bureaus which use direct and relationship marketing to reach international patients and offer them all relevant services. Since 2001, the Singapore medical tourism sector made news for many complex and innovative procedure such as tooth-in-eye surgery and separation of conjoined twins. In the year 2007, 571000 medical tourists visited the country. Singapore expects this number to increase to one million visitors (generating more than USD1 billion dollars) per annum by 2012.

According to Korea Health Industry Development Institute in 2007, Korea aims to be a preferred medical tourism destination by leveraging its ranking as 14th in the world in terms of the standards of its medical services. Korea receives 30,000 foreign patients per year. The tourists travel to Korea for therapies that offer a blend Western and Oriental medicine (Korea Health Industry Development Institute, 2007). Another Asian giant Dubai, partnering with a Harvard Medical School subsidiary, has built the "Dubai Health Care City", a massive healthcare complex of the size of a small city to attract the medical tourists from developed countries. The medical tourists travel for a wide range of treatment facilities that motivate the travel decision for medical tourism. The IMTJ in 2008 described the range of treatment facilities viz. Organ transplant, plastic surgery, dentistry, eye care, orthopedic surgery (such as knee/hip replacement), fertility treatments, heart Surgery and dialysis (support service).

1.3 Medical tourism in India

India, as a destination for medical tourism, has attracted international patients ever some five thousand years ago since the beginning of Yoga. Yoga retreats and meditation centers positioned Indian medical tourism as the epicenter of spiritual and eastern culture. Bhangale (2008) describes India as an exotic tourist destination, offering everything from beaches, mountains, cosmopolitan cities, quaint villages and pilgrimages to suit every palate. According

to the Confederation of Indian Industries (CII), India is unique since it offers holistic medicinal services such as yoga, meditation, ayurveda, allopathy, and other systems of medicines that are difficult to match by other countries. With the development in the field of western clinical medicines and deep commitment to technology and premier healthcare infrastructure, India has not only positioned itself as one of the oldest medical tourism destinations but also has now become one of the world's most popular hub as well (Connell, 2006). McCallum and Jacoby (2007) identify Wockhardt hospital, Escorts heart institute and research center, Apollo hospital, Indraprastha hospital, and Gleneagles hospital as some of the respected premier health solution providers in India. State of the art equipments, ranges of healthcare services, low cost treatment, technological advances, qualified medical professionals, personalized patient care and a mix of modern medicine and alternative therapy have put India on the global medical tourism map. Additionally the clinical outcomes in India are at par with the world's best centers besides having internationally qualified and experienced specialists (Connell, 2006).

The demand for medical tourism in India is experiencing tremendous growth. Statistics suggest that the medical tourism industry in India is worth USD 333 million (Rs 1,450 crore). According to the Federation of Indian Chambers of Commerce and Industry, the Indian health care market, by 2012, will be worth between USD 50 billion to USD 69 billion. The Bulletin of the World Health Organization in 2007 indicated contributing 6.2% to 8.5% towards the country's GDP. According to Bhangale (2008), revenue generated by India through medical tourism may be approximately half of revenue earned in Asia by 2012. A study conducted by confederation of Indian industry (CII) reveals that India has the potential to attract one million medical tourists per annum and this could contribute huge amount of revenue to the Indian economy. In 2007, 0.45 million patients travelled India for healthcare as shown in Figure 1.2 (Deloitte, 2008). The number of medical tourists to India is growing at the rate of 25% annually (Debata et al., 2011). India is currently a preferred medical tourism center. The medical tourism in India is a lucrative market and is attracting medical tourists from all over the world (Connell, 2006; Chinai and Goswami, 2007). According to Connell (2006), medical tourism in India has shown two-digit growth per annum in recent years. Debata et al. (2011) described that the growth in medical tourist's arrival to India has been pegged at 25% annually. A report by Deloitte in India revealed that the medical tourism sector is expected to grow by 30 per cent a year from 2009 to 2015.

Comparison of Major Destinations

Major Destinations	# of Medical Tourists	JCI Accredited Hospitals[2,a]	Range of Costs (% of US cost)[1,b,c]	Popular Treatment Options
Thailand	1.54 MM (in 2007)[6]	5	6%-28%	Alternative Medicine, Cosmetic Surgery, Dental Care, Gender Realignment, Heart Surgery, Obesity Surgery, Oncology and Orthopedics
India	0.45 MM (in 2007)[3]	11	6%-21%	Alternative Medicine, Bone-marrow Transplant, Cardiac Bypass, Eye Surgery and Hip Replacement
Singapore	0.41 MM (in 2006)[5]	15	8%-33%	Organ Transplants, Stem Cell Transplants and other high end procedures
Malaysia	0.29 MM (in 2006)[4]	2	6%-23%	Cardiovascular Surgery, Cosmetic Surgery, Dental Care, Eye Surgery, General Surgery, Orthopedic and Transplant Surgery

Note: [a] JCI stands for Joint Commission International; [b] Cost of treatment includes hospital stay only, [c] Average cost for treatment of Heart Bypass, Hear Valve Replacement, Angioplasty, Hip Replacement, Hysterectomy, Knee Replacement and Spinal Fusion.

Source: Deloitte, 2008

Figure 1.2 Comparison of major medical tourism destinations

The realization of such potential in the medical tourism sector and the post deregulation of the Indian economy gave way to the privatization of healthcare sector. The health care sector in India has witnessed an enormous growth in infrastructure in the private sector. The privatization of healthcare in India with wide ranges of healthcare services equipped with the most modern state-of-the-art technology and increased salary caught the attention of Indian doctors working abroad. The Government of India is providing tax concession to the medical tourism industry. Lower import duties and increased rate of depreciation for life-saving medical equipments with prime land being provided at subsidized rates (Tattara, 2010) are positive developments in medical tourism for India. Major healthcare corporate houses such as Apollo, Tatas, Fortis, Max, Wockhardt, Piramal, and the Escorts group have made significant investments in setting up modern healthcare establishments in major cities. Most of the major metropolitan cities like Delhi, Mumbai, Kolkata, Chennai and Hyderabad have shown tremendous growth in corporate hospitals with multispecialty care. Major hospitals in these cities have recorded about 12% of medical tourists as their customers. Many have also designed special packages including airport pickups, visa assistance and boarding and lodging to cater to the medical tourism more effectively. Today, the Indian corporate hospitals have a large pool of doctors, nurses and support staff ensuring individualized care. Medical tourists seeking treatment in India are concerned about the safe quality of healthcare. To provide a guarantee of service quality for medical tourists in India, JCI has already accredited the quality and safety of healthcare facilities

in eleven hospitals in India (Figure 1.2). The national government (e.g., Ministry of Tourism, Department of Ayurveda, Yoga/Naturopathy, Unani, Siddha, Homeopathy (AYUSH), and National accreditation board for hospitals and healthcare providers (NABH) has recently been working on accreditation standards and has further recommended accreditation of thirty-five hospitals. The involvement of government has further improved the competitive advantage for Indian medical tourism with relaxation in the criteria to receive a visa for medical tourism. The new Medical Visas (M-visas) are valid for a year and are issued for companions of the customers too.

The competitive advantage of India lies in provision of world-class healthcare at substantially less cost, availability of latest technology and competent specialists, and above all attaining comparable success rates. Based on 2002 data, an inpatient knee surgery would cost of USD 10,000 in the USA and just USD 1,500 at hospitals in India (Mattoo and Rathindran, 2006). The cost differential for medical treatment between developed nations and India is extraordinary. Treatment in India starts at around a 10^{th} of the price of comparable treatment in the USA or Britain. Mattoo and Rathindran (2006) also suggested that India can provide quality healthcare at very low cost due to the availability of relatively cheaper but quality manpower and low-priced drugs. The Indian pharmaceutical sector has gained international recognition and has contributed to a large extent to the growth of medical tourism in India. The country is a net exporter of healthcare services by providing a range of services such as open-heart surgery, pediatric heart surgery, hip and knee replacement, bone marrow transplant, bypass surgery, breasts lump removal cosmetic surgery, dentistry, cataract surgery, in vitro fertilization and cancer therapy to the medical tourists.

The aforesaid promising factors have been responsible for the growth of medical tourism in India. However, many other service quality factors may account for such expansion. Bhangale (2008) describes such advantages of medical treatment in India as no-wait lists, options for private room, provision of translators, private chef, dedicated staffs, tailor-made/ personalized services and medical treatment easily combined with a holiday trip. On the contrary, the Indian medical tourism faces certain challenges such as an image of poverty and poor hygiene associated with the country's name (Begde, 2008), risk of legal actions related to consumer satisfaction (Cherukara and Manalel, 2008), safety of the patients, cultural as well as psychological barriers and Government restrictions (Kalshetti and Pillai, 2008), competition from neighboring countries (Gopal, 2008), lack of initiative to promote medical tourism, poor coordination between the various players in the industry such as airline operators, hotels etc. (Chakravarthy et al., 2008), infrastructural facilities, the foreign customer concerns and

expectations, inadequate health care standardization, market accessibility, excess glamorization of health care, state intervention, competition, medicine insurance back-up and global medical tourism market (Kaur et al., 2008). In particular, the sector needs to address the concerns that prospective medical tourists have with regard to service quality or quality of care being provided to them during the treatment. For these reasons, medical tourists' perception of healthcare services in India is now an important part of quality assessment in medical tourism.

1.4 Rationale for the research

In light of the above discussion and based on extensive review of literature, the medical tourism sector in India is found to be a rising sector and it requires a lot of thoughtful attention to all its stakeholders. Feedback and suggestions from Government, policy makers, hospital administrators, medical tourism intermediaries and most importantly, the medical tourists themselves is necessary for the sustainability and success of the industry. Many research studies have been carried out with regard to healthcare issues in the past. Patient satisfaction is a key factor in quality assessment of the health care system. Few studies have sought to assess patient's perception of health care quality in Indian context. However, the reliability as well as validity of those measuring instrument is questionable. The paucity in understanding of perceived service quality of medical tourists to India stimulates a new field of research. Medical tourists' perception of service quality can serve as a reference for the enhancement of medical tourism service and the general improvement of hospitals. The medical tourism sector in India today is facing fierce competition from neighboring countries. Therefore, the sector requires identifying the challenges that seriously affect the overall growth of the sector. These challenges threaten the sector's survival and financial viability. Decision makers, Government and performance improvement professionals are active in determining whether the medical tourism sector is operating efficiently and effectively. To overcome the challenges, it is necessary to categorize their degree of significance and investigate their direct and indirect effects.

Although India is positioning itself as one of the most preferred global medical tourism hubs, an understanding geared to attract, retain and satisfy medical tourists in such context remains limited. The medical tourism service providers often find it difficult in constituting a framework to confirm the service demands of medical tourists. To demonstrate the medical tourism effectiveness, the medical tourists' requirements and service provider's practices need to be associated in a structured manner. This framework would assist the medical tourism service providers in developing, managing and evaluating their medical tourism strategies in Indian context. The primary focus of medical tourism is to capitalize on returns and identify the best business practices essential for establishing quality standards. Since medical tourists, third-

party payers, and regulators have challenged the service providers to demonstrate both healthcare effectiveness and efficiency, evaluation of the multiple input-output nature of organization performance is required to identify weaknesses for subsequent improvement measures. Loyal medical tourists are most likely to publicize the medical tourism service provider and the medical tourism destination through positive word of mouth. Even the satisfied medical tourists develop a desire to maintain cordial relationship for future follow up with the service provider. Loyalty considerations are a must to add to the sustainability factor in the Indian medical tourism industry. Therefore, it is imperative to develop an insight into interrelationship between the quality and loyalty dimensions in medical tourism services. With these above considerations, the research is aimed at attaining the following objectives.

1.5 Research objectives

Based on the discussions presented in the previous sections, this section summarizes the issues and problems that the thesis attempts to address. The vital premise of this research is to propose a framework for providing guidelines for the decision makers, managers and healthcare officials in policy formulation with respect to medical tourism service quality. Succinctly, the research objective of this thesis is as follows:

1. To design and develop a generic instrument for assessing medical tourism service quality in Indian context and to differentiate between accredited / non-accredited healthcare service providers based on medical tourism related practices.
2. To develop the contextual relationship amongst the medical tourism enablers and establish interrelationship amongst the enablers.
3. To propose an integrated framework for system design using interpretive structural modeling (ISM) and quality function deployment (QFD) for achieving improved levels of medical tourists' satisfaction.
4. To benchmark medical tourism performance using Data Envelopment Analysis (DEA) with Assurance region so that the best practices can be highlighted and transferred to non-performing units.
5. To examine the effect of medical tourism service quality dimensions on service loyalty dimensions of medical tourism using Structural Equation Modeling (SEM).

1.6 Organization of the thesis

To meet the above objectives, the thesis is organized into nine chapters including Chapter 1. Rest of this chapter provides a brief overview of each of the chapter as follows:

- Chapter 2: Literature review

The purpose of this chapter is to review the literature on medical tourism service quality as well as on models and factors proposed for assessing service quality. This chapter adopts an exploratory approach for identifying and examining a diverse range of issues in Medical tourism service quality (MTSQ). It provides background information on the issues to be considered in the thesis and stresses the relevance of the present study. The chapter also provides a summary of the base knowledge already available in health care service quality issues. This chapter on has been divided into four sections. The first section presents various assessment models of healthcare/medical tourism service quality that exist in the literature (Section 2.2). The second section underscores the medical tourism enablers (Section 2.3). Section 2.4 presents several conceptual frameworks for assessing the healthcare performance and efficiency measurement techniques in healthcare. The fourth section provides with extensive review of literature on service loyalty and examination of the relationship between service quality and service loyalty (Section 2.5). Finally, the chapter is concluded by identifying literature gaps (Section 2.6) so that relevance of the present study can be emphasized. Thus, this chapter provides a general review of literature for rest of the chapters 3 to 8.

- Chapter 3: Material and method

This chapter is a summary account of some of the important research tools and techniques used in this research work. This chapter has been divided into six subsections. The first (Section 3.2) outlines the aim of explanatory factor analysis and its application. Next section (Section 3.3) highlights how medical tourism enablers are analyzed using interpretive structural modelling (ISM), Cross-impact matrix multiplication applied to classification (MICMAC) and Fuzzy cross-impact matrix multiplication applied to classification (FMICMAC). Further, this section underlines the construction of the contextual relationship of the medical tourism enablers and its application. Section 3.4 describes a service planning and development support method known as quality functional deployment (QFD) that deals with customer needs more systematically. Later, this section identifies several advantages and application of QFD tool. Section 3.5 emphasizes efficiency measure in the context of data envelopment analysis (DEA). The next section (Section 3.6) highlights the CFA technique that tests the validity of the measurement model. Finally, the key characteristics, process of developing and analyzing, and application of a structural equation modeling (SEM) are described in Section 3.7.

- Chapter 4: Assessment of medical tourism service quality: An Indian perspective

This chapter describes the process and steps in selection of scale items to be used for studying medical tourism service quality. A questionnaire survey is conducted to capture the

medical tourist's perception of healthcare service quality. The responses are analyzed using exploratory factor analysis for developing the medical tourism service quality measurement instrument. This chapter is segregated into three sections. The first section emphasizes on the improvement of medical tourism service quality instrument in Indian context (Section 4.2). Section 4.3 describes the development of a construct for medical tourism service quality in Indian context using exploratory factor analysis (EFA). The final Section 4.4 illustrates key findings to assist the policy planners of the medical tourism industry and to develop strategies for improving satisfaction level of medical tourists.

- Chapter 5: Interrelationship between medical tourism enablers

This chapter describes the interrelationship between the system design requirements using ISM approach. This chapter also highlights the classification or grading of the medical tourism enablers so that the more important enablers get greater management attention. This chapter is divided into three sections. First, section 5.2 identifies eleven key medical tourism enablers in India from extensive literature review. Next Section 5.3 exploits ISM, MICMAC and FMICMAC techniques to the medical tourism enablers in order to place them in a hierarchy and show their contextual relationships. Last section (Section 5.4), prior to the conclusion, depicts the key results and discussion.

- Chapter 6: An Integrated approach for service quality improvement in medical tourism

This chapter presents a balanced approach incorporating both demand side and supply side in the medical tourism industry. This approach identifies the design requirements that need most urgent improvement and help to achieve the highest levels of medical tourists' satisfaction. These design requirements are prioritized employing an integrated approach of ISM and QFD. This chapter is divided in to three sections. The first section (Section 6.2) elaborates development of an integrated framework for medical tourism service quality in Indian context. Before conclusion, Section 6.3 provides key findings of the chapter based on the analysis presented in the earlier section.

- Chapter 7: Benchmarking of Medical tourism service providers

The chapter aims to develop an appropriate methodology to benchmark medical tourism performance in India, so that deficiencies can be highlighted and possible strategies can be evolved to improve the performance of the deficient units. DEA, being a robust mathematical tool, has been employed to evaluate the healthcare performance. DEA, basically, takes into account the input and output components of a decision making unit (DMU) to calculate technical efficiency (TE). TE is treated as an indicator for safety performance of DMUs and comparison

has been made among them. A total of thirty nine Indian medical tourism service providers are chosen for comparison purpose.

- Chapter 8: Interrelationship between Service Quality And Service Loyalty In Medical Tourism

This chapter aims at identifying service quality and service loyalty dimensions in the context of medical tourism in India. In addition, an attempt has been made to examine the effect of medical tourism service quality dimensions on service loyalty dimensions. In order to develop the service quality as well as service loyalty dimensions, EFA has been employed. The reliability and validity of the quality factors and loyalty factors are established through confirmatory factor analysis (CFA) using AMOS version 18.0. The related hypotheses are tested using structural equation modeling. The chapter confirms an eight factor construct for medical tourism service quality and a three factor construct for service loyalty. It is found that treatment satisfaction has positive and significant impact on service loyalty. It is also observed that service quality has positive effect on service loyalty.

- Chapter 9: Executive summary and conclusions

This chapter presents the summary of the results, recommendations and scope for future work in the area of medical tourism service quality. It also discusses the specific contributions made in this research work and the limitations there in. This chapter concludes the work covered in the thesis with implications of the findings and general discussions on the area of research.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

India as a medical tourism destination allures medical tourists predominantly because of its mysticism, spirituality, exotic locales, rich history and culture. In recent times, privatization and globalization of healthcare sector in India underlines the fact that the country is an attractive, affordable and preferred global medical tourism destination. In view of such development, it is important to understand, analyze, and infer the medical tourist's perception about the overall healthcare facilities provided to them in availing the medical tourism services. It is imperative to review the key healthcare as well as medical tourism service quality factors that determine the medical tourist's satisfaction. Moreover, the medical tourism enabler that poses as challenges to the medical tourists as well as to the sector itself need to be identified and emphasized. The medical tourism enablers, when overlooked, can cause serious crises for the medical tourist's conduct and threaten the sector's survival and financial feasibility. Decision makers, Government and performance improvement professionals consider identification of efficacy in medical tourism as a significant bearing for sustainable growth of the sector. However, a single variable cannot be attributed for medical tourism performance because multiple input-output variables operate in the system. The major apprehension is to assess Indian medical tourism performance and identify the benchmark medical tourism service provider. This study adopts an exploratory approach for identifying and examining a diverse range of factors that influence the medical tourist's perception on service quality. In this direction, the current chapter highlights the development of strategies and problems associated with various aspects of medical tourism with relevance to the service quality assessment, challenges and enablers, performance evaluation and customer loyalty. With the concept of service quality being introduced in 1960s, literature survey with special reference to healthcare service quality, however, begins with papers published after 1990 with maximum attention to those published in the last decade. The research was restricted to those articles for which full text was available. Table 2.1 provides the source and number of citations from each source.

Table 2.1 Summary of publications referred

Name of Journal	Citations
African Journal of Business Management	1
Annual Review of Public Health	1
Asian Nursing Research	1
Benchmarking: An International Journal	3
BMC Health Services Research	1
Books	7
British Journal of General Practice	1
Computers and Operations Research	1
Conference papers	7

Decision Sciences	1
European Business Review	1
European Journal of Marketing	3
European Journal of Operational Research	1
Health Care Management Review	1
Health Care Management Science	3
Health Economics	1
Health Expectations	1
Health Marketing Quarterly	2
Health Policy	3
Health Service Research	2
Health Services Management Research	1
Healthcare Management Review	1
Healthcare Informatics Research	1
Hospital and Health Services Administration	1
Indian Journal of Community Medicine	1
International Journal for Quality in Health Care	10
International Journal of Clinical Practice	1
International Journal of Health Care Quality Assurance	4
International Journal of Indian Culture and Business Management	1
International Journal of Leisure and Tourism Marketing	1
International Journal of Research in Marketing	1
International Journal of Service Industry Management	1
International Journal of Services and Standards	1
Journal of Business Research	3
Journal of Consumer Satisfaction, Dissatisfaction and Complaining Behavior	1
Journal of Family Practice	1
Journal of Harvard Business Review	1
Journal of Health Care Marketing	3
Journal of Health Management	1
Journal of Hospitality and Leisure Marketing	1
Journal of Management in Medicine	2
Journal of Managerial Issues	1
Journal of Marketing	5
Journal of Marketing Research	1
Journal of Marketing Theory and Practice	1
Journal of Medical Marketing	1
Journal of Naval Science and Engineering	1
Journal of Retailing	1
Journal of Risk and Insurance	2
Journal of Service Industry Management	1
Journal of Service Research	3
Journal of Services Marketing	2
Journal of the Academy of Marketing Science	1
Journal of Economic Psychology	1
Managing Service Quality	3
Marketing Health Services	1
Marketing Intelligence and Planning	1
Medical Care Research and Review	1

Quality and Safety in Healthcare	1
Quality Progress	1
Social Science and Medicine	3
Social Science Medicine	1
Socio-Economic Planning Science	3
Sociology and Social Research	1
Sudanese Journal of Public health	1
The Marketing Management Journal	1
Total Quality Environmental Management	1
Total Quality Management and Business Excellence	1
Tourism Analysis	1
Tourism Management	2
VIKALPA	1
World Applied Sciences Journal	1
Total	125

The literature review gives enough confidence to identify a pertinent gap and methodological weaknesses in the existing literature to solve the research problem. The literature is classified into four categories: each dealing with specific issues associated with medical tourism service quality as illustrated in Figure 2.1. Figure 2.2 provides the classification of the research citations. The next sections provide a brief discussion on these issues and critical analysis of literature. Finally, this chapter is concluded by summarizing the medical tourism aspect in India and possible literature gap so that relevance of the present study can be emphasized.

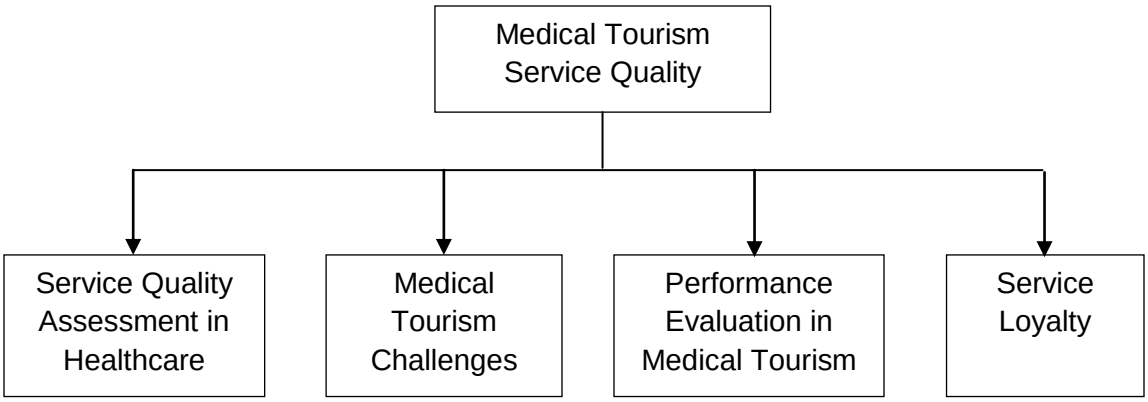


Figure 2.1 Research on medical tourism service quality issues

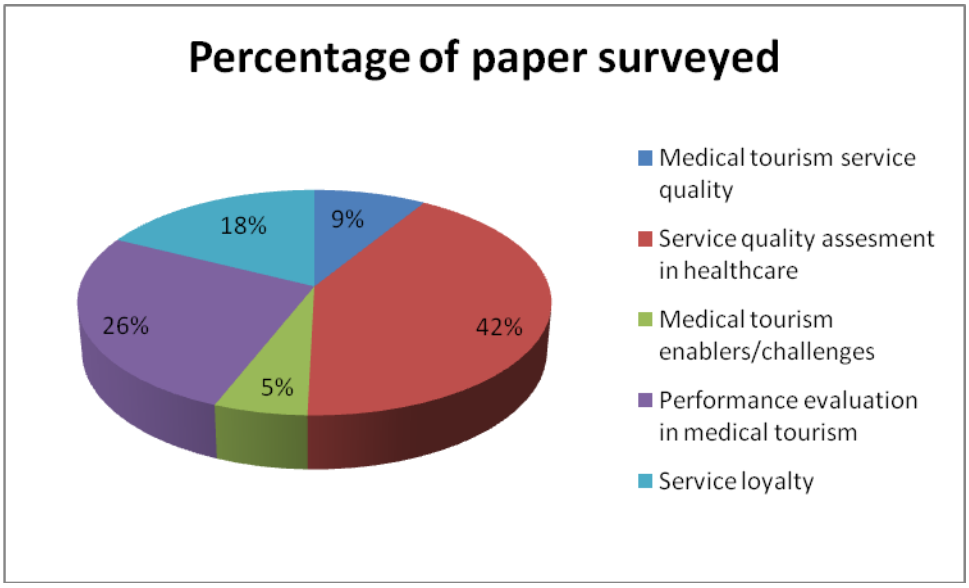


Figure 2.2 Percentage of articles surveyed

2.2 Literature Review

2.2.1 Service Quality

Service quality has been defined, in services marketing literature, as an overall assessment of service by the customers. Service quality is the comparison between customers' prior expectations about the service and their perceptions after actual experience of service performance (Zeithaml et al., 1990; Parasuraman et al., 1985). The perception of service quality has been extensively studied during the past three decades. A large number of models have been developed to measure customer perceptions of service quality. The first attempt to measure service quality was based on service quality paradigm proposed by Grönroos (1984). It has been proposed that service quality is a multidimensional concept (Parasuraman et al., 1985) that customers use while evaluating the services (Lewis and Booms, 1983). Rust and Oliver (1994) expanded Gronroos' model by adding a service environment dimension. Parasuraman et al. (1985) carried out the most famous and influential studies on service quality relating to the development of the SERVQUAL instrument. On an operational level, research in service quality has been dominated by the SERVQUAL instrument (Cronin and Taylor, 1992; Oh, 1999). While the SERVQUAL instrument has been widely used, it has also been criticized. Many researchers have criticized their methodology as well as the psychometric setting (Carman, 1990; Buttle, 1996; Ko and Pastore, 2005). Later, the validity and reliability of the difference between expectations and performance has been questioned and several authors have suggested that perception scores alone offer a better indication of service quality (Cronin and Taylor, 1992). Cronin and Taylor (1992) find that performance only (p-only) based

measures such as SERVPERF may better reflect customers' service quality assessments. Finally, Gronroos (1984) has emphasized the importance of developing an adaptation of the instrument that takes into account the role of expectations from a dynamic perspective. Since then the p-only model has been extensively used in different service settings and provides an improved consistent service quality constructs viz. LODGSERV which measures service quality in hotels (Knutson et al., 1990); LOGQUAL applicable to hospitality (Getty and Thompson, 1994); TourServQual for tourism service quality (Eraqi, 2006); HOTELQUAL and PERTINENT for lodging services (Falces Delgado et al., 1999); ADVENTUREQUAL for investigating young people's outdoor adventure water sports (Donne, 2009); HISTOQUAL for historic houses (Frochot and Hughes, 2000); and ECOSERV designed for measuring perceived quality in ecotourism (Khan, 2003) and service quality measurement scale for the fast food business (Tsai et al., 2007). Cronin and Taylor (1994) illustrate that service quality can be predicted adequately by using perception only. This measure explains more of the variance in an overall measure of service quality than SERVQUAL. Moreover, it obtains psychometrically superior assessment of service quality in terms of construct validity and operational efficacy through its performance items.

2.2.2 Service quality assessment in healthcare

Quality issues in healthcare have drawn significant attention of the researchers. Healthcare service quality simply focused on the professional techniques of doctors and nurses. However, the concept of healthcare service quality has gradually developed to include the views of patients (Yeh, 2010). Padma et al. (2009) termed service quality as "perceived service quality" from the point of view of patients. In the last few decades, patients have emerged as the core concern in health care provision and quality assurance efforts (Sitzia and Wood, 1997). Therefore, healthcare service quality, defined as patients' self-reported experience of care, is a useful metric for evaluating health care quality. Service quality in healthcare is measured by asking patients about their experience. Understanding patients' experience of healthcare may inform about their selection of hospitals, health leaders' assessments of organizational performance, and quality improvement professionals' choice of improvement targets. Moreover, patient perceptions of health care quality are critical to health care organization's success because of its influence on satisfaction and hospital profitability (Williams and Calnan, 1991). Several tools have emerged to continuously monitor healthcare processes and to improve and control different areas of care. In developing countries, the main quality concern has been the accessibility to health care services (Mera, 2002). Improving patient perceptions of service quality has become a central concern to health managers, policy makers and researchers in

recent years (Otani and Harris 2003; Rao et al., 2006). This enables healthcare service providers to identify various dimensions in need of improvement. Additionally, satisfied patients can save hospitals' time and money when patients' complaints are resolved (Pakdil and Harwood, 2005). Consequences of low-perceived quality of care include poor compliance with treatment and advice, failure to pursue follow-up care and dissuading others from seeking care (Andaleeb et al., 2007). The major instruments for measuring service quality in health care industry include SERVQUAL, technical/functional measurement, three-component model, 5Q's, JCAHO model and p-only model. Parasuraman et al. (1985) proposed that service quality is a function of the differences between expectation and performance along the quality dimensions. They developed a service quality model based on gap analysis as shown in Figure 2.3. The various gaps visualized in the model are:

- Gap 1: Difference between consumers' expectation and management's perceptions of those expectations.
- Gap 2: Difference between management's perceptions of consumer's expectations and service quality specifications.
- Gap 3: Difference between service quality specifications and service actually delivered.
- Gap 4: Difference between service delivery and the communications to consumers about service delivery.
- Gap 5: Difference between consumer's expectation and perceived service. This gap depends on size and direction of the four gaps associated with the delivery of service quality on the marketer's side. According to this model, the service quality is a function of perception and expectations is shown in Equation 2.1:

$$SQ = \sum_{j=1}^{k} (P_{ij} - E_{ij}) \qquad (2.1)$$

where

SQ = overall service quality; k = number of attributes.

P_{ij} = Performance perception of stimulus i with respect to attribute j.

E_{ij} =Service quality expectation for attribute j that is the relevant norm for stimulus i.

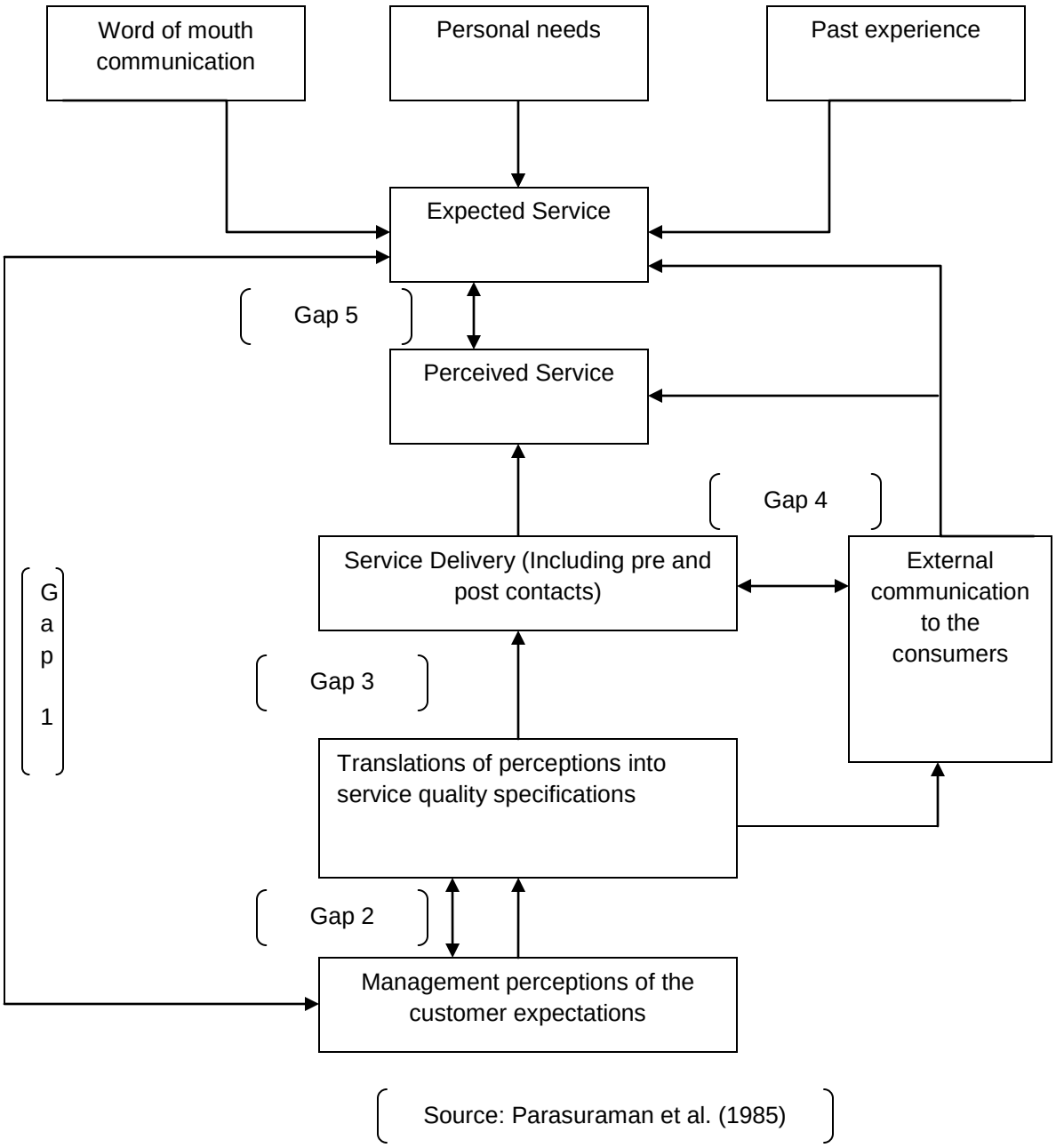


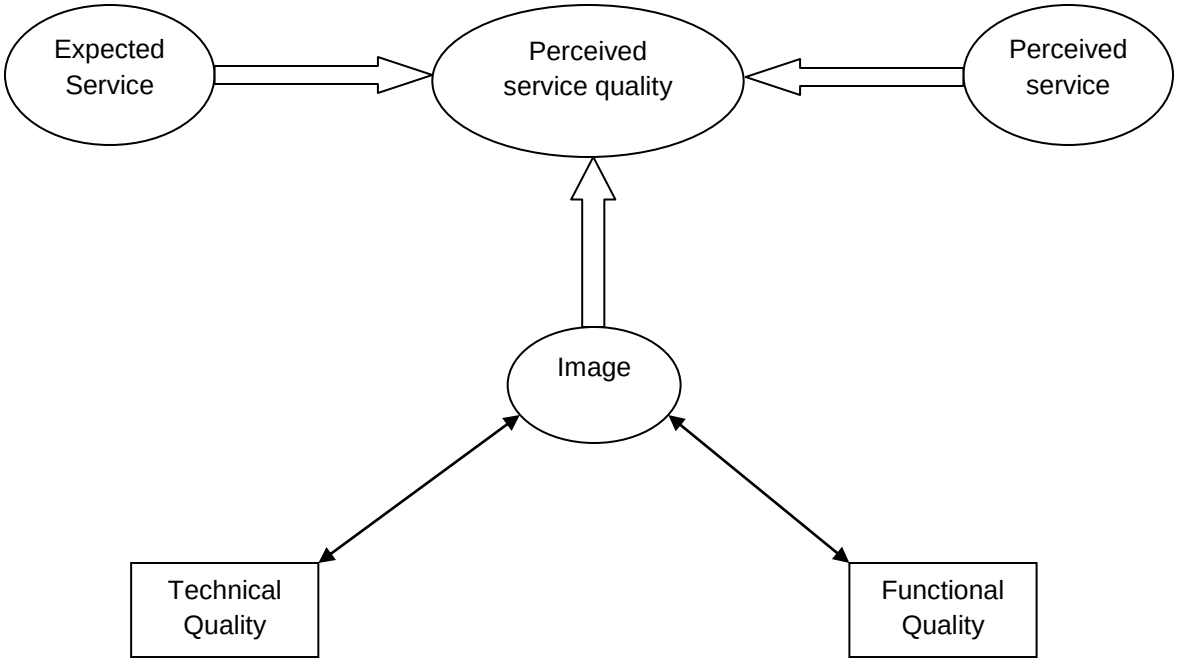
Figure 2.3 Gap analysis service quality model

The SERVQUAL instrument has been applied in healthcare industry. Some studies employed the original twenty two-item instrument and adjusted it to some specific settings such as private hospitals and walk-in clinics. Some studies incorporate other dimensions not addressed in the SERVQUAL instrument. In spite of the extensive application of SERVQUAL in health care industry, there are some heavy criticisms. First of all, several previous studies find

that five dimensions of service quality measured by SERVQUAL may vary in the healthcare industry depending on the specific application areas, for example primary care physician's offices or hospital emergency departments (Strawderman and Koubek, 2006). Secondly, several studies argue that this gap measurement is not appropriate in health care industry because many patients do not have expectations on the healthcare services (Cronin and Taylor, 1992; Oliver, 1993). After comparing different models of service quality, Cronin and Taylor (1992) empirically substantiate that the perceptions only measurement i.e. the SERVPERF outperform the SERVQUAL instrument.

Gronroos (1984) identified three components of service quality viz., technical quality, functional quality, and image shown in Figure 2.4. In health care organization, a proliferation of studies used the technical functional dimensions to measure health care services. Technical quality in health care industry refers to the accuracy of diagnostic and therapeutic processes; whereas functional dimension refers to the manner and behavior of the health care providers during the service delivery process (Babakus and Mangold, 1992). Most of the studies are only focusing on the functional dimension in the health care literature (Choi et al., 2005) and give priority to the functional quality rather than the technical quality (Bowers et al., 1994). The reason for the ignorance of technical dimension is the time lag between the provision of the medical care and the recognition of the technical outcomes (Choi et al., 2004). According to Zeithaml and Bitner (1996), patients base their perceptions of the health care quality primarily on the service employee's interaction (courtesy) and environmental factors during the health care delivery process.

Brown and Swartz (1989) substantiate that technical dimension such as environment of health care delivery process. Moreover, for the patient the technical quality should be a prime object because the proper treatment of patients largely depends upon the proper diagnoses of the diseases. Sometimes, many patients do not have precise idea about the technical matter for the treatment. In this regard, the consciousness of the patients is a vital matter. Image is very important to healthcare firms and this can be expected to built up mainly by technical and functional quality of service including the other factors (tradition, ideology, word of mouth, pricing and public relations)



Source: Gronroos (1984)

Figure 2.4 Technical and functional service quality model

Zifko-Baliga and Krampf (1997) developed the three-component model of healthcare service quality. They revealed that structure, process and outcome as the important components. Structure includes the physical environment, process includes communication, courtesy extended, accessibility and so on, and outcome refers to the results of healthcare services such as length of stay in the hospital and technical care quality competency. The three-component model involves several other dimensions of healthcare quality which are not addressed in the other healthcare service instrument. These dimensions include security, accessibility, communication, and technical quality care competency. Zineldin (2000) expands technical-functional and SERVQUAL quality models into a framework of five quality dimensions (5Qs) designated as quality of object, process, infrastructure, interaction, and atmosphere as shown in Table 2.2.

Table 2.2 Dimensions of perceived service quality in 5Qs model

5Q Dimensions	Definitions
Quality of object	Measuring the treatment itself; the main reason of why a patient is visiting a hospital.
Quality of process	Measuring how well health care activities are being implemented.

Quality of infrastructure	Measuring the basic resources which are needed to perform the health care services: the quality of the internal competence and skills, experience, know-how, technology, internal relationships, motivation, attitudes, internal resources and activities, and how these activities are managed, co-operated and co-ordinated.
Quality of interactions	Measuring the quality of information exchange (e.g. the percentage of patients who are informed when to return for a check-up, amount of time spent by physicians or nurses to understand the patient's needs, etc.), financial exchange and social exchange, etc.
Quality of atmosphere	Measuring the quality of the atmosphere in a specific environment where they co-operate and operate.

Source: Zineldin (2000)

Nine dimensions of perceived health care quality identified by JCAHO (*Joint Commission on Accreditation of Healthcare Organizations*) model include efficacy, appropriateness, efficiency, respect and caring, safety, continuity, effectiveness, timeliness, and availability. The dimensions are defined in Table 2.3 (Sower et al., 2001).

Table 2.3 Dimensions of health care quality in JCAHO model

JCAHO Dimensions	Definitions
Efficacy	The degree to which the care of the patient has been shown to accomplish the desired or projected outcomes.
Appropriateness	The degree to which the care provided is relevant to the patient's clinical needs, given the current state of knowledge.
Efficiency	The degree to which the patient or a designee is involved in his or her own care decisions.
Respect and caring	The degree to which these providing services do so with sensitivity and respect for the patient's needs, expectations, and individual differences.
Safety	The degree to which the risk of an intervention and risk in the care environment are reduced for the patient and others, including health care provider.
Continuity	The degree to which the care for the patient is coordinated among practitioners among organizations over time.
Effectiveness	The degree to which the care is provided in the correct manner, given the current state of knowledge, to achieve the desired or projected outcome for the patient.
Timeliness	The degree to which the care is provided to the patient at the most beneficial or necessary time.
Availability	The degree to which appropriate care is available to meet the patient's needs.

Source: Sower et al. (2001)

Patient perception of service quality using p-only model has been extensively used in USA (Carman, 2000; Lin et al., 2004; Weingart et al., 2006), Australia (Grimmer et al., 2001; Clemes et al., 2001), Europe (Lawthers et al., 1999; Lo and McKechnie, 2007; Papanikolaou and Zygiaris, 2012), Africa (Sofaer and Firminger, 2005; De Jager et al., 2010). The review of the literature together with key informants has revealed patients perception of service quality in Asian continent - Afghanistan (Hansen et al., 2008), Vietnam (Duong et al., 2004), Bangladesh (Andaleeb, 2008), Iran (Nekoei-Moghadam and Amiresmailli, 2011) and Srilanka (Senarath and Gunawardena, 2011). In India, Rao et al. (2006) conducted a cross-sectional survey of health

facilities and patient's perception at healthcare units. They developed a sixteen item scale having good reliability and validity. Using exploratory factor analysis, five dimensions of perceived quality are identified viz., medicine availability, medical information, staff behavior, doctor behavior, and hospital infrastructure. The result indicated that the aforesaid dimensions of perceived quality have larger impact on patient satisfaction. Senthil and Prabhakaran (2011) studied the service quality in healthcare from patient's perspective. They explored the ways and means towards optimizing the competing patients' perspectives on enhancing the service quality in health care. Padma et al. (2009) determine the dimensions of service quality in Indian hospitals from the perspectives of patients and their family members/friends. They proposed and conceptualized two instruments for measuring the dimensions of hospital service quality - one each from the perspective of patients and attendants. Few researchers have adopted a case study method in Indian healthcare organizations to measure the patient perceived service quality (D'souza and Sequeira, 2012; Sharma and Narang, 2011; Sodani et al., 2010). It is concluded that there is a dearth in services marketing research for service quality measurement through patient perspective in health care organizations. The dimensions of healthcare quality instrument for few studies are shown in Table 2.4.

2.2.3 Service quality evaluation in medical tourism

The process of international patients/medical tourists availing healthcare services combining with recreational activities is termed as medical tourism (Debata et al., 2011). Hence, the medical tourist's perception of healthcare service quality is coined as medical tourism service quality. There is a conspicuous scarcity in literature about medical tourism service quality, at least in Indian context. Guiry and Vequist (2011) conducted the first study that used SERVQUAL to assess United States medical tourist's expectation and perception of the service quality of healthcare facilities located outside the USA. Rad et al. (2010) studied the influence of healthcare service quality on satisfaction of medical tourists coming to Malaysia as international patients. The authors evaluated the medical tourism service quality using SERVQUAL method and the findings revealed a positive relationship between healthcare service quality and overall patient satisfaction. However, tangibility dimension was not found to be significant in medical tourism service quality. Yu and Ko (2012) performed a cross-cultural study of perception of medical tourism among Chinese, Japanese and Korean medical tourists. They found that significant difference exist in how Chinese, Japanese and Korean medical tourists view factors of choice, discomfort and preferred product items. Debata et al. (2011) developed an instrument to measure the medical tourists' perception of medical tourism service quality in Indian context. The instrument covered thirty-six items over ten dimensions. The results indicate that the

medical tourists to India perceive accessibility and treatment satisfaction as important dimensions. A study by Veerasoontorn et al. (2011) on medical tourism service quality at Bumrungrad International hospital in Thailand reveals that “low price” medical treatment abroad profoundly contributes to patient satisfaction.

Table 2.4 Relevant studies of healthcare quality

Authors	Dimensions
Baker (1990)	Consultation time, professional care, depth of relationship
Carman (2000)	Nursing care, technical attributes of hospital services, the outcome of the hospitalization and physician care, the affection dimensions of a hospital stay
Choi et al. (2005)	Physician concern, staff concern, convenience of the care process, and tangibles, reflecting aspects of technical, functional, environment and administrative quality
Clemes et al. (2001)	Reliability, tangibles, assurance, empathy, food, access, outcome, admission, discharge and responsiveness
Dagger et al. (2007)	Interpersonal quality, technical quality, environment quality, administration quality, interaction, relationship, outcome, expertise, atmosphere, tangibles, timeliness, operation, support
Dansky and Miles (1997)	Total time spent waiting for the clinician (including time spent in the waiting room and in the treatment room); informing patients how long their wait would be and being occupied during the wait
Evans and Lindsay (1999)	Time, timeliness, completeness, courtesy, consistency, accessibility & convenience, accuracy, and responsiveness
Fowdar (2008)	Reliability/fair and equitable treatment, core outcome, assurance/empathy, and equipment and records
Kara et al. (2005)	Reliability, Assurance, Tangibles, Empathy, Responsiveness, Courtesy,
Licata et al. (1995)	Competence, reliability, understanding, credibility, access, listening skills, facilities, personal association, responsiveness, patient preference, specialist affiliation, geographic convenience
Marley et al. (2004)	Participatory leadership, clinical quality, process quality, patient satisfaction
Padma et al. (2009)	Infrastructure, personal quality, process of clinical care, administrative procedure, safety measures, corporate image, social responsibility, trustworthiness of the hospital
Priporus et al. (2008)	Tangibles, reliability, assurance, interpersonal communication, responsiveness, total satisfaction
Reidenbach and Sandifer-Smallwood (1990)	Patient confidence, empathy, quality of treatment, waiting time, physical appearance, support services business aspects
Tomes and Chee Peng Ng (1995)	Empathy, relationship of mutual respect, dignity, understanding of illness, religious needs, food, the physical environment
Tucker III and Adams (2001)	Access, communication and outcomes
Wellstood et al. (2005)	Physician-patient interaction; information/communication between the physician and patient and waiting time

2.3 Medical tourism enablers/challenges

Medical tourists from the developed industrialized nations are still relatively rare not only because of the distance factor but also owing to the fact that India continues to suffer from an image of poverty and poor hygiene that discourages many patients (Begde, 2008). Cherukara and Manalel (2008) identified “Insurance related problems” and “Risk of legal actions related to consumer satisfaction” as the major medical tourism challenges. In 2007, The International Medical Travel journal conducted a study and identified “safety, quality control, accreditation, provision for follow-up care and resolution of complications” as the biggest challenges facing the medical tourism industry. According to Kalshetti and Pillai (2008), selection of best possible destination for the specific healthcare service poses a challenge to the medical tourists. They also identified few other challenges to medical tourism viz., safety of the patients, cultural and psychological barriers and Government restrictions. Gopal (2008) describes a number of challenges faced by medical tourism industry ranging from competition from neighboring countries to unhygienic standards outside hotels and hospitals resulting in common infections. According to Chakravarthy et al. (2008), the major medical tourism challenges in India are listed as lack of initiative to promote medical tourism, poor coordination between the various players in the industry-airline operators, hotels, and hospitals, and lack of uniform pricing policies across hospitals. Prasad (2008) identified that weak malpractice laws and poor transplantation laws worry the international patients availing healthcare facilities in India. Kaur et al. (2008) have opined that India is emerging as an attractive and affordable destination for healthcare but there are some challenges viz., Infrastructural facilities, the foreign customer concerns and expectations, the image of India for standardization, market accessibility, excess glamorization of health care, state intervention, infrastructure, competition, medicine insurance backup and global medical tourism market.

2.4 Performance evaluation in medical tourism

Benchmarking is a process of comparison between the performances characteristics of separate, often competing, organizations intended to enable each participant to improve its own performance in the marketplace. Its objectives are to obtain a clearer understanding of competitors and of customers' requirements. Benchmarking has been given many different definitions by different organizations and authors but aims to reach the same conclusion (Table 2.5).

Table 2.5 Definition of benchmarking

Authors	Definition of Benchmarking
Camp (1989)	The continuous process of measuring products, services and practices against the toughest competitors or those companies recognized as industry leaders.
Cook (1995)	A kind of performance improvement process by identifying, understanding and adopting outstanding practices from within the same organization or from other businesses.
Geber (1990)	A process of finding the world class examples of a product, service or operational system and then adjusting own products, services or systems to meet or beat those standards.
Kleine (1994)	An excellent tool to use in order to identify a performance goal for improvement, identify partners who have accomplished these goals and identify applicable practices to incorporate into a redesign effort.
Vaziri (1992)	A continuous process comparing an organization's performance against that of the best in the industry considering critical consumer needs and determining what should be improved.
Watson (1993)	The continuous input of new information to an organization.

Benchmarking was used in health system to improve quality in the health services (Camp, 1989). Benchmarking indicators in health have been defined as a measurement tool used to monitor and evaluate the importance of governance, management, clinical and support functions (Wait and Nolte, 2005). Many methodological challenges in the field of benchmarking related to the selection and quality of indicators used to make comparisons both within and between health systems (Goddard et al., 2000; Walshe, 2003). Therefore, benchmarking is a valuable performance evaluation technique for quickly enhancing the performance of a healthcare organization. Over the past 15 years, the comparative assessment of the performance of healthcare systems within and between countries has gained importance. One of the initial studies include the research on Organization for Economic Co-operation and Development (OECD) on international benchmarking of health systems with a major focus on inputs into healthcare such as healthcare expenditure and human resources and its ranking with the world's health system (WHO, 2000). Many countries have developed national quality assessment frameworks to benchmark healthcare such as Denmark (Westert, 2008), Netherlands (Westert and Verkleij, 2006), Sweden (Heugren et al., 2007), and Taiwan (Chiu et al., 2007). Several countries had developed conceptual frameworks for monitoring and assessing the performance of health systems with improving the quality of care. In 1998, the UK Department of Health developed a NHS Performance Assessment Framework. Similarly in

2001, Australian National Health Performance Framework has been developed to measure the health care efficiency.

Efficiency is expressed as a percentage calculated as the ratio total output power to total input power under specified conditions. Efficiency measurement techniques in healthcare consist of four classes' viz., Parametric, Non-parametric, Deterministic and Stochastic (Kengil et al., 2010). These techniques have several strengths and weaknesses. Parametric techniques are regression-based approaches in general and assume a specific functional form for the frontier where as non-parametric techniques do not (O'Neilla et al., 2008). Parametric techniques are susceptible to model misspecification as the efficiency scores are sensitive to distributional assumptions regarding the error term (Rosko, 1999). Deterministic methods do not contain random error component. Hence, they may be sensitive to extreme observations since they assume that the observed distance to the frontier is due to inefficiency. Stochastic methods are less sensitive to outliers since part of the distance to the frontier can be attributed to random error (O'Neilla et al., 2008). Most relevant applications deal with activities in which some outputs and/or inputs are intangible, and therefore, the efficiency analysis of such activities can hardly be performed by aggregating benefits and costs in accounting terms (Ballesteroa and Maldonadob, 2004). According to Kontodimopoulos and Niakas (2005), efficiency analysis has always been linked to the relative difficulty encountered in assessing the performance of decision-making units (DMUs) to find its weakness so that subsequent improvements can be made. However, economists have developed technical efficiency (TE) to meet the needs of researchers, healthcare managers and policy makers. According to Worthington (2004), technical efficiency refers to the use of productive resources in the most technologically efficient manner. It implies the maximum possible output from a given set of inputs. Today, both parametric and nonparametric are used to measure production efficiency related to the utilization of available resources such as facilities, technologies and workforce (Cooper et al, 2004).

The literature on DEA is rich and lengthy and has been extensively used in Asia (Chang, 1998), America (Shroff et al., 1998) and Western Europe (Linna et al., 2003) to shed light on the efficiency of various aspects of national health systems. This mathematical programme has been successfully used to study healthcare issues such as hospital performance (Zhu, 2003), cardiac surgeon performance (Chilingerian, 1995), pharmaceutical industry (Key et al., 2005), hospitals (Braithwaite et. al, 2006), health maintenance organizations (HMO) industry (Brockett et. al., 2004), and long term care (Bjorkgren et al., 2001). Since 1980s, DEA has been extensively used for efficiency analysis of health care organizations (Mohamed, 2010) due to its

ability to handle multiple inputs and outputs (Hollingsworth, 2003). Therefore, this method has become the dominant approach for measuring efficiency in health care and many other sectors in the economy.

2.5 Service loyalty in medical tourism

Loyalty in literature has been defined as customers' disposition in terms of preferences and intentions (Blomer and Casper, 1995) and a psychological process resulting in brand commitment (Bloemer and De Ruyter, 1998). Loyalty research has focused primarily on product or brand whereas loyalty to service organizations has remained underexposed (Gremler and Brown, 1996). Some contributions have been made in service marketing literature in measuring the service loyalty. There are number of reasons in differentiating service loyalty with product loyalty (Gremler and Brown, 1996). Service loyalty is peculiar and is more dependent on the development of interpersonal relationships (Macintosh and Lockshin, 1998) that focus on personal encounter (Crosby et al., 1990) and has greater perceived risk compared to product loyalty (Zeithaml, 1981). Indeed, it has been demonstrated that loyalty is more prevalent among service customers than customers of tangible products (Snyder, 1986). Measuring service loyalty in healthcare is quite difficult due to rare and infrequent purchases (Oppermann, 1999), clandestine behavior with regard to intention to revisit in future (Jones and Sasser 1995). Bei and Chiao (2001) described that the process of repetitive purchase is due to convenience, habits or no alternatives. However, Hennig-Thurau et al. (2002) state that service loyalty is more than a repetitive purchase; it is related to appreciation and commitment. Extensive literature review supported that loyal customers are most likely to publicize the company and its products through positive word of mouth and through a desire to maintain that relationship (Hennig-Thurau et al., 2002; Bloemer and De Ruyter, 1998).

Kumar et al. (2006) describe two alternate forms of loyalty: behavioral loyalty and attitudinal loyalty. Lam et al. (2004) describe that loyalty is manifested in two other ways - repeat patronage and recommendation. Many other researchers have focused on attitudinal loyalty and behavioral loyalty (Kumar et al., 2006; Bove et al., 2009). Behavioral loyalty means consumers' repurchase behavioral or intension of specific brand (Russell-Bennett et al., 2007). The cognitive loyalty component is the preference to the service organization which means service that first comes to mind when making a purchase decision (Lee and Zeiss, 1980).

Taylor and Baker (1994) tested the relationship between service quality and loyalty. They find that the moderating influence is supported in communication, transportation and recreation industry. High service quality is viewed as linked to favorable behavioral intentions (Olorunniwo and Hsu, 2006). The cognitive evaluation of the different service quality dimensions will lead to

a favorable behavioral response from the customer (Brady et al., 2002; Carrillat et al., 2009). The effects of different service quality dimensions on service loyalty have also been tested in different service contexts of technology based banking (Ganguli and Roy, 2011), store loyalty card (Noordhoff et al., 2004), tourism (Baloglu, 2001), package tour operators (Andreassen and Lindestad, 1998), call centers (Dean, 2002), multi-service scenario (Zeithaml et al., 1996) and internet services (Parasuraman et al., 2005). Previous research has suggested that the quality of customer's service experience aids them to develop positive value perceptions about the service provider that leads to loyalty.

2.6 Critical analysis of literature

- Extensive review of literature reveals that few studies have been made on patients' perception of healthcare quality in India. However, most of the studies have been confined to the family planning field (Population council, 1999). Some local studies have attempted to measure patient perceptions of health care quality but validity and reliability of the scales are questionable. The applicability of these instruments in Indian context may be misleading (Haddad et al., 1998). Moreover, there is a scarcity in understanding medical tourist's perception of healthcare service quality in India. There is no evidence of scale being developed to understand medical tourist's perception of service quality in Indian context.
- Few studies have been carried out to understand the medical tourism enablers. However, extensive studies on medical tourism enablers have not been carried out in Indian context and no study had been reported to identify, classify and analyze the medical tourism enablers. Little is known about the direct and indirect effects of each enabler on Indian medical tourism industry. No study depicts the use of interpretive structural modeling (ISM), cross-impact matrix multiplication applied to classification (MICMAC) and fuzzy cross-impact matrix multiplication applied to classification (FMICMAC) methodology in medical tourism enablers in Indian context.
- Many generic methodologies used in healthcare industries especially in medical tourism industries have failed to capture the industry-specific features. Furthermore, they focus only on the demand side, consequently limiting the applicability to provide a clear guidance to medical tourists and the medical tourism service providers. To overcome these challenges, a more balanced approach incorporating both demand side and supply side is desirable in the medical tourism industry i.e., functional aspects of service provision in medical tourism and an in-depth understanding of service elements that customers deem critical in order to evaluate medical tourism service. Extensive survey of literature revealed little use of QFD in

the healthcare service and QFD has not been integrated in the medical tourism service quality.

- Many countries have developed national quality assessment frameworks to benchmark healthcare. DEA is a powerful non-parametric mathematical method that is widely used to measure healthcare efficiency. However, hardly any study is found in measuring the medical tourism performance either in Indian national context or in global context using such kind of methods.
- There are no articles found in the literature on the measurement of service loyalty for medical tourism sector. Primarily, the medical tourism studies, to date, have not addressed and examined the construct of service loyalty. Therefore, it is crucial to develop an all-encompassing measurement for medical tourism service loyalty (MTSL) considering various scales developed for service loyalty construct. Moreover, there is no literature found on effect of medical tourism service quality on service loyalty.

2.7 Conclusions

Quality issues in healthcare settling have caught increasing awareness since 1990s. However, the year 2000 has witnessed paradigm shift in healthcare service quality by considering the patient perceptions. Thus, healthcare service providers identify various new dimensions of service quality that differs from the traditional service quality dimensions. The healthcare service quality as a function of patients' self-reported experience of care is considered as a useful and valuable quality assessment metric. A total number of one hundred thirty eight articles have been reviewed to identify the relevant literature gaps aligned with the research objectives. Thirty nine percent of the literature focuses on service quality assessment in healthcare. The extensive survey identifies several models of perceived health care quality worldwide. In India, few empirical studied have been carried out to understand the patient's perception (Rao et al, 2006; Senthil and Prabhakaran, 2011; Padma et al., 2009). Few researchers have adopted case study method in Indian healthcare organizations to measure the patient perceived service quality (D'souza and Sequeira, 2012; Sodani et al., 2010). Many of the studies in medical tourism assessing the healthcare quality have been limited to developed economies. Few studies are found in Indian context. There is a lack of evidence in understanding the medical tourist's perception of service quality in Indian context. Similarly, twenty one percent of literature describes the performance evaluation approaches and found that DEA is the most robust method for measuring efficiency in health care economy. There is also a dearth of literature focusing on medical tourism enablers. Only six percent of the literature underlines several challenges faced by the medical tourism sector. No articles are found in the

literature on the measurement of service loyalty for medical tourism sector. Moreover, the medical tourism service quality's influence on service loyalty is not clear.

CHAPTER 3

MATERIALS AND METHODS

3.1 Introduction

The competitive edge of Indian medical tourism sector lies in offering a holistic medicinal service that can make India a matchless medical tourism destination worldwide. The first chapter of this thesis describes many other advantageous features for the growth of medical tourism in India. The country recommends for its medical tourists an unusual tourist destination that offers beaches to mountains and cosmopolitan cities to picturesque country sides. The modern and sophisticated healthcare facilities with competent service employees allure the medical tourists to India. The medical tourists incur high medical expenses during hospitalization. The substantial revenue encourages medical tourism service providers in India to be more competitive in terms of medical treatment and services provided to medical tourists. A satisfied medical tourist is an asset that may encourage return visits or positive word of mouth. On the contrary, dissatisfied medical tourists could become a threat to the service provider in terms of losing the trust and loyalty. Patient satisfaction has emerged as an important factor in measuring the medical tourism service quality. As a result, it is vital to determine the medical tourists' satisfaction and perception of medical tourism service quality. In this work, both exploratory factor analysis and confirmatory factor analysis are used to develop a measurement instrument to assess the medical tourism service quality (Chapter 4 and Chapter 8). The reliability and validity of the medical tourism service quality factors are established through confirmatory factor analysis (CFA) using AMOS version 18.0.

The emergent medical tourism sector faces several challenges that could become hindrance for the medical tourists in choosing their desired medical tourism destination. Thus, it is essential to identify, classify and analyze the medical tourism enablers. Moreover, it is also crucial to measure the importance of these enablers so that the more vital enablers get greater management attention. For this reason, the inter-relationship between the medical tourism enablers needs to be studied to distinguish between the direct and indirect effects of each enabler on Indian medical tourism industry. It is also critical to identify the functional aspects of service provision and an in-depth understanding of service elements that customers estimate critical in order to evaluate medical tourism services. Interpretive structural modeling is a robust model that has been used extensively to identify and classify barriers in energy conservation in China (Wang et al., 2008), reverse logistics (Ravi and Shankar, 2005), and environment impact assessment (Arya and Abbasi, 2001). This thesis, therefore, employs an integrated methodology of interpretive structural modeling, multiplication applied to a classification and quality functional deployment methods to understand the mutual interaction of these enablers so that the specific relationships and overall structure are portrayed in a graphical model. Fuzzy

MICMAC method enables the study of the diffusion of impacts through reaction paths and loops for developing hierarchy of the enablers. Finally, QFD framework is used to translate customers' requirements into specific service design requirements and to develop practical suggestions to improve medical tourists' satisfaction.

Medical tourism in India evidences rapid growth and is a major source of revenue generation as well as employment opportunity. Therefore, it is essential to enhance the productivity and profitability of the medical tourism service providers so as to become competitive in the marketplace. In such context, this research attempts to develop appropriate framework to benchmark Medical tourism in India for effective decision making by minimizing deficiencies and implementing possible strategies to improve the medical tourism performance. Data envelopment analysis, being a robust mathematical tool, has been employed to evaluate the efficiency of hospital (Zhu, 2003; Braithwaite et. al, 2006), cardiac surgeon (Chilingerian, 1995), health maintenance organizations (Brockett et. al., 2004) and long term care (Bjorkgren et al., 2001). In Indian context as well as globally, medical tourism performance has hardly been assessed. This thesis applies this non-parametric technique as a performance assessment tool for benchmarking of Medical tourism in India. The study provides a simple but comprehensive methodology for improving medical tourism performance. A sensitivity analysis has been carried out to study robustness of the methodology.

Extensive literature review in Chapter 2 supports that loyal customers are most likely to publicize the company and its products through positive word of mouth and desire to maintain that relationship. The effects of different service quality dimensions on service loyalty have also been tested in different service contexts of technology based banking (Ganguli and Roy, 2011), tourism (Baloglu, 2001), package tour operators (Andreassen and Lindestad, 1998), call centers (Dean, 2002), multi-service scenario (Zeithaml et al., 1996) and internet services (Parasuraman et al., 2005). Structural equation modeling technique is used that depicts a path diagram or a pictorial representation of a model to verify the reliability and validity of the service quality and service loyalty construct. The graphical representation provides a convenient and powerful way to present complex relationships. In healthcare, structural equation modeling is used in private health centre (Haque et al., 2012), and medical tourism (Rad et al., 2010). This research seeks to demonstrate the conceptualization of medical tourism service loyalty construct. It also attempts to examine the effect of service quality dimensions on service loyalty dimensions of medical tourism. Finally, the related hypotheses are tested to investigate the influence of medical tourism service quality dimensions on medical tourism service loyalty dimensions.

3.2 Exploratory factor analysis (EFA)

It is commonly referred to as the 'factor analysis'. It is a set of procedures used to simplify complex sets of quantitative data by analyzing the correlations between variables to reveal the small number of factors which can explain the correlations. The EFA is employed to identify the main dimensions/constructs that will explain the inter-correlation matrix. One of the aims in factor analysis is to obtain simple structure. If there are two or more factors, each factor should have high correlations with a few variables and the remaining correlations should be close to zero. When planning to carry out factor analysis, there should be at least one hundred respondents and twice as many respondents as there are variables. In exploratory factor analysis, one usually begins with a principal components analysis (PCA) which yields a set of uncorrelated components.

The aim of factor analysis is to explain the correlation matrix with few factors as possible. The number of factors to extract can be determined from a scree plot or by examining the eigen values. Communality indicates the variance in each item explained by the extracted factors. A factor loading is the correlation of a variable with a factor. The naming of factors is subjective process. One examines the variable with high loadings on the factor and selects a name that summarizes the content of these variables. The EFA has been employed in the Chapter 4 using SPSS 18.0.

3.2.1 Application of EFA in healthcare quality

Mostafa (2005) highlighted a three-factor solution for the SERVQUAL instrument with sixty seven per cent of variance explained. The result does not support the five dimension construct of original SERVQUAL. Arasli et al. (2008) identify six factors regarding the service quality as perceived in both public and private Northern Cyprus hospitals. These consist of empathy, priority to the inpatients' needs, relationships between staff and patients, professionalism of staff, food and the physical environment. Research results revealed that various expectations of patients have not been met either in the public or the private hospitals. Clemes et al. (2001) identify ten dimensions of patient perception of service quality in an empirical study at New Zealand healthcare setting. Acharyulu and Rajashekhar (2007) applied factor analysis to identify the important dimensions underlying the service perceptions of patients in Indian healthcare industry. Three factors are extracted which contribute 64.6 % of the total variation. Aagja and Garg (2010) develop a scale for measuring perceived service quality for public hospitals from the user's (patient's). A reliable and valid scale called public hospital service quality (PubHosQual) is developed to measure the five dimensions of hospital service quality such as admission, medical service, overall service, discharge process, and social responsibility.

Marrakchi et al. (2009) proposed that factors such as reception, care, information, comfort, food and invoice service represent patient satisfaction, as these factors explain 73.78% variance in a questionnaire survey analyzed using factor analysis. Based on the sample of 201 respondents, Garg and Jayesh (2010) develop a scale for measuring perceived service quality for public hospitals from the patient's perspective. A reliable and valid scale called public hospital service quality (PubHosQual) is developed to measure the five dimensions of healthcare service quality which are admission, medical service, overall service, discharge process, and social responsibility. The proposed scale PubHosQual could be used as a diagnostic tool to identity areas where specific improvements are needed and to analyze various aspects of the healthcare services that require modification. Padma et al. (2009) empirically explored the conceptualize hospital service quality into its component decisions from the perspectives of patients and attendants for a sample of two hundred four patients and attendants. The research revealed that patients and attendants treat the interpersonal aspect of care as the most important one as they cannot fully evaluate the technical quality of healthcare services. The study also revealed that the hospital service providers have to understand the needs of both patients and attendants in order to gather a holistic view of their services. Based on the sample of five hundred respondents, Fowder (2005) develops a scale for measuring perceived service quality in private healthcare setting using exploratory factor analysis. The results revealed that SERVQUAL is not a comprehensive measure of service quality and additional dimensions such as "core medical Services/professionalism/skill and competence" and "information dissemination" are important in a private healthcare setting. Fowdar (2008) proposed a new service quality instrument called PRIVHEALTHQUAL for assessing healthcare services.

3.3 Interpretive structural modeling (ISM) and fuzzy impact matrix cross-reference multiplication applied to a classification (FMICMAC)

Interpretive structural modeling (ISM) refers to the systematic application of some elementary notions of graph theory in such a way that theoretical, conceptual, and computational leverage is exploited. It is a structural analysis tool that transforms unclear, poorly articulated mental models of a system into visible well-defined, hierarchical models. This methodology is used for identifying and summarizing relationships between specific variables, which define a problem or an issue or a system. According to Faisal et al. (2006), ISM provides with a means by which order can be imposed on the complexity of such variables. Therefore, the risk factors have been analyzed using the ISM method to show the relationships between the risk factors and their levels in a hierarchy based on their influence or dependence on the

other risk factors. The basic idea of ISM is to decompose a complicated system into several variables by using practical experience of experts and their knowledge. It is interpretive as the judgment of the experts decides whether and how the variables are related. It is structural as on the basis of relationship, an overall structure is extracted from the complex set of variables. It is a modeling technique as the specific relationships and overall structure are portrayed in a graphical model. Therefore, ISM is a method that efficiently constructs a directed graph or network representation of the complex pattern, of a contextual relationship among a set of elements.

Interpretive structural modeling was proposed by Warfield (1974) as a computer assisted methodology. The theory of ISM is based on discrete mathematics, social sciences, group decision- making, and computer assistance. The first step of ISM is to identify the variables relevant to the problems or issues by calculating a binary matrix called relation matrix. It then extends with a group problem-solving technique. A structural self-interaction matrix (SSIM) is then developed based on a pair-wise comparison of variables. The SSIM is formed by asking questions such as, "Does the feature e_i inflect the feature e_j?" If the answer is yes, then $\pi_{ij} = 1$; otherwise, $\pi_{ij} = 0$.

The general form of the relation matrix can be presented in Equation 3.1.

$$D = \begin{array}{c} \\ e_1 \\ e_2 \\ \vdots \\ e_m \end{array} \begin{array}{c} \begin{array}{cccc} e_1 & e_2 & \cdots & e_n \end{array} \\ \begin{bmatrix} 0 & \pi_{12} & \cdots & \pi_{1n} \\ \pi_{21} & 0 & \cdots & \pi_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ \pi_{m1} & \pi_{m2} & \cdots & 0 \end{bmatrix} \end{array} \tag{3.1}$$

e_i is the i^{th} element in the system, π_{ij} denotes the interrelationship between the i^{th} and the j^{th} elements. D is the relation matrix represented as SSIM. After constructing the SSIM, we can convert it into a reachability matrix. Its transitivity is then checked with Equations 3.2 and 3.3 (Huang et al. 2005)

$$M = D + I \tag{3.2}$$

$$M^* = M^K = M^{K+1}, K > 1 \tag{3.3}$$

where I is the unit matrix, k denotes the powers, and M^* is the reachability matrix. Note that the reachability matrix is under the operations of the Boolean multiplication and addition

$(\text{i.e. } 1\cdot 1=1,\ 1+1=1, 1\cdot 0=0, 1+0=0+1=1, 1\cdot 0=0\cdot 1=0)$ to obtain a final reachability matrix, which can reflect the convergence of the relationship among the elements. For example:

$$M=\begin{bmatrix}1 & 0\\ 1 & 1\end{bmatrix},\ M^2=\begin{bmatrix}1 & 0\\ 1 & 1\end{bmatrix}$$

Next it is imperative to calculate the reachability set and the priority set based on Equations 3.4 and 3.5 respectively.

$$R(t_i)=\{e_i / m^*_{ji}=1\} \quad (3.4)$$

$$A(t_i)=\{e_i / m^*_{ij}=1\} \quad (3.5)$$

where $R(t_i)$ is the reachability set and $A(t_i)$ is the antecedent set. m_{ij} denotes the value of the i^{th} row and the j^{th} column. Further, the levels and relationships between the elements are determined using Equation 3.6 and the structure of the elements' relationships is expressed using the graph.

$$R(t_i)\cap A(t_i)=R(t_i) \quad (3.6)$$

3.3.1 MICMAC analysis

MICMAC principle is based on the multiplication properties of matrices. The objective of the MICMAC analysis is to analyze the driving power and the dependence of the variables. It categorizes variables based on the relationship and the extent they influence on one another. MICMAC takes into consideration all levels of transitivity unlike the ISM method which takes into consideration only one level of transitivity. If element i directly influences element k and if k directly influences element j, any change affecting i can have repercussions on j. There is an indirect connection between i and j. Numerous indirect relationships of $i \rightarrow j$ type which exist in the structural matrix cannot be taken into account in a direct relationship approach. When the matrix is squared, second order relationships are revealed, such as $i \rightarrow j$. Similarly, when the matrix is multiplied, 3, 4, 5 or n^{th} times, the number of influence paths (for influence loops) of the 3rd, 4th, 5th order interconnecting the variables can be found. Each time this process is repeated, a new hierarchy of elements can be deduced. Their classification is based on the number of indirect actions (influences) they have on other elements. When raised to a certain power, this

hierarchy repeats in the next stage of multiplication (both in the hierarchy of the column as well as of the row). Such a stage is considered as a stable stage and such matrix is called stabilized indirect matrix.

3.3.2 FMICMAC analysis

However, the enablers having strong direct impact in the direct relationship matrix can suppress hidden factors that may substantially influence the model under consideration. Therefore, Fuzzy matrix cross-reference multiplication applied to a classification (FMICMAC) is introduced to check the sensitivity between the enablers. The fuzzy direct relationship matrix (FDRM) becomes an input to FMICMAC analysis. The matrix is multiplied repeatedly up to a power until the hierarchies of the driver power and dependence are stabilized. The multiplication process follows the principle of fuzzy matrix multiplication (Kandasamy, 2007) rather than Boolean multiplication of matrices. Fuzzy matrix multiplication is basically a generalization of Boolean matrix multiplication (Kandel, 1986). According to fuzzy set theory (FST), when two fuzzy matrices (Equation 3.7 and 3.8) are multiplied, the product matrix is also a fuzzy matrix (Equation 3.9):

$$A = [a_{ik}] \tag{3.7}$$

$$B = [b_{kj}] \tag{3.8}$$

$$A * B = \max_k [\min(a_{ik}, b_{kj})] \tag{3.9}$$

Fuzzy matrix multiplication leads to the stabilization of FDRM. The driving power of the elements in FMICMAC is derived by summing the entries of possibilities of interactions in the rows, and the dependence of the criterion is determined by summing the entries of possibilities of interactions in the columns. The ranks of the driving power of the elements decide the hierarchy of elements. This technique has been predominantly used in the Chapter 5 and Chapter 6.

3.3.3 Application of ISM Methodology

Wang et al. (2008) used ISM and MICMAC to identify and classify obstacles affecting energy conservation in China. Ravi and Shankar (2005) used ISM and MICMAC to analyze obstacles for the reverse logistics and how they affect one another in the automobile industry. Jha and Devaya (2008) used ISM and MICMAC to analyze risks faced by business when contracting international projects in India. Qureshi et al. (2007) used ISM and MICMAC to build a relationship model for variables in logistics service outsourcing in order to make shipping suppliers more efficient and productive. Faisal et al. (2006) adopted ISM and MICMAC to analyze the dynamic of variables and figure out the key factor that reduces risk in the supply

chain. Talib et al. (2011) used the ISM methodology to understand the mutual relationships among the TQM (Total quality management) practices and presents a hierarchy-based model of the practices. The research shows that there exists a group of practices of TQM having a high driving power and low dependence requiring attention for strategic importance. According to Pfohl et al. (2011), interpretive structural modeling supports risk managers in identifying and understanding interdependencies among supply chain risks on different levels (e.g. 3PL (third party logistics), first-tier supplier, focal company etc.). The theoretical findings of the modeling and the applicability for practical use have been tested in two case studies with two German industry and trade companies. Upadhye et al. (2011) developed a systemic relationship among lean manufacturing implementation issues which are identified and supported from various literary sources using ISM. ISM provides means to impose order on the complexity of the issues concerned. Arya and Abbasi (2001) integrated ISM and FMICMAC to identify and classify key factors in an environmental impact assessment. Qureshi et al. (2008) integrated ISM and FMICMAC to identify and classify the key criteria for evaluating logistics service suppliers. Khurana et al. (2010) adopted the ISM and FMICMAC to identify and classify the important criteria for information sharing enablers for building trust in Indian manufacturing industry and establish direct and indirect effects of each criterion on the trust building process in supply chain management.

3.4 Quality functional deployment (QFD)

Quality function deployment is a service planning and development support method which provides a structured way for service providers to assure quality and customer satisfaction while maintaining a sustainable competitive advantage. QFD facilitates the translation of a prioritized set of subjective customer requirements into a set of system level requirements during system conceptual design. A similar approach may be used to subsequently translate the system level requirements into a more detailed set of requirements at each stage of the design and development process. QFD focuses on delivering “value” by seeking out both spoken and unspoken customer needs, translating them into actionable service features (technical requirements) and communicating them throughout an organization. Sometimes this process of translation is referred to as the voice of the customer (VOC). QFD is a highly effective and a structured planning tool to deal with customer needs more systematically and each translation uses a chart on the basis of House of Quality (HoQ) framework. The HoQ typically contains information on “what to do” (performance characteristic), “how to do” (engineering characteristics) and the integration of this information and the relevant benchmarking data. The house of quality (HoQ) illustrated in Figure 3.2 shows how QFD is used to accomplish this. The

left matrix on the HoQ contains a listing of customer requirements. The roof on the HoQ is the technical/design requirements or the voice of engineering (VOE). The goal of QFD is enhanced customer satisfaction, organizational integration of expressed customer wants and needs and improved quality.

QFD was first conceptualized in the late 1960s (Akao, 1990). In 1972, QFD was implemented successfully at the Kobe shipyards of Mitsubishi Heavy Industries Ltd. inspiring other industries to implement the technique throughout Japan. It remained a Japanese tool until the early 1980s. Following the article by Kogure and Akao and through Ford Motor Company and the Cambridge Corporation, QFD has entered the borders of the US and has started to play an important role at companies such as General Motors, Chrysler, Digital Equipment, Hewlett-Packard, ATandT, Procter and Gamble, and Baxter Healthcare (Prasad, 1998). There are two major organizations as sources of QFD viz. American Supplier Institute (ASI) and GOAL/QPC (a non-profit institution with the mission to help organizations and communities to grow and prosper since 1978) that developed their own models having many similarities to each other. The ASI employs a basic four-matrix method developed by Macabe, a Japanese reliability engineer, while GOAL/QPC uses a multiple matrix developed by Akao that incorporates many disciplines into a less structured format consisting of a matrix (Shillito, 1994). The technique of QFD is also extensively used in service sectors. Early applications of QFD in service organizations in Japan by Ohfuji, Noda and Ogino in 1981 applied for a shopping mall, a sports complex, and variety retail store (Akao, 1990). Kaneko has been integrating QFD, reliability and quality circle activities in hotels, shopping centers and hospitals (Kaneko, 1992).

The QFD methodology begins with the accumulation of the voice of customer (customer requirements). To satisfy customers, it is necessary to understand their requirements and how well these requirements affect the satisfaction level of the customers. The relationships between the customer requirements and their satisfaction have been explained in Kano's model of quality consisting of three types of customer requirements such as normal requirements, expected requirements and exciting requirements as depicted in Figure 3.1 (Kano, 1994).

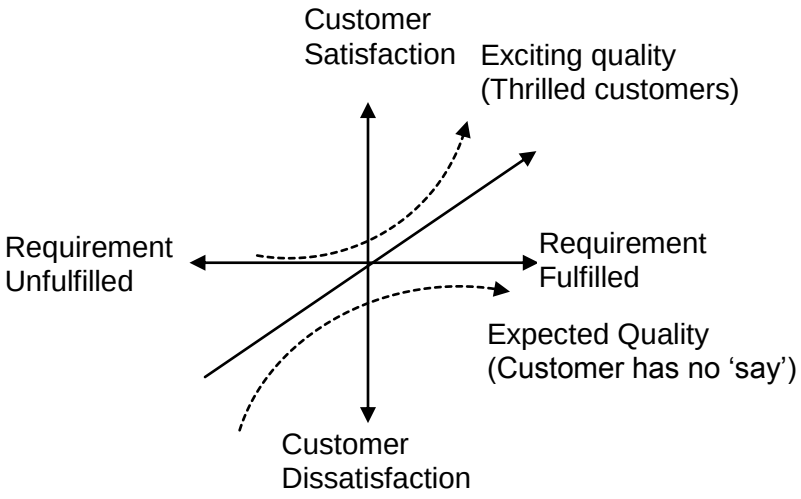


Figure 3.1 Kano's model of quality

The basic idea of QFD is to transform the above stated customer requirements into specific design requirements. QFD analysis starts by obtaining the customer requirements $(\mathrm{CR_i})$ with respect to the product being designed. These requirements are commonly referred to as the 'whats' and can be derived through the interview/questionnaire survey. Once the 'whats' are established, the QFD team then determines the mechanism that would satisfy the 'whats'. These mechanisms are commonly referred to as 'hows'. The 'hows' comprises the list of technical descriptions of the product from the customer perspective. The technical descriptions $(\mathrm{TD_j})$ might be linked with other elements of the product life cycle process including design activities $(\mathrm{DA_j})$. Next, the QFD team establishes relationships between them. They assign a strength value of very weak, weak, moderate or strong to each relationship. Furthermore, the team will also assess each $\mathrm{TD_j}$ with respect to its interaction with the other $\mathrm{TD_j}$ to determine if there is positive, negative or no correlation. The product features are then related to themselves in the roof of the diagram using correlation symbols such as strong, moderate, weak and very weak. The strength values lie between 0 and 1. The QFD team incorporates all the information on a graphical display known as 'House of Quality'. This house provides a framework that guides the team through the QFD process. It is a matrix that identifies the 'whats' and 'hows', the relationship between them and criteria for deciding which of the 'hows' will provide the greatest customer satisfaction. The peak of the house identifies the interrelationships between the 'hows'. When the house of quality is complete, the QFD team can then analyse and use it to achieve a product/service realization that will allow the organization to enjoy greater customer

and employee satisfaction, improved product/service performance and enhanced profitability. Enhancements to the QFD process include adding importance measures to the customer requirements including target values for product design features and relating product design features to part and mechanism characteristics. Figure 3.2 shows a typical QFD matrix (house of quality) that is the foundation of QFD practices. The rows of the matrix in Figure 3.2 are the customer requirements i.e. what the customer wants in the product. The columns of the matrix shows what the manufacturer does to ensure the quality of the product. The right side of the matrix contains the planning information i.e. the importance rating, competitive analysis, target value, amount of scaling up necessary and the sales points. The relationships between customer requirements and design requirements are categorized in the body of the matrix. The important goal of QFD is to turn the design requirements into the detailed design activities. A full implementation of the QFD concept allows the customer requirements $(\mathrm{CR_i})$ to be cascaded down through the technical descriptions $(\mathrm{TD_j})$ and functional descriptions $(\mathrm{FD_j})$ to design activities $(\mathrm{DA_j})$ as illustrated in Figure 3.3.

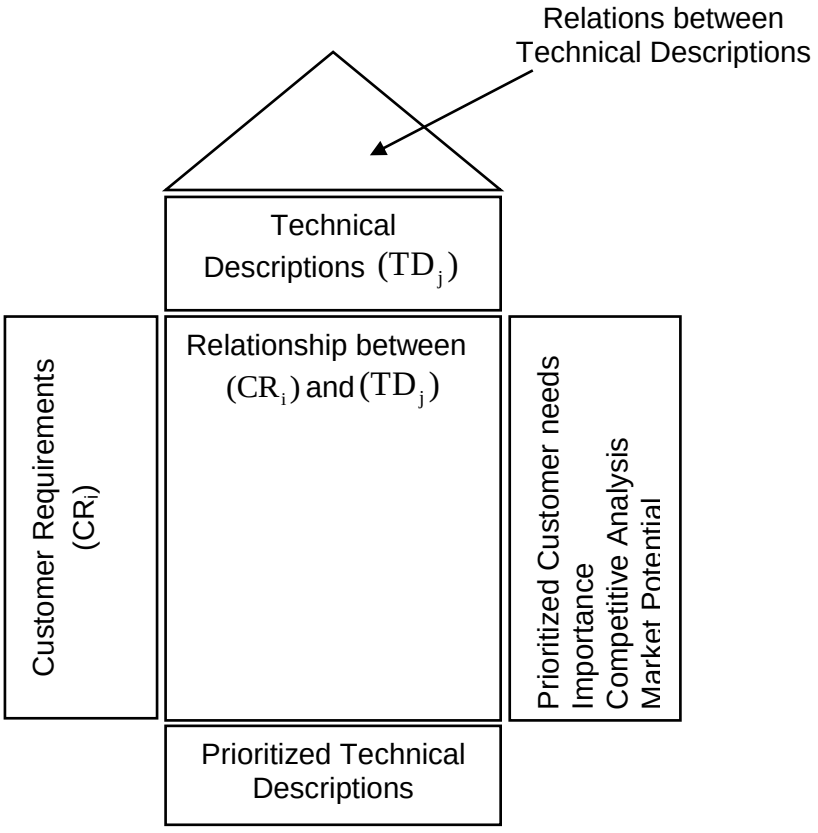


Figure 3.2 House of quality (QFD matrix)

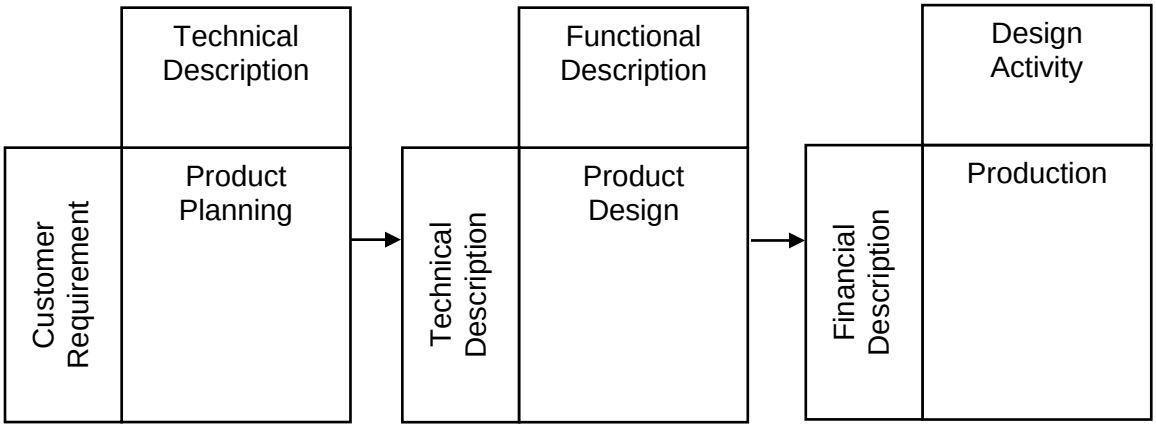


Figure 3.3 Phases of QFD

QFD's fundamental objectives are to:

(i) Identify the customer

(ii) Identify what the customer wants;

(iii) Identify how to fulfil the customer's wants

It can be employed to address almost any business situation requiring decision-making involving a multitude of criteria, requirements, or demands. The widespread acceptance of QFD is due to its numerous benefits. Some of the most important benefits of QFD that are found include:

a. Fewer design and service costs due to the reduction of irrelevant processes and fewer and earlier design changes because of the early identification of high risk areas.
b. Lower cycle time and cost minimization of midcourse changes and implementation.
c. Fewer start-up problems and better company performance.
d. Improved service designs that meet or exceed customers' expectations.
e. Better handling of increased demand and efficient allocation of resources.
f. Establishment and maintenance of documentation due to the fact that information is stored in the matrices so none of the details is lost over time.
g. More stable quality assurance planning and increased possibility for breakthrough innovation.
h. Identification of future application opportunities and effective use of competitive information.
i. Improved service quality since QFD helps prioritizing customer requirements in order of importance from the customer viewpoint.
j. Increased customer satisfaction due to the fact that QFD helps understanding the actual customer requirement.

k. Improved exchange of ideas and increased communication within the organization. QFD changes management communication patterns from “up-over-down” flows to more horizontal routes. Cross-functional team members communicate directly with one another.

QFD has been predominantly used in the chapter six.

3.4.1 Application of QFD Methodology

QFD has been widely applied in many studies. The wide acceptability of the QFD technique can be shown from its reported applications in banking (Gonzalez et al., 2004), engineering services (Pun et al., 2000), government services (Lewis and Hartley, 2001), education (Mahapatra and Khan, 2007), tourism (Sharma, 2005), airlines (Wang, 2007), telecom (Wang and Hong, 2007) etc..

Miyoung and Haemoon (1998) study both external and internal service management issues in hospitality industry and focus exclusively on customers without emphasizing the intra-organizational service generation and delivery processes using QFD. Chang and Kim (2010) conducted a research to identify both the users’ service requirements on health information websites (HIWs) and the key functional elements for running HIWs. With the quality function deployment framework, the derived service attributes (SAs) are mapped into the suppliers’ functional characteristics (FCs) to derive the most critical FCs for the users’ satisfaction. Nine factors of SAs and five key features of FCs were identified, and these served as the basis for the house of quality model. Sturgeon (2004) discusses the incorporation of QFD within the information management and technology strategic planning process. He established an explicit link between a Scottish national health service (NHS) health board health planning and the implementation of Scottish national strategic information management and technology programmes. Chiou and Cheng (2008) presented an integrated methodology of Kano model and QFD in a healthcare service setting. Firstly, Kano model is applied to identify customer needs, and calculate customer satisfaction coefficient that helps the manager to prioritize the importance of service qualities that can increase customer satisfaction. Then, following the same procedures for product design, the four phases of QFD are used to translate the voice of the patients’ needs into the regular service planning**.** Radharamanan and Godoy (1996) used QFD in a health care system to deploy the voices of the customers in understanding their requirements and to include them for continuous improvement of quality in services provided. Dori et al. (2007) used QFD approach for quality measurement in health care structures. Rahman and Qureshi (2008) suggested the fuzzy QFD method to assess healthcare service quality in India. HOQ, an in-built QFD matrix, was constructed to take care of LIFENET's various

requirements in order to satisfy internal and external customers. They concluded that set of parameters costs, treatment response time, disease/risk, and health service satisfaction influence individual's decisions to opt for healthcare services. Chang (2006) conducted a study on a nursing home institute located in Yunlin area in China to examine service quality using QFD. He introduced the concept of fuzzy theory into the calculations used to determine entries in the house of quality. Furthermore, the Fuzzy analytic hierarchy process (FAHP) is introduced to calculate quality based on client requirements. Finally, the fuzzy utility value computation method is used to determine the technical importance. Sahney et al. (2006) developed an integrated framework for quality in education. ISM, QFD and Path analysis were used to identify the set of minimum design characteristics/quality components that meet the requirements of the students as an important customer.

3.5 Data envelopment analysis (DEA)

Data envelopment analysis is a methodology based upon linear programming based technique for measuring the performance efficiency of organizational decision making units (DMUs) using multiple incommensurate inputs and outputs. The efficiency is the key measure in DEA, it is required to emphasize on efficiency measure in the context of DEA (Charnes et al., 1978). The efficiency can simply be defined as the ratio of output to the input.

$$\text{Efficiency} = \frac{\text{Output}}{\text{Input}} \tag{3.10}$$

A DMU is regarded as the entity responsible for converting inputs (i.e. resource, money etc.) into outputs (i.e. sales, profits etc.). Usually, the investigated DMUs are characterized by a vector of multiple inputs converting to multiple outputs making it difficult to directly compare them. In order to aggregate information about input and output quantities, DEA makes use of fractional programming problem (FPP) and corresponding linear programming problem (LPP) together with their duals to measure the relative performance of DMUs (Charnes et al., 1978). The FPP model measures the efficiency of DMUs by calculating the ratio of weighted sum of its outputs to the weighted sum of its inputs. The fractional programme is run for each DMU subjected to the condition that no DMU can have relative efficiency score greater than unity for that set of weights. Thus, the DEA model calculates a unique set of factor weights for each DMU. The set of weights has the following characteristics:

- It maximizes the efficiency of the DMU for which it is calculated
- It is feasible for all DMU
- Since DEA does not incorporate price information in the efficiency measure, it is also appropriate for non-profit organizations where price information is not available.

Since the efficiency of each DMU is calculated in relation to all other DMUs using actual input-output values, the efficiency calculated in DEA is called relative efficiency. In addition to calculating the efficiency scores, DEA also determines the level and amount of inefficiency for each of the inputs and outputs. The magnitude of inefficiency of the DMUs is determined by measuring the radial distance from the inefficient unit to the frontier.

The efficiency evaluation of a unit in presence of multiple inputs and outputs becomes difficult. The difficulties are further enhanced when the relationship between the inputs and outputs are complex and involve unknown tradeoff. Simple efficiency measure defined in Equation 3.10 cannot be used in this situation. Therefore, efficiency score is calculated as the "weighted cost approach" in presence of multiple inputs and outputs as shown in Equation 3.11.

$$\text{Efficiency} = \frac{\text{Weighted sum of output}}{\text{Weighted sum of input}} \tag{3.11}$$

The Equation 3.11 can be mathematically expressed as

$$\text{Efficiency} = \frac{\sum_{r=1}^{n} v_r y_r}{\sum_{i=1}^{m} u_i x_i} \tag{3.12}$$

where y_r = quantity of output r

v_r = weight attached to output r

x_i = quality of input i

u_i = weight attached to input i

r=1,2…,n = number of outputs

i=1,2…,m = number of inputs

The major drawback with this measure is that it assumes that all weights are uniform. In order to alleviate this drawback, Farrell introduced a new measure of efficiency called 'TE' which employs the efficient production function. To understand the concept of an efficient production function, we take the example of a set of firms employing two factors of production (inputs) to produce a single product (output) under conditions of constant returns to scale. Considering the inputs and outputs for each firm, an isoquant diagram is drawn as shown in Figure 3.4. A constant return to scale means that increase in the inputs by a certain proportion, results in a proportional increase in the output. An isoquant diagram is the one in which all firms producing the same output lie in the same plane. A point represents each firm in an isoquant diagram so

that a set of firms yields a scatter of points. An efficient production function is a curve that joins all the firms in an isoquant diagram utilizing the inputs most efficiently.

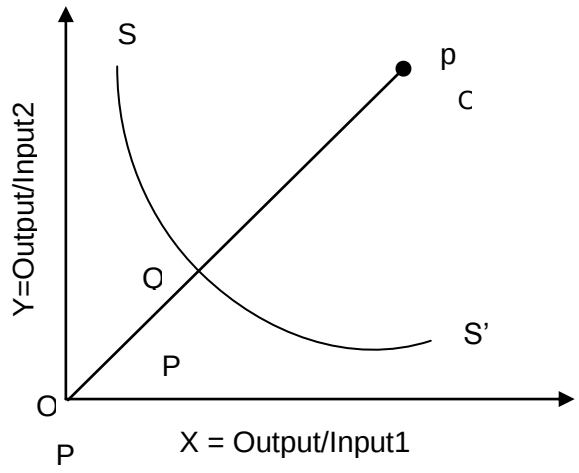


Figure 3.4 Representation of the production function

The point P represents an inefficient firm, as it is outside the isoquant SS'. It used two inputs per unit of output in a certain proportion. Since Q is on the isoquant curve, it represents an efficient firm producing same output as P but uses only a fraction of input (OQ/OP). This ratio is defined as the TE of firm P. Similarly, the TE of firm Q is OQ/OQ=1, which is an efficient firm. Adopting the idea from Farrell's TE that considers the relative performance of inputs and outputs, Charnes et al. (1978) proposed a new methodology known as data envelopment analysis that can be used to measure the efficiency of a DMU relative to other DMUs in order to find the relative efficiency. In DEA, the efficiency of any DMU is obtained as the maximum of a ratio of weighted output to weighted input subjected to the condition that similar ratios for every DMU be less than or equal to unity. Usually a vector of multiple inputs and multiple outputs characterizes the investigated DMUs. Thus, direct comparison of DMUs is generally difficult. In order to aggregate information about input and output quantities, DEA makes use of fractional and corresponding linear programmes (together with their duals) to measure the relative performance of DMUs (Cooper et al., 2004). In addition to calculate the relative efficiency scores, DEA also determines the level and amount of inefficiency for each of the inputs and outputs. The magnitude of inefficiency of the DMUs is determined by measuring the radial distance from the inefficient unit to the production function SS'. Algebraically the DEA model can be written as:

The basic DEA model for 'n' DMUs with 'm' inputs and 's' outputs proposed by CRS, the relative efficiency score of P^{th} DMU is given by:

$$\begin{aligned} &\mathrm{MaxZ}_p = \frac{\sum_{k=1}^{s} v_k y_{kp}}{\sum_{j=1}^{m} u_j x_{jp}} \\ &\text{Subject to } \frac{\sum_{k=1}^{s} v_k y_{ki}}{\sum_{j=1}^{m} u_j x_{ji}} \le 1 \forall i \\ &v_k, u_j \ge 0 \forall k, j \end{aligned} \tag{3.13}$$

where $k = 1$ to s (no. of outputs)

$j = 1$ to m (no. of inputs)

$i = 1$ to n (no. of DMUs)

Z_p = Relative efficiency of the P^{th} DMU

y_{ki} = amount of output k produced by DMU_i

x_{ji} = amount of input j utilized by DMU_i

v_k = weight given to output k

u_j = weight given to input j

The fractional program Equation 3.13 can be reduced to Linear Programming Problem (LPP) as shown in Equation 3.14.

$$\begin{aligned} &\mathrm{MaxZ}_p = \sum_{k=1}^{s} v_k y_{kp} \\ &\text{Subject to } \sum_{i=1}^{m} u_j x_{jp} = 1 \\ &\sum_{k=1}^{s} v_k y_{ki} - \sum_{j=1}^{m} u_j x_{ji} \le 0 \forall i \\ &v_k, u_j \ge 0 \forall k, j \end{aligned} \tag{3.14}$$

The model is called CRS output-oriented maximization DEA model. The efficiency score of 'n' DMUs is obtained by running the above LPP 'n' times. The dual DEA model for the above

LPP is used for benchmarking in DEA. For every inefficient DMU, DEA identifies a set of corresponding efficient units that can be utilized as benchmarks for improvement. The benchmarks can be obtained from the dual problem shown as Equation 3.15 (Talluri, 2000).

$$\begin{aligned} &\text{Min}\theta \\ &\text{Subject to}\sum_{i=1}^{n}\lambda_i x_{ji} - \theta x_{jjo} \le 0 \forall j \\ &\sum_{i=1}^{n}\lambda_i x_{rj} - y_{jj_0} \ge 0 \forall r \qquad (3.15) \\ &\lambda_i \ge 0 \forall i \end{aligned}$$

where θ = Efficiency Score

λ = Dual Variable

r = Number of output = 1,2,..,n

i = Number of input = 1,2,..,m

j = Number of DMUs

The main difference between the primal Equation 3.14 and dual Equation 3.15 model of DEA is that the number of constraints of primal depends upon the number of DMUs whereas in dual model the constraints depend upon the number of inputs and outputs. The DEA models may have any of the two-orientation viz. input orientation or output orientation. Input orientation means how much inputs can be reduced while maintaining the same level of output. But output orientation of DEA is characterized by how much output can be increased while keeping the level of inputs constant. The latter orientation is more relevant for many service providers where the objective is to maximize the output maintaining the same level of inputs. Another variation to a DEA model is the returns to scale (RTS) assumption. Constant, decreasing, increasing, and variable returns to scale assumptions may be employed. Constant Return to Scale (CRS) implies that doubling inputs will exactly double outputs. Decreasing return to scale implies that doubling inputs will less-than-double outputs. Increasing return to scale implies that doubling inputs will more-than-double outputs. Thus, variable return to scale (VRS) allows for a combination of constant, increasing, and decreasing inputs and outputs. The DEA model shown in Equation 3.14 and 3.15 assume a constant return to scale (CRS). The drawback with the CRS model is that it compares DMUs only based on overall efficiency assuming constant

returns to scale. It ignores the fact that different DMUs could be operating at different scales. To overcome this drawback, Banker, Charnes and Cooper developed a model which considers variable returns to scale and compares DMUs purely on the basis of TE. The model can be shown as below.

$$\text{Min } \theta$$

$$\text{Subject to } \sum_{i=1}^{n} \lambda_i x_{ji} - \theta x_{jj_0} \leq 0 \; \forall \; j$$

$$\sum_{i=1}^{n} \lambda_i y_{rj} - y_{jj_0} \geq 0 \; \forall \; r \qquad (3.16)$$

$$\lambda_i = 1 \; \forall \; i$$

The difference between the CRS model Equation 3.15 and the VRS model Equation 3.16 is that the λ_i is restricted to one. This has the effect of removing the constraint in the CRS model that DMUs must be scale efficient. Consequently, the VRS model allows variable returns to scale and measures only TE for each DMU.

In the optimal weight of DEA models for inefficient DMUs, one may see many zeros - showing that the DMU has a weakness in the corresponding items compared with other (efficient) DMUs. Large differences in weights from item to item may also be concern. This leads to the development of the assurance region approach which imposes constraints on the relative magnitude of the weights for special items. For example, we may add a constraint on the ratio of weights for Input 1 and Input 2 as follows (Equation 3.17):

$$L_{1,2} \leq \frac{v_2}{v_1} \leq U_{1,2} \qquad (3.17)$$

$L_{1,2}$ and $U_{1,2}$ are lower and upper bounds that the ratio $\frac{v_2}{v_1}$ may assume. The name assurance region (AR) comes from this constraint which limits the region of weights to some special area. The DEA efficiency score in the corresponding envelopment model is worsened by the additions of these constraints and a DMU previously characterized as efficient may subsequently be found to be inefficient after such constraints have been imposed. The ratio of the multipliers is likely to coincide with the upper or lower bound in an optimal solution. Hence, some care needs to be exercised in choosing these bounds (Equation 3.18).

$$L_{1,2} = \frac{Minv_2}{Maxv_1}; U_{1,2} = \frac{Maxv_2}{Minv_1} \tag{3.18}$$

However, the choice of the input (v1) in Equation 3.17 is arbitrary so we could use constraints such as shown in Equation 3.19.

$$L_{1,2}v_1 \leq v_2 \leq U_{1,2}v_1; L_{1,2}v_2 \leq v_3 \leq U_{2,3}v_2 \tag{3.19}$$

This technique is predominantly used in the Chapter 7.

3.5.1 Application of DEA

Nunamaker and Lewin (1983) measured routine nursing service efficiency using DEA in 1983. Since then, applications of DEA to measure hospital efficiency are widely used (Hofmarcher et al., 2002; Retzlaff-Roberts et al., 2004; Osei et al., 2005). Ersoy et al. (1997) used the DEA method to examine technical efficiency in Turkey hospital and found that over ninety percent of Turkish acute general hospitals were inefficient. They indicated that the inefficient hospitals used far more inputs and produced fewer outputs than their efficient counterparts. In South Africa, Zere et al. (2001) measured the technical efficiency and productivity of eighty six hospitals using the DEA model. The authors found that a large number of hospitals (eighty-seven percent) were inefficient. In Kenya, Kirigia et al. (2002) used two basic DEA models, constant returns to scale and variable returns to scale, to examine the technical efficiency of fifty four public district hospitals. Due to a plenitude of information from the database of the Ministry of Health, twelve input and eight output measures were employed. The results showed that seventy four percent of the total public hospitals were technically efficient and 70.5 per cent achieved scale efficiency. In Namibia, Zere et al. (2006) investigated the technical efficiency of Namibian hospitals based on a sample of twenty six district hospitals during the period 1997-2001. The input-oriented DEA model was employed and the robustness of the DEA technical efficiency scores was tested. The authors reported that more than half of the district hospitals were inefficient and the inefficiency was due to both pure technical inefficiency and scale inefficiency. It was also indicated that the prevalent inefficiency was due to the increasing returns to scale. It would be possible for the hospitals to become efficient by reducing their excess inputs used by 26-37% or by merging some small hospitals after expanding the primary care units. In Ukraine, Pilyavsky and Staat (2008) conducted a study to investigate technical efficiency and efficiency changes of hospitals and polyclinics. It was found that most hospitals analyzed were efficient; however, a large number of polyclinics were

inefficient. Salehzade and Ketabi (2011) evaluate the relative efficiency of public and private hospitals in Qatar using data envelopment analysis (DEA) approach. Then, input-oriented CRS and VRS were used to assess the performance of hospitals. Three out of Eight hospitals found efficient and five hospitals as inefficient. The final ranking of hospitals is done based on Anderson-Peterson (AP) model. Alamtabriz and Imanipour (2011) measured the relative efficiency of health care in sixteen hospitals associated with Shahid Beheshti University of Medical Sciences. The authors used CRS input oriented multiplier model of DEA. LINDO software was utilized to solve the model. Their result suggested that the efficiency of inefficient hospitals could be improved through the potential savings in resources (62.44% in infrastructure, 43.88% in the number of active beds, 37.15% in the number of physicians and 38.58% in the number of paramedics). In Indian context, the application of DEA in measuring the hospital efficiency is limited. Shetty and Pakkala (2010) analyzed technical efficiency based on health outcomes such as reduced infant mortality and increased life expectancy at birth to measure the performance of health system and handle negative data Non-proportional range directional model (NP-RDM) of DEA is used. This study reveals two categories of states responsible for poor health outcomes of the country. One category of states makes inefficient use of health inputs and the second category of states has inadequate healthcare resources. Dash et al. (2010) estimate the relative TE for twenty nine hospitals of Tamil Nadu. It was found that 52% were technically efficient as they had relative efficiency score 1.00 and lie on the efficiency frontier while the remaining 48% were technically inefficient and can use some of the efficient hospitals as their peers to improve their efficiency. Further, the average scale efficiency among the inefficient hospitals was 81%, which implies that the scale inefficient hospitals could reduce their size by 19% without reducing their current output levels.

3.6 Confirmatory Factor Analysis (CFA)

CFA is a technique based on a framework of structural equation modeling (SEM). While in EFA, the data are used to derive a model that is exploratory in nature but in case of CFA, the model is proposed first and then is applied to the data. Thus, the technique of CFA analyze a priori measurement models in which both the number of factors and their correspondence to the indicators are explicitly specified (Byrne, 2010). CFA is appropriately used when the researcher has some knowledge of the underlying latent variable structure. Based on knowledge of the theory, empirical research or both, he or she postulates relations between the observed measure and the underlying factors a priori and then tests this hypothesized structure statistically.

CFA of a measuring instrument is most appropriately applied to measure that have been fully developed and their factor structures validated. The legitimacy of CFA use, of course, is tied to its conceptual rationale just as a hypothesis testing approach is tied to data analysis. That is to say, based on theory, empirical research or a combination of both, the researcher postulates a model and then tests for its validity given the sample data. Thus, application of CFA procedure assesses instruments that are still in the initial stages of development. In testing for the validity of factorial structure for an assessment measure, the researcher seeks to determine the extent to which items designed to measure a particular factor (i.e. latent construct) actually do so. In general, subscales of a measuring instrument are considered to represent the factors; all items comprising a particular subscale are therefore expected to load onto their related factor.

Because (a) the structural portion of a full structural equation model involves relations among only latent variables and (b) the primary concern in working with a full SEM model is to assess the extent to which these relations are valid, it is important that the measurement of each latent variable is psychometrically sound. Thus, analysis of full latent variable models tests the validity of the measurement model first before attempting to evaluate the structural model. Accordingly, CFA procedure is used in testing the validity of the indicator variables. Once it is known that the measurement model is operating adequately, one can then have more confidence in finding related to the assessment of the hypothesized structural model. This technique has been predominantly used in Chapter 8, Amos 18.0 version software has been used for the purpose.

3.7 Structural Equation Modeling (SEM)

SEM is a statistical methodology that takes a confirmatory (i.e. hypothesis testing) approach to the analysis of a structural theory bearing on some phenomenon (Byrne, 2010). Typically, this theory represents “casual” processes that generate observations on multiple variables. The term SEM conveys two important aspects of the procedure: (a) that the casual processes under study are represented by a series of structure (i.e. regression equations) and (b) that these structural relations can be modeled pictorially to enable a clearer conceptualization of the theory under study. The hypothesized model can then be tested statistically in a simultaneous analysis of the entire system of variables to determine the extent to which it is consistent with the data. If goodness-of-fit is adequate, the model argues for the plausibility relations among variables. In case it is inadequate, the tenability of such relation is rejected.

As a class of research tool, the SEM approach encompasses diverse statistical techniques such as path analysis, CFA, casual modeling with latent variables, and even analysis of variance and multiple linear regressions. Several aspects of SEM set it apart from the older generation of multivariate procedure. First, as noted above, it takes a confirmatory rather than an exploratory approach to the data analysis (although aspects of the latter can be addressed). Further, it demands that the pattern of inter-variable relations be specified at priori and SEM lends itself well to the analysis of data for inferential purposes. By contrast, most other multivariate procedures are essentially descriptive by nature (e.g. EFA) so that hypothesis testing is difficult, if not impossible. Second, whereas traditional multivariate procedures are incapable of either assessing or correcting for measurement error, SEM provides explicit estimates of these error variance parameters. Third, SEM procedures incorporate both unobserved (i.e. latent) and observed variables. Given these highly desirable characteristics, SEM has become a popular methodology. A brief summary of the key characteristics of SEM are listed below:

(i) As mentioned, SEM is a priori and requires researchers to think in terms of models. But, being a priori does not mean that it is exclusively confirmatory. Many application of SEM are a blend of exploratory and confirmatory analyses.

(ii) The explicit representation of the distinction between observed and latent variables is characteristic of many structural equation models. This distinction makes it possible for researchers to test a wide variety of hypotheses.

(iii) The basic statistic in SEM is the covariance. It is possible, however, to analyze other types of data such as means or averages.

(iv) The technique of SEM is not just for non-experimental (co-relational) data. Instead, it is a very flexible analytical tool, which can be applied to data from experiments too.

(v) Many standard statistical procedures including multiple regressions, canonical correlation and the analysis of variance (ANOVA) can be viewed as special cases of SEM.

(vi) SEM is a still a large-sample technique. That is, most application of SEM requires large samples.

(vii) It is possible to test many different types of effects for statistical significance in SEM but the role of statistical tests in overall analysis is often less important compared with more traditional techniques.

The process of developing and analyzing a structural equation model, the following steps are outlined:

Step 1: Identify the research problem

The first stage in identifying the research problem is to develop hypotheses about the relationships among variables that are based on theory, previous empirical findings or both. These relationships may be direct or indirect whereby intervening variables may mediate the effect of one variable on another. Next stage is to outline the model by determining the number and relationships of measured and latent variables. Care must be taken in using variables that provide a valid and reliable indicator of the constructs under study. A path diagram depicting the structural and measurement models will guide in identifying the model.

Step 2: Identify the Model

Identifying the model is a crucial step in model development as decisions at this stage will determine whether the model can be feasibly evaluated. For each parameter in the model to be estimated there must be at least as many values (i.e. variance and covariance values) as model parameters (e.g. path coefficients, measurement error). A model that has fewer of these values than parameters is referred to as under identified and impossible to solve mathematically. This problem also occurs when variables are highly inter-correlated (i.e., multicollinearity) or the scales of the variables are not fixed (the path from a latent variable to one of the measured variables must be set as a constant). These problems may be remedied with the addition of independent variables, which requires that the model be conceptualized before data are collected.

Step 3: Estimate the Model

There are many estimation procedures available to test models. Maximum likelihood (ML) is set as the default estimator in most SEM software. It is an iterative process that estimates the extent to which the model predicts the values of the sample covariance matrix with values closer to zero indicating better fit. The estimate maximizes the likelihood that the data were drawn from its population. The estimates require large sample sizes but do not usually depend on the measurement units of the measured variables. It is also robust to non-normal data distributions (Muthén, 1993). Another widely used estimate is least squares (LS) which minimizes the sum of the squares of the residuals in the model. LS is similar to ML as it also examines patterns of relationships. However, LS determine the optimum solution by minimizing the sum of the squared deviation scores between the hypothesized and observed model. It often performs better with smaller sample sizes and provides more accurate estimates of the model (Hu and Bentler, 1998). The third, asymptotically distribution free (ADF) estimation procedures (also known as weighted least squares) are often used but may be appropriate if the data are skewed

or peaked. This method requires sample sizes of two hundred to five hundred to obtain reliable estimates for simple models and under-estimate model parameters (Hu et al., 1992).

Step 4: Determination of the model's goodness of fit

These estimation procedures determine how well the model fits the data. There are many indices available with most ranging from 0 to 1 with a high value indicating a great degree of variance in the data accounted for by the model. The comparative fit index (CFI) is most commonly used and compares the existing model with a null model. A good fit is also represented by low residual values (e.g., .00), which represents the amount of variance not accounted for by the model. These are calculated as indices such as the root mean square error of approximation (RMSEA), which is the square root of mean differences between the estimate and the true value. Another goodness-of-fit statistic commonly reported is χ^2, which assesses the likelihood that the differences between the population covariance matrix and model implied covariance matrix are zero. This statistic, however, varies as a function of sample size, cannot be directly interpreted (because there is no upper bound), and is almost always significant. It is useful, however, when directly comparing models on the same sample. In summary, when evaluating fit statistics, CFI values $\geq$ .90 and RMSEA < .05 are considered adequate. To determine the model's goodness-of-fit, sample size is an important consideration. It must be large enough to obtain stable estimates of the parameters. Using a large sample reduces the likelihood of random variation that can occur in small samples (Bentler, 1999), but may be difficult to obtain in practice.

Step 5: Re-specify the model if necessary

To obtain improved fit results, the above sequence of steps is repeated until the most succinct model is derived (i.e., principle of parsimony). A recommended procedure to improve the model estimations is through examination of the size of the standardized residual values between variables. Large residuals may suggest inadequate model fit. This can be addressed by the addition of a path link, or inclusion of mediating or moderating variables (if theoretically supported). Once the model is re-calculated, its fit may show improvement and residual may be reduced. These results then need to be confirmed on an alternate sample, and through further studies. This replication strengthens confidence in the inferences, and provides implications for theoretical development and practical application.

SEM as a multivariate technique has been employed in Chapter 8; and for the same AMOS 18.0 has been used.

3.7.1 Application of SEM in healthcare

Kui-Son Choi et al. (2005) investigated the structural relationships between out-patient satisfaction and service quality dimensions under a South Korea health care system where patients have substantial freedom in choosing their medical service providers and to further study the causal relationship between service quality and satisfaction between out-patients subgroups obtained on the basis of gender, age and types of services received. After assessing the construct validity of the service quality dimensions based on confirmatory factor analysis, a path model specifying the relationships between service quality dimensions and patient satisfaction was estimated. Results indicated that the general causal relationship between service quality and patient satisfaction was well supported in the South Korean health-care delivery system. An examination of the estimated path coefficients showed that the pattern of relationships between service quality and patient satisfaction was similar across the gender, age, and service type subgroups. Rad et al. (2010) investigated the influence of healthcare service quality on loyalty of international patients that come to Malaysia. . They used CFA and SEM to establish the relationship between service quality and loyalty. The study findings revealed a positive relationship between healthcare service quality and overall loyalty. Lertwannawit and Guild (2011) performed a quantitative study using four hundred medical tourists response from private hospitals in Thailand. They used structural equation modeling to test the hypothesis and the result indicated significant positive relationship between service quality and loyalty. Haque et al. (2012) studied the impact of patient perceived service quality on satisfaction for private health centre in Malaysia using structural equation modeling approach. The results confirms the existence of a very strong relationship between personnel support and customer satisfaction, implying that excellent positive outcome can only be achieved through the rigorous implementation of various support procedures as well as increasing the facilities related to improve customer's satisfaction, which appears to be directly related to the patients of the hospital. Omar et al. (2009) investigated the impact of customer's perceived service quality on satisfaction and trust using SEM. The findings unveil that perceived service quality is positively related to satisfaction and trust in Malaysian childcare setting. Sahin et al. (2007) performed SEM to determine the influence of patient characteristics on patient satisfaction. The results of SEM analysis showed that fifteen percent of the total variance in patients' satisfaction was explained by the model. Badri et al. (2009) presented a comprehensive structural equation based service quality and patient satisfaction model taking into account the patient's condition before and after discharge. The goodness-of-fit statistics supported the healthcare quality-patient status-satisfaction model.

3.8 Conclusions

This chapter outlines the important statistical tools, methods and techniques based on the proposed research objectives (Chapter 1). This chapter also demonstrates the significance, usage and broad application of suitable methods to meet the research objectives. Methods discussed in various sections are suitable for the present study. There are many more competing methods. However the aforesaid methods are found to be reasonably good because they have already been tested in other fields. Prior to the said exploration, in Chapter 4, the identification of scale items for assessing medical tourism service quality has been done.

CHAPTER 4

ASSESSMENT OF MEDICAL TOURISM SERVICE QUALITY: AN INDIAN PERSPECTIVE

4.1 Introduction

Service quality defined as patients' self-reported experience of care is a useful metric for evaluating health care quality. Service quality in healthcare is measured by asking patients about their experience. Several tools have emerged to continuously monitor healthcare processes and to improve and control different areas of care. Moreover, patient perceptions of health care quality are critical to health care organization's overall success. The perception of service quality enables the healthcare providers to identify various dimensions that lead to patient satisfaction. Literature review presented in the Chapter 2 reveals a gamut of dimensions and variables responsible for patient satisfaction. Moreover, extensive studies on patient's perception of medical tourism service quality have not been made out in Indian context and little is known about the satisfaction of international patients coming as medical tourists to India. Therefore, medical tourism in India is struggling to obtain feedback regarding its own healthcare service quality. Another concern is to implement appropriate strategies for medical tourism as medical tourists' preferred destination to gain competitive advantage. Hence, it is vital for healthcare providers to be intensely aware of what the medical tourists look for while evaluating the healthcare service. In such a competitive environment, critical factors for medical tourism service quality need to be identified so that healthcare service providers position India as the most preferred global medical tourism hub. In this chapter, an attempt has been made to analyze medical tourist's perception of healthcare quality and develop a medical tourism service quality construct in Indian context. It is to be noted that patient perception influence the overall healthcare service quality. A questionnaire survey was conducted by collecting data from medical tourists to India. The responses are analyzed using exploratory factor analysis and ten factors are extracted and interpreted. Later the medical tourist's perception score is analyzed on the basis of medical tourism service provider's accreditation status. This chapter also identifies and highlights several key areas where improvement is needed in order to advance service quality for medical tourists to India.

4.2 Development of MTSQ instrument in Indian context

According to Sitzia and Wood (1997), patients have emerged as the core concern in healthcare provision and quality assurance efforts. In such a competitive environment, focusing on healthcare service quality measurement precisely in the context of medical tourist' perception is of real challenging and vital for all the stakeholders. A survey using a questionnaire is widely accepted as a method for measuring medical tourism service quality (MTSQ) shown in Appendix 4.1. Fifty two items on overall healthcare service quality that constitute the questionnaire are selected through a review of related literature and theory as well as

discussion with a group of experts in the field comprising of academicians, healthcare managers and healthcare administrators . The items in the questionnaire covering various areas of MTSQ are shown Table 4.1. All the items are relevant to healthcare service. The questions are framed to suit the healthcare practices. Before conducting the survey, the questionnaire was discussed with focus groups in medical tourism industry to ensure face validity.

Table 4.1 Medical tourist's perception about MTSQ

Item No.	MTSQ Measurement Items	Source
1	Website provides adequate information on illness treatment	Expert-opinion
2	Online pre-consultation of doctors	Expert-opinion
3	Fast and errorless online registration facility	Lawthers et al. (1999)
4	The 24 × 7 contact centre and toll-free help lines always willing to help	Expert-opinion
5	Medical treatment location has excellent connectivity by air/railways	Das et al. (2007)
6	Adequate transportation facilities by the medical care unit	Chaudhary (2000); Yen et al. (2008)
7	Guaranteed reservation by the medical care unit	Alen et al. (2006)
8	Hospital provides sufficient assistance in obtaining the medical visa	Expert-opinion
9	High level of transparency by the employees of the hospital	Abramowitz et al. (1987)
10	High level of safety while availing the hospital facilities	Abramowitz et al. (1987)
11	Employees of hospital protects from crime and terrorist-related problems	Dotson et al. (2008)
12	Good tie-up of the hospital with insurance companies	Self-developed
13	Accreditation of medical care unit is globally accepted	Mattoo and Rathindran (2006); Van Niekerk et al. (2003)
14	State-of-the-art diagnostic centre	Duong et al. (2004)
15	Payment facility is easy and flexible	Haddad et al. (1998)
16	Healthy, neat and clean environment	Alen et al. (2006); Rao et al. (2006); Ruiqi and Adrian (2009); Hansen et al. (2008)
17	Hospital provides sufficient employees for treatment	Duong et al. (2004)
18	Employees in hospital regularly monitor and assure recovery	Expert-opinion
19	Highly qualified and globally trained doctors	Tung and Chang (2009)
20	Significant cost saving on the medical treatment	Riser (1975); Hansen et al. (2008)
21	Good value for money against the medical tourism travel	Haddad et al. (1998)
22	Routine visit of doctors and staffs	Haddad et al. (1998)
23	Employees of the hospital are consistently courteous and respectful	Hansen et al. (2008); Duong et al. (2004)
24	The behavior of hospital employees build emotional and psychological confidence	Fowdar (2008)

25	Fast response to the questions and worries by the hospital's employees	Andaleeb (2008)
26	Employees of the hospital are trustworthy	Fowdar (2008); Hansen et al. (2008)
27	Employees of hospital provide undivided attention	Rao et al. (2006)
28	Foreign exchange facilities are provided within the premises	Narayan et al. (2008)
29	24 x 7 internet connectivity inside the premises	Narayan et al. (2008)
30	24 x 7 STD/ISD connectivity inside the premises	Narayan et al. (2008)
31	Quality and variety of food with multi-cuisine dining hall	Alen et al. (2006); Das et al. (2007)
32	Hospital offers alternative therapy	Self-developed
33	Spiritualism/meditation programme is also provided with general treatment	Self-developed
34	The prescribed medicines are available inside the premises	Fowdar (2008); Rao et al. (2006)
35	Round-the-clock pharmaceutical service	Rao et al. (2006)
36	Adequate information/travel desk counters to cater to specific needs	Rao et al. (2006)
37	Hospital's information and advertisement about the country's cultural heritage is adequate	Yen et al. (2008); Narayan et al. (2008); Chaudhary (2000)
38	Hospital keeps treatment records confidential	Fowdar (2008)
39	The attitude of local people is excellent	Das et al. (2007); Narayan et al. (2008)
40	Excellent recreational service during the period of therapy	Narayan et al. (2008)
41	Good tie-up with external travel agencies	Das et al. (2007)
42	Waiting time for medication is short	Hansen et al. (2008); Lawthers et al. (1999)
43	Waiting time for the doctors' examination is short	Boos et al. (2001)
44	Short-time stay in hospital	Rao et al. (2006)
45	Faster in admission and discharge procedures	Weingart et al. (2005)
46	Sufficient healthcare infrastructure	Das et al. (2007); Narayan et al. (2008); Yen et al. (2008)
47	Employees in hospital clearly communicate about the diagnosed illness and treatment	Andaleeb (2008)
48	Hospital keeps its promises it makes	Ruiqi and Adrian (2009
49	Purpose of medical tourism travel is fulfilled	Self developed
50	Communicate positive things about the hospital to other people	Brown and Swatz (1989); Parasuraman et al. (1988); Crosby and Stephens (1987)
51	Recommend the hospital to friends, relatives and people who seek advice	Aydin and Ozer (2005); Collier and Bienstock (2006)
52	Willingness to visit the hospital for further/follow-up treatments	Expert-opinion

4.2.1 Data collection

The questionnaire used in this research contains fifty two items and respondents are requested to respond by indicating their level of agreement for each item on a five-point Likert-type scale (1-Strongly Disagree and 5-Strongly Agree). The responses are collected from medical tourists and tourist's companions across India through face-to-face interview. The perceptions on fifty two items from respondents are compiled. The perception of the medical tourists in each item is captured in similar fashion as service quality is measured using performance only (SERVPERF) proposed by Cronin and Taylor (1992) due to its superiority as demonstrated by Brady et al. (2002). The list of medical tourism service providers (Hospitals) in India is selected through accessing different hospital websites, healthcare quality accreditation websites, International medical tourism journal (IMTJ) website, suggestions made by joint commission international (JCI) and personal contacts. This research uses probability as well as non-probability sampling for selecting the healthcare units and respondents. In probability sampling, stratified random sampling is used whereas convenience and judgmental sampling is used for non-probability sampling. Stratified sampling uses random selection of study units from various groups based on similarity in certain characteristics. In non-probability convenience sampling, the study units (the medical tourists and tourist's companions) that happen to be available at the time of data collection are selected for the purpose of convenience. Non-probability judgmental sampling considers different elements of survey design while deciding upon the study units. The survey is conducted through different modes of collecting responses over a period of four months (March 2010-June 2010). The minimum nuber of sample required for the study is one hundred and eighty nine (Nargundkar, 2008) and the process of estimating the sample size is shown in Appendix 4.4. The survey is conducted at seven different Indian hospitals providing healthcare services to medical tourists/international patients. Out of seven hospitals, four hospitals have JCI accreditation and rest three hospitals do not have international accreditation. Four accredited hospitals are randomly selected out of the ten accredited hospitals in India. A total number of three hundred thirty two responses are collected from seven hospitals. Medical tourists, who were seriously ill, admitted in intensive care unit could not provide reliable information and these responses were excluded. Responses are screened based on completeness, rational scoring and adherence to scale and finally, two hundred eighty nine responses (87%) were considered for further analysis.

4.3 Model Development

Explanatory factor analysis (EFA) has been carried out to develop a construct for Medical tourism service quality in Indian context as discussed in section 4.3.1.

4.3.1 Exploratory factor analysis

Two hundred eighty nine useful responses were tested to examine the validity and reliability of the scale so as to obtain a quantitative and statistically proven identification of the responses. The test for quantitative variable was conducted by factor analysis on responses using principal component method followed by varimax rotation to ensure that the variables are important and suitable for the model using SPSS 16.0. The criteria used for factor extraction is based on the eigen value that shall be greater than one but more importantly the factor structure should be meaningful, useful and conceptually sound (Pett et al., 2003). The algorithms for principal component method factor analysis and varimax rotation are given in Appendix 4.2 and Appendix 4.3 respectively. In the initial application, the number of items is reduced from fifty two to thirty six. All thirty six factor loading scores are higher than 0.60 and cross loadings are less than 0.40 which indicates the validity of the construct. In the second application, the thirty six items are categorized under ten factors consisting of various variables for the proposed instrument to measure the perceived medical tourism service quality. The ten quality factors are defined as accessibility/convenience, treatment satisfaction, courtesy, physical environment features, technical quality of care competency, promptness, facility premises, alternative therapy, finance factors for medical services and pharmaceutical services. Sixteen items measuring other factors of service quality were not considered for further analysis due to their low loadings (less than 0.60) to any factor. They refer to items 2, 3, 5, 6, 11, 15, 16, 17, 18, 25, 31, 39, 41, 42, 48 and 49.

Percentage of total variance explained was found to be 73.93% which is higher than 60%, an acceptable value for the principal component varimax rotated factor loading procedure and indicates the validity of the instrument (Johnson and Wichern, 2002). Eigenvalue greater than one is rotated using the oblimin direct with Kaiser Normalization procedure (Kaiser, 1974). Eigen values range from 2.456 to 6.090. The internal consistency of survey data were tested by computing the Cronbach's Alpha (α) for reliability of the instrument. The value of alpha for each factor is shown in Table 4.2 and the value of alpha for all dimensions is 0.909, which is well above the acceptable value of 0.70 for demonstrating internal consistency of the established scale (Nunnally, 1988) and considered acceptable for the factor to be reliable (Hair et al., 2006). The value of Kaiser–Meyer–Olkin (KMO), which is a measure of sampling adequacy, was found to be 0.782 indicating that the factor analysis test has proceeded correctly and the sample used is adequate as the minimum acceptable value of KMO is 0.5 (Othman and Owen, 2001). It can be further concluded that the matrix did not suffer from multicollinearity or singularity. Bartlett's

test of sphericity ($p < 0.05$) is used to test empirically whether the data were likely to factor well (Bikker and Thompson, 2006; Kaiser, 1974) The result of Bartlett's test of sphericity shows that it is highly significant (sig. = 0.000), which indicates that the factor analysis is correct and suitable for testing multidimensionality (Othman and Owen, 2001). Therefore, the statistical tests indicated that the proposed items and all factors of instruments are likely to factor well and the questionnaire is multidimensional.

Table 4.2 Factors loading score

Factors	Measurement items	Factor Loading	Cronbach Alpha	Cumulative % of Variance
Accessibility/ Convenience	1: Website provides adequate information	0.795	0.89	13.78
	4: The 24/7 contact centre	0.843		
	8: Medical visa assistance	0.629		
	9: High level of transparency	0.748		
	40: Excellent recreational service	0.715		
Treatment Satisfaction	47: Transparency in communication	0.693	0.95	26.181
	50: Communicate positive things	0.754		
	51: Recommend	0.809		
	52: Follow up treatments	0.801		
Courtesy	23: Consistently courteous and respectful	0.741	0.86	35.397
	24: Emotional & psychological confidence	0.744		
	26: Trustworthy	0.673		
	27: Provide undivided attention	0.606		
Physical environment features	7: Guaranteed reservation	0.808	0.88	44.898
	36: Adequate information / travel desk	0.683		
	37: Adequate information on cultural heritage	0.684		
	38: Confidential treatment records	0.771		
	10: Safety and security	0.708		
Technical quality of care competency	12: Tie-up with insurance companies	0.688	0.91	52.196
	13: Global accreditation	0.729		
	14: State of art diagnostic centre	0.671		
	46: Health care infrastructure	0.645		
	19: Highly qualified doctors	0.610		
Promptness	43: Waiting time	0.737	0.83	57.201
	44: Short time stay in hospital	0.788		
	45: Faster in admission and discharge procedures	0.671		
	22: Routine visit of doctors and staffs	0.736		
Facility Premises	28: Foreign exchange facilities	0.824	0.81	62.519
	29: 24x7 internet connectivity	0.755		
	30: 24x7 STD / ISD connectivity	0.771		

Alternative Therapy	32: Hospital offers alternative therapy	0.772	0.71	67.099
	33: Spiritualism / meditation program	0.844		
Finance factors for medical services	20: Significant cost saving	0.881	0.86	70.591
	21: Good value for money	0.686		
Pharmaceutical services	34: Availability of prescribed medicines	0.614	0.73	73.935
	35: Round the clock pharmaceutical service	0.664		

The percentage of variation explained by factor analysis with varimax rotation is explained in Table 4.3. Accessibility/convenience happens to be the most important factor whereas pharmaceutical services are the least important factor. Treatment satisfaction is considered to be the next vital factor followed by courtesy, physical environment features and technical quality of care competency. Promptness is the sixth ranked factor followed by facility premises, alternative therapy and finance factors for medical services.

Table 4.3 Percentage of variation explained by factor analysis

Factors	Percentage of commonality variance explained	Ranking of factors
Accessibility / Convenience	15.405	1
Treatment Satisfaction	9.577	2
Courtesy	8.764	3
Physical environment features	7.609	4
Technical quality of care competency	6.761	5
Promptness	6.288	6
Premises	5.079	7
Alternative Therapy	4.926	8
Finance factors for medical services	4.812	9
Pharmaceutical services	4.709	10

4.4 Results and discussions

Amongst two hundred eighty nine respondents, one hundred ninety two (66.4%) are male and ninety seven (33.6%) are female. The average age was 43.5 years with the range between 20 years and 72 years. 59.2% of the medical tourists are employed in service, 28.7% are self-employed and 12.1 % are found housewives. Out of the total two hundred eighty nine medical tourists interviewed, one hundred twenty four (42.9%) are from the United Arab Emirate (UAE), forty one (14.2%) from European countries, forty nine (17%) from USA (United States of America) and Canada, thirty seven (12.8%) from SAARC countries, twenty eight (9.7%) from African countries and ten (3.5%) from Australia. Sixty two (21.5%) medical tourists have income level less than USD 10000, sixty eight (23.5%) have income level between USD 10000-20000, one hundred seventeen (40.5%) have between USD 20000- 30000, twenty seven (9.3%) have

between USD 30000-50000 and fifteen (5.2%) patients have income level more than USD 50000 per annum. Out of the two hundred eighty nine respondents, one hundred ninety seven (68.2%) are married, fifty three (18.3%) are single and rest thirty nine (13.5%) are divorced. The medical tourists are admitted to various inpatient departments of the selected hospitals for treatment of various ailments like Gastroenterology (22.1%), ENT (11.1%), Urology (18%), Cardiology (12.5%), Orthopedics (12.5%), Gynecology (9.7%), Nephrology (5.5%), General Surgery (5.9%) and Ophthalmology (2.8%) shown in Table 4.4.

Table 4.4 Type of treatment

Type of treatment	Percentage
Gastroenterology	22.10%
ENT	11.10%
Urology	18.00%
Cardiology	12.50%
Orthopedics	12.50%
Gynecology	9.70%
Nephrology	5.50%
General Surgery	5.90%
Ophthalmology	2.80%

The average perception of thirty two items loaded on various factors are plotted in Figure 4.1. It is observed that item 13 (Accreditation of healthcare) has the highest average mean value of 4.4 followed by item 42 (Short waiting time for medication) with average mean value of 4.39. Therefore, it can be inferred that medical tourists perceive accreditation of the hospital as crucial role in selecting the medical tourism service provider. The medical tourists accept the accreditation of the hospital for safety and quality healthcare standards. The short waiting time for medication signify early diagnosis of the illness, prompt investigation and early recovery. This is followed by item 34 (Availability of prescribed medicines inside the premises) with mean 4.35 and item 30 (24x7 STD/ISD connectivity inside the premises) with mean 4.34. The availability of prescribed medicines inside the premises entails time saving, relieving from anxiety in complex situations, timely consumption of medicines and transportation hindrance. The round-the-clock STD/ISD connectivity inside the premises enables the patients and their companions to interact with their friends and relatives at their home country. The least average mean is found to be 3.46 for item 8 (Medical tourism provider’s assistance in obtaining the M-

visa (medical visa)). The service provider must ensure sufficient assistance in providing the M-visa to the patients by building rapport with the government agencies and the medical tourism intermediaries. The augmented service to the patients will certainly provide enormous information about government's relaxation criteria and other related benefits towards M-visa.

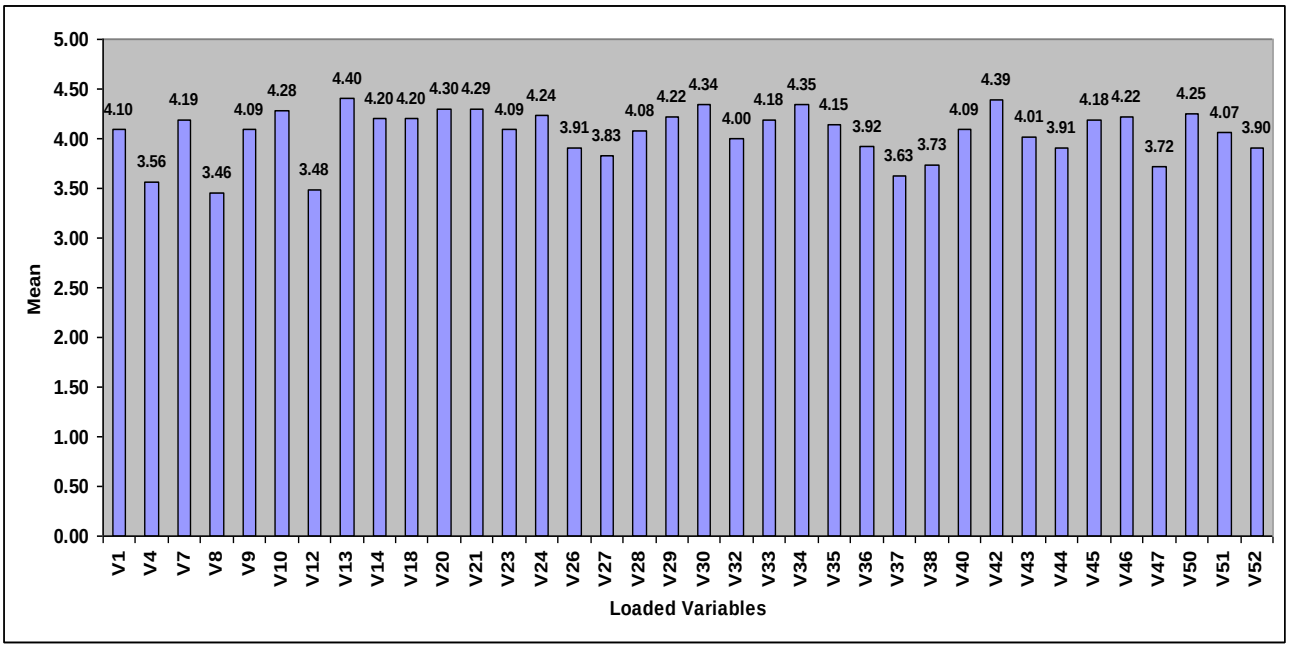


Figure 4.1 Average perception of medical tourism service quality items

Figure 4.2 illustrates difference of average perception of loaded items between accredited medical tourism service providers and non-accredited providers. It is found that average perception vary widely on the basis of JCI accreditation, a global accreditation for the medical tourists. The figure expose that the mean score for the accredited medical tourism service providers is more than that of non-accredited medical tourism service providers for almost all the items. The maximum difference is observed for the item 13 (Global accreditation of medical care unit) and item 23 (Employee of the hospital are consistently courteous and respectful). In this context, the Indian Ministry of Health had already recommended accreditation of healthcare facilities in India. However, the Government of India along with the health ministry should aggressively implement quality and safety of healthcare as per the quality manuals and promote the accredited healthcare infrastructures worldwide. The accredited healthcare service firms in India should also look for an opportunity in collaborating with international healthcare institutions. However, mean score for non-accredited hospital is more than the accredited

hospitals in two items such as item 21 (Good value for money against the medical tourism travel) and item 34 (The prescribed medicines are available inside the premises).

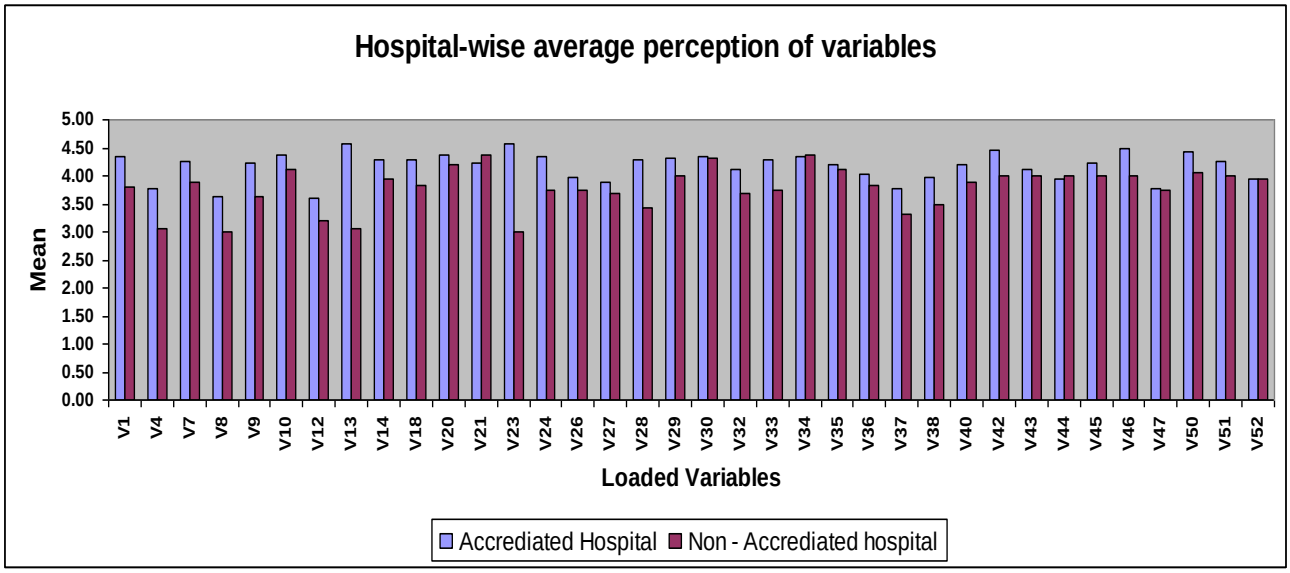


Figure 4.2 Average perception of items based on accreditation

Hence, the Indian Ministry of Health should investigate, analyze and recommend standardization of cost factor in treatment. The Indian Pharmaceutical sector must ensure an effective physical distribution system so that the international patients avail the prescribed medicine inside healthcare premises. Interestingly, mean score is same for both accredited service providers and non-accredited service providers for item 52 (Willingness to visit the hospital for further/follow up treatments). This indicates that the medical tourists to India are overall satisfied with the healthcare services rendered to them.

In order to test the significant difference between mean in accredited hospitals and mean in non-accredited hospitals, t-test for means is carried out. The t-test is conducted using SPSS VERSION 19.0 software. For the item V_1, it is observed that there is a significant difference in the scores for mean in accredited hospitals (M=4.4, SD=0.7) and mean in non-accredited hospitals (M=3.76, SD=1.37) conditions; t (287) = 5.58, p = 5.29709E-08. Similarly for item V_{10}, it is found the similar result in the scores for mean in accredited hospitals (M=4.6, SD=0.565) and mean in non-accredited hospitals (M=4.1, SD=0.76) conditions; t (287) = 4.41, p = 1.23119E-05. Moreover a paired sample t-test is carried to test the significant difference between mean in accredited hospitals and mean in non-accredited hospitals for all the items. The hypothesis set is as follows:

Null hypothesis: H0: Mean in accredited hospitals = Mean in non-accredited hospitals.
Alternate hypothesis: H1. Mean in accredited hospitals ≠ Mean in non-accredited hospitals.
For the hypothesis, the result shows a Paired t (35) = = 8.111, p <. 001 so as to reject the null hypothesis. It implies that there is a significant difference between mean in accredited hospitals and mean in non-accredited hospitals for all the items.

4.5 Conclusions

The vital challenge for the medical tourism service providers in India is to develop a better understanding of the key components comprising medical tourist's requirements and their perception of quality in healthcare. The convincing approaches need to be evolved to develop constructs to measure service quality in medical tourism. In this research, an instrument is proposed for reliably measuring the satisfaction level of medical tourists. The instrument consists of ten dimensions with thirty-six items. The dimensions have been extracted through factor analysis using the data collected through a broad-based survey. It is important to note that some of the variables that appear in this instrument specifically suit to the Indian conditions and hardly appear in the literature (e.g. item 32 and item 33). This research reflects the difference in the healthcare service in India in respect to its potential competitors. The reliability of the scale is verified by calculating Cronbach's alpha,and factor analysis has proceeded in correct fashion as indicated by KMO and Bartlett statistics. This research highlights various service quality issues for improvement. Accessibility/convenience happens to be the most important factor whereas a pharmaceutical service is the least important factors. Treatment satisfaction is considered to be the next vital factor followed by courtesy, physical environment features and technical quality of care competency. Promptness is the sixth ranked factor followed by facility premises, alternative therapy and finance factors for medical services. The accredited and non-accredited hospitals in India need to take appropriate decisions in enhancing satisfaction levels of the medical tourists in efficient manner. The Indian Ministry of Health's proactive recommendations for accrediting more hospitals and government's intervention in relaxing M-visa will certainly help medical tourists to avail safe and quality medical tourism service. The ten dimensions are shown in Figure 4.3 to assist the policy planners of the hospitals to develop strategies for improving satisfaction level of international customers. Thus, culturally rich India with its subsidized cost of medical facilities will become one of the most preferred medical tourism destinations in the world. The managers of healthcare service providers may find insights into the satisfaction of international patients and formulate policies to attract medical tourists to contribute national economy positively.

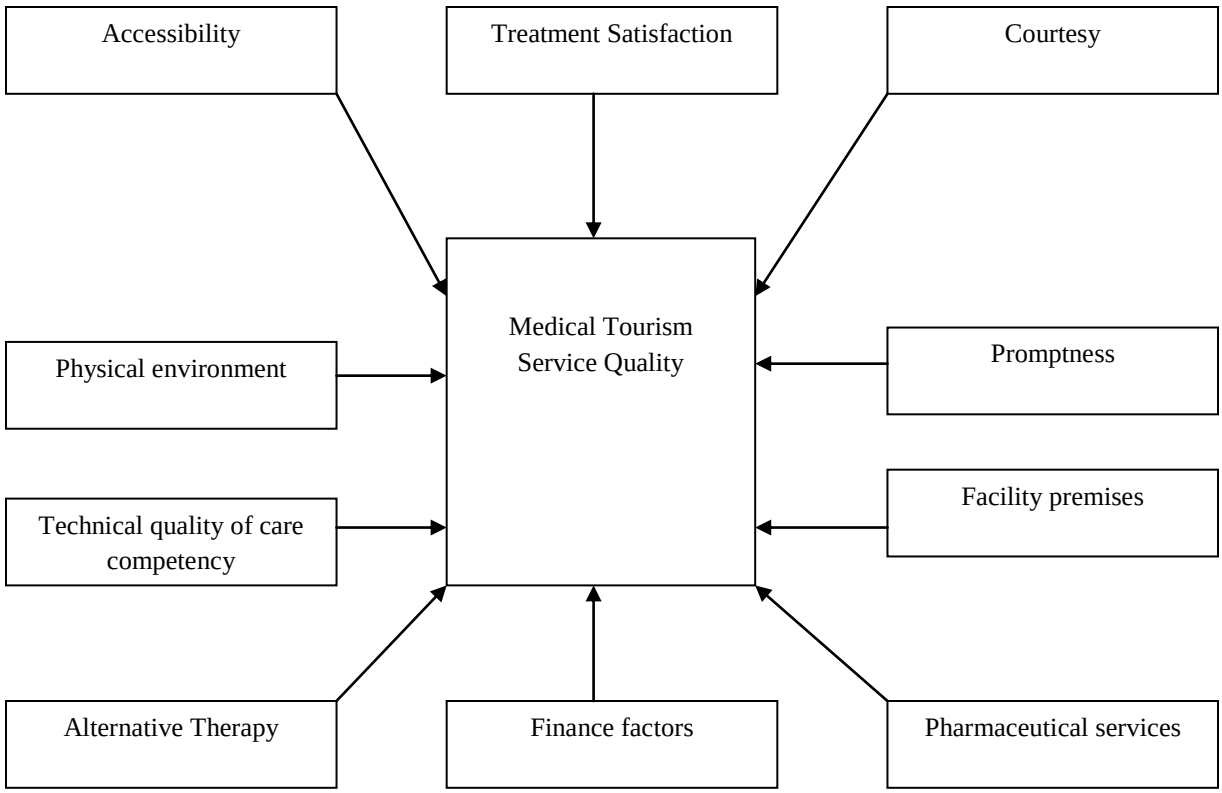


Figure 4.3 Medical tourism service quality model in India

CHAPTER 5

INTERRELATIONSHIP BETWEEN MEDICAL TOURISM ENABLERS

5.1 Introduction

In the previous chapter, critical factors for medical tourism service quality have been discussed. However, the medical tourism sector faces various challenges that might be of prime concern for the medical tourists in choosing the desirable medical tourism destination. One such challenge is that India as a country suffers from an image of poverty and poor hygiene discouraging many patients (Begde, 2008). A study by Cherukara and Manalel (2008) describe "Insurance related problems" and "Risk of legal actions related to consumer satisfaction" as the major medical tourism challenges. The International Medical Travel Journal conducted The Medical Tourism Climate Survey in 2011. It examined the current challenges and opportunities in the medical tourism sector viz., increasing competition, lack of coordination and integration within the industry, lack of quality standards and international standards, lack of transparency, lack of understanding of industry by patients, poor marketing, and product and service differentiation. A study of problems and challenges faced by medical tourists to India has been conducted in 2011 by Ministry of Tourism in India. This report describes Medical tourism challenges as follows:

1. India has only 16 Joint Commission International (JCI) accredited and 63 National Accreditation Board for Hospitals and Healthcare Providers (NABH) accredited hospitals (as on 25.1.2011) - Lack of accreditation.
2. Language related problems in case of non-English speaking customers - Lack of interpreters.
3. Lodging arrangements inadequate - Lack of accommodation facilities.
4. Indian medical tourism not aggressively promoted by Government - Lack of Government's involvement.
5. Competition from neighboring countries especially Thailand and Singapore - Global competition.
6. General infrastructure is not impressive - Lack of healthcare infrastructure facilities.
7. Cost of Medical visa is inhibitive. It is almost twice the cost of tourist visa - Low National Healthcare Policy.
8. Differential pricing - Lack of top management commitment
9. There is no institutional tie-up of Indian hospitals with insurance companies in western countries - Lack of medical insurance coverage.
10. Lack of international healthcare collaboration and lack of research in medicine.

Extensive literature review in Chapter 2 reveals a number of challenges faced by the medical tourism industry. In this chapter these challenges are considered as medical tourism

enablers, which influence the medical tourist's perception about medical tourism service quality. This chapter also describes the interrelationships between the medical tourism enablers, classification or grading of the enablers and quantified measure of the importance of the enablers so that the more important enablers get greater management attention.

5.2 Medical tourism enablers

Based upon the literature survey (Begde, 2008; Cherukara and Manalel, 2008; Kalshetti and Pillai, 2008; Gopal, 2008; George and Nedelea, 2009; Matto and Rathindran, 2006; Bhargava et al., 2005; Peters et al., 2002; Sarin and Lodge, 2007; Kaur at al., 2008; Cohen, 2010; Prasad, 2008; Acharya, 1994; Bergman and Klefsjö, 2007) and expert opinion, eleven key enablers of medical tourism in India have been identified. They are discussed in brief as follows:

5.2.1 Medicine insurance coverage

In recent years, there has been a liberalization of the Indian healthcare sector to allow for a much-needed private insurance market to emerge. According to a study by the New Delhi-based PHD Chamber of Commerce and Industry, the healthcare insurance is projected to grow up to USD 5.75 billion in next few years. Moreover, the Insurance Regulatory and Development Authority (IRDA) eliminated tariffs on general insurance as of January 1, 2007. Removal of tariffs will result in wider acceptance of individual health coverage making healthcare more affordable to larger segments of the populace. Another challenge is that the foreign insurance companies are not willing to extend their coverage for treatments in low cost countries such as India due to concerns about the quality of health services offered. The insurers are also concerned with the absence of malpractice law in a foreign jurisdiction in which case the patient will have no recourse to his/her healthcare expenses. Indian policy makers need to find ways to improve upon the existing situation in the health sector and to make equitable, affordable and quality health care accessible to the medical tourists.

5.2.2 Research in medicine and pharmaceutical sciences

Horowitz and Rosensweig (2007) identified India as one of the preferred medical tourism destinations. The growth in foreign patient arrivals to India has usually been pegged at twenty-five percent annually. Therefore, the medical tourism providers seek to develop clinical practice guidelines and foster effective interventions to improve the quality of care for the medical tourists. Research in medicine also measures complex aspects of the healthcare delivery system and patient perceptions of quality of care (Eccles et al., 2003), one of the critical issues in medical tourism.

5.2.3 Medical tourism market

According to George and Nedelea (2009), countries like India, Mexico, Singapore, Brazil, Philippines etc. are actively promoting medical tourism. Generally, medical tourists are the resident of developed industrialized countries and they contribute towards major revenue earnings for many of the countries providing medical tourism. India provides world-class healthcare at substantially less cost. Based on 2002 data, an inpatient knee surgery would cost of USD 10,000 in the USA and only USD 1500 at hospitals in India (Matto and Rathindran, 2006). The low-cost solutions alone may not be enough to bring in international tourists for undergoing healthcare treatments in India. The negative perceptions about Indian medical tourism market with regard to hygiene standards, prevalence of contagious diseases in India, quality of healthcare services provided, and waste management practices counter the positive vibes created by the cost competitiveness of Indian healthcare system. Other infrastructure associated problems such as shortage of air linkages, power, water, and traffic congestions also affect the flow of healthcare tourists towards India.

5.2.4 Healthcare infrastructure facilities

Healthcare infrastructure indicators of India vis-à-vis developed countries highlight the disparity and areas for improvement. Bhargava et al. (2005) have pointed out that healthcare infrastructure facilities and quality of services depend on economic development in the region. This would require sizeable investments for strengthening, upgrading and expanding the medical tourism health infrastructure in India. India needs to upgrade the healthcare infrastructure facilities with regard to improving sanitation standards, health awareness, availability of safe drinking water and nutrition. The government's role in improving the national health indicators should be reiterated through increase in government's budget for medical tourism. Today, there has been a rapid rise in private providers of healthcare (Peters et al., 2002). The Health Ministry must encourage the private player's active participation through benevolent tax structure and fiscal incentives. The concept of telemedicine should be promoted in an attractive manner in order to make more number of players to participate.

5.2.5 International healthcare collaboration

The International healthcare collaboration normally gears towards improving health care access and quality of care across racially and ethnically diverse populations. International healthcare collaboration helps the medical tourism providers in improving their overall efficiency and management of healthcare services. According to Sarin and Lodge (2007), international collaboration such as Cochrane Collaboration help people make well informed decisions about health care by facilitating, maintaining and promising access to systemic reviews of the effects

of health care interventions. Hence, effective communication is of pivotal importance for a successful collaboration (Raza, 2005). Successful collaborators take the initiative in starting and maintaining communication.

5.2.6 Global competition

Global competition is emerging in the medical tourism industry. The patients of developed countries want to avail health care facilities overseas on competitive basis and combine recreational facility during their stay. In 2005, an estimated 500,000 Americans traveled abroad for treatment. 400,000 international patients traveled to Bumrungrad International Hospital in Bangkok, Thailand out of which 55,000 were Americans (Cohen, 2010). In 2004, 1.2 million patients traveled India for healthcare (Schult, 2006). India has also seen the growth in number of Spas in the last few years. The growth in Spas in India is also luring the medical tourists to visit some less-visited corners of India. This has also led to growth of Indian traditional healthcare systems in the domestic as well as in the international scenario.

5.2.7 Transplantation law

Organ transplantation is a revolution in the medical tourism as it has helped in saving the lives of those who would have died otherwise. Kidney, liver, heart, lung, pancreas, and small bowel are some of the organs that can be donated for an organ transplant (Acharya, 1994). The Human Organs Transplant Act (1994) has laid down various regulations that have to be followed while conducting the organ transplantation in India. According to the Act, any unrelated donor has to file an affidavit in the court stating that the organ is being donated out of affection. The Act does not permit medical tourist to India availing organs from a local donor. According to a survey by World Health Organization, Transplantation tourism is emerging in the world scenario with increasing number of patients moving to other destinations like Singapore where the transplantation laws are less rigid.

5.2.8 Top management commitment

According to Bergman and Klefsjo (2007), quality management calls for top management commitment. From the management's perspective, the medical tourism field would benefit from expanding its current interpretation of structure to include broader perspectives on organizational capabilities. Effective organizational capabilities such as leadership, human capital, information management systems and group dynamics are essential structural elements of quality improvement in a health-care organization (Glickma et al., 2007). The quality management has become a priority for senior executives and chief medical officers for successful medical tourism services. These leaders produce ideas, convey new ideologies, and propagate them throughout their organization.

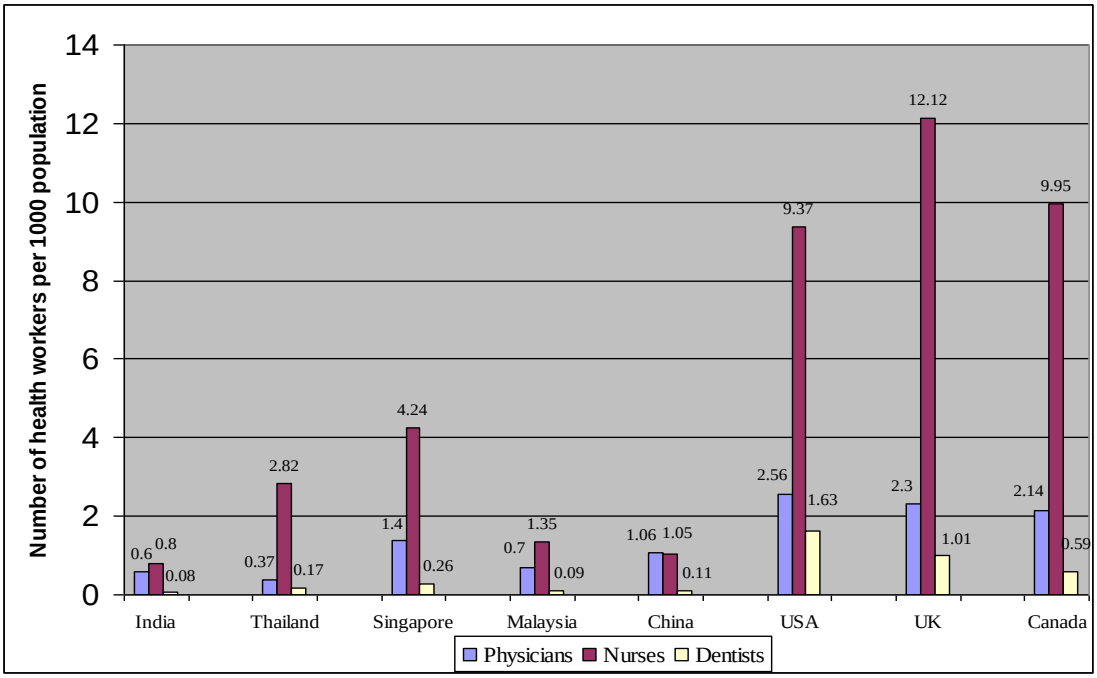
5.2.9 National healthcare policy

Government of India has announced a national health policy and a national tourism policy in 2002. Some references have been made in the national tourism policy with regard to India's potential to tap the tourism market using its healthcare skills including the traditional wellness systems. The realistic formulation of health policies and programs requires a better understanding of health care seeking behavior in terms of utilization of different sources of care (Bhatia and Cleland, 2001). Therefore, there is a need of specific policy focusing on promotion of healthcare tourism with clearly identifying the roles of various segments of players. This would require coordination between the two major government departments viz., Tourism and health. Consultations may also be necessary with other departments/agencies/organizations such as Ministry of External Affairs, immigration department, tourism promotion organizations, state governments, Indian healthcare federation, association of travel agents, tour operators and hotels.

The real change in the pharmaceutical science arrived in the mid-1990s when India signed the World Trade Organization (WTO) TRIPS agreement (Trade-Related Aspects of Intellectual Property Rights). As a result of signing this agreement, India began its own serious innovative research in Pharmaceutical Science.

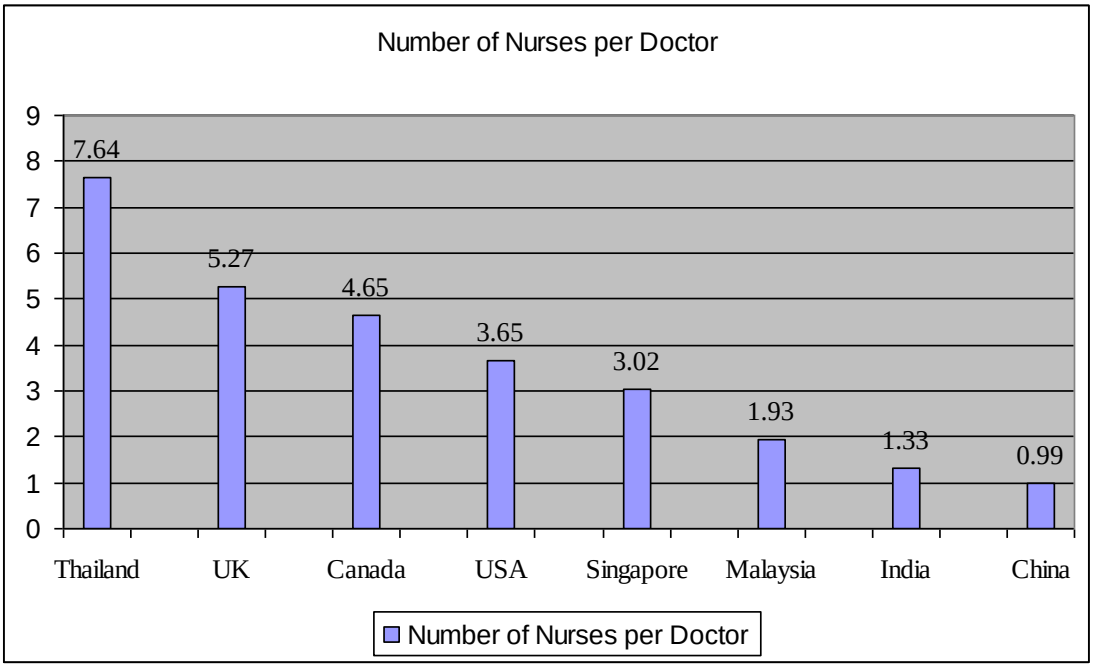
5.2.10 Competent medical and para-medical staff

India has over 600,000 physicians with a density of 0.60 physicians per 1000 population is shown in Figure 5.1. However, there is a shortage of qualified specialist nurses and paramedical professionals and so qualified hospital administrators. Number of nurses per doctor in India is estimated to be 1.33 as compared to 5.27 in UK and 4.67 in Canada (Figure 5.2). Thailand, another developing country competing in the world healthcare tourism market has 7.64 nurses per doctor. One of the main reasons for low ratio of nurses to doctors in India is cross-border movement of nursing professionals from India.



Source: Working Together for Health, World Health Report, 2006, World Health Organisation, 2006

Figure 5.1 Distribution of health workers in selected countries



Source: Working Together for Health, World Health Report, 2006, World Health Organisation, 2006

Figure 5.2 Nurse-doctor ratios in select countries

5.2.11 Efficient Information system

The use of efficient information technology in health care is rapidly intensifying. The widespread adoption of patient care information systems (Berg, 1999) is encouraging health care reform. However, the implementation of efficient information systems in health care practices is full of risks and dangers. According to Dick et al. (1997), the more comprehensive the technology, the more difficult it appears to achieve success. In addition to digitizing the information that medical tourism providers use to care for their patients within organizations, clinicians, patients, and policymakers are looking ahead to sharing appropriate information electronically among organizations.

5.3 Interrelationship between medical tourism enablers

Based on the literature review and the views of experts, a list of eleven medical tourism enablers has been identified. Although the descriptions use for the enablers have been taken from literatures discussed earlier, they are briefly defined in Figure 5.3. The contextual relationship is undertaken through brain storming process of experts from industry and academia. A total of twelve experts from various facets of the industry (such as healthcare industry, healthcare institutions and medical tourism consultancy firms) are consulted for the development of contextual relationship of different enablers using ISM methodology. The experts are chosen according to their experience (about 20 years on an average) in the industry and their willingness to participate. First, introductory brain storming session and personal interview is held to introduce the research agenda and its significance. Final brainstorming session is conducted after a week wherein many enablers identified through literature review were discussed and finally eleven enablers are compiled for the modeling. Secondly, the eleven enablers are then sought and their responses are used to apply the ISM technique in order to place them in a hierarchy and show their contextual relationships. It led to the development of initial relationship matrix and final relationship matrix. Further, the same responses have been used in the MICMAC analysis as well.

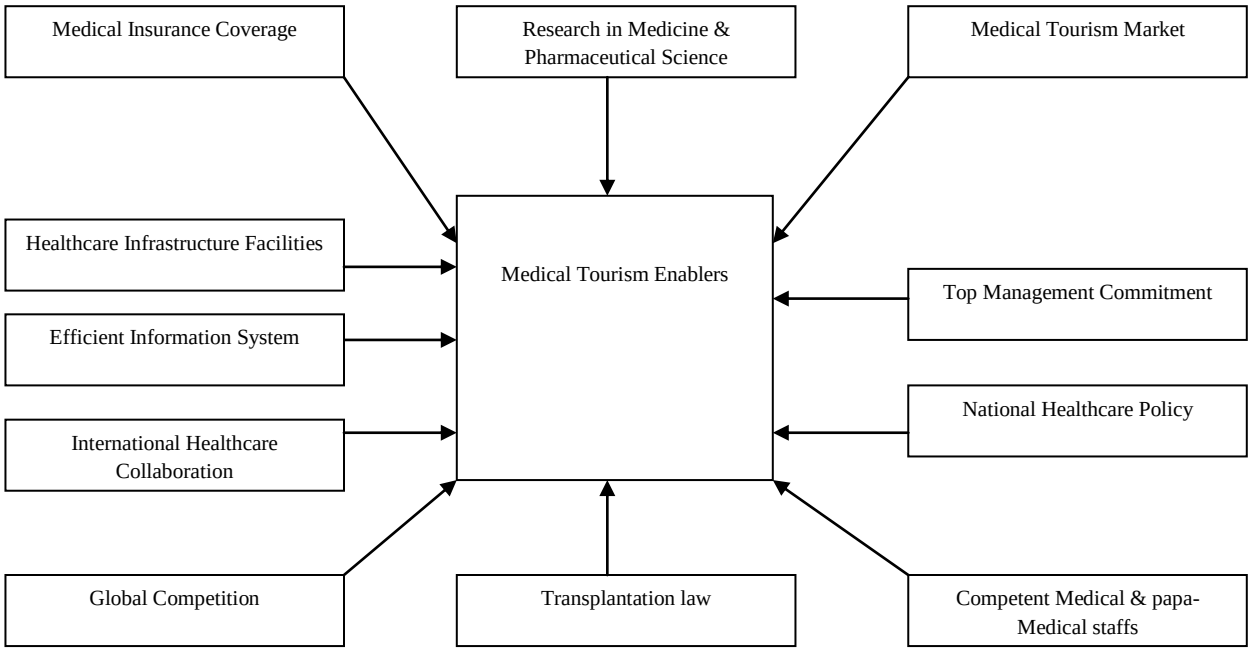


Figure 5.3 Medical tourism enablers in India

5.3.1 ISM methodology

Interpretive Structural Modeling (ISM) was developed by Warfield (1974) to look at the complex systems in an organized manner. ISM is an interactive learning process in which a set of different and directly related factors are structured into a comprehensive systematic model (Warfield, 1974). According to Faisal et al. (2006), ISM provides a means by which order can be imposed on the complexity of such variables. MICMAC method identifies the main variables that are both independent and dependent. Therefore, ISM and MICMAC are referred as modeling in the sense that the specific relationships and overall structure are portrayed in a graphical model. ISM and MICMAC aim to deal with numerous factors and identify the role of low-key or hidden factors in influencing the system. In this study, the medical tourism enablers have been analyzed using the ISM and MICMAC method to show the relationships between the enablers and their levels in a hierarchy based on their independence or dependence with other enablers. The various steps involved in the ISM methodology are as follows (Khurana et al., 2010).

1. Identification of factors: The elements of the system are identified which are relevant to the issue and then achieved with a group problem-solving technique like brain storming sessions.
2. A contextual relationship is established among factors with respect to which pairs of factors would be examined.

3. Contextual Relationship: From the factors identified in step 1, a contextual relationship is identified among factors with respect to which pairs of factors would be examined.
4. A structural self-interaction matrix (SSIM) is prepared based on pair-wise comparison of factors of the system under consideration.
5. Reachability matrix is developed from the SSIM and the matrix is checked for transitivity leading to the development of 'Final reachability matrix'. The transitivity of the contextual relation is a basic assumption made in ISM. It states that if a factor A is related to B and B is related to C, then A is necessarily related to C.
6. The 'Final reachability matrix' obtained is partitioned into different levels. Final reachability matrix is developed in its Conical form i.e. most zero (0) variables in the upper diagonal half of the matrix and most unitary (1) variables in the lower half.
7. Based on the relationships given in the reachability matrix and the determined levels for each factor, a directed graph is drawn and the transitive links are removed.
8. The resultant digraph is converted into an ISM by replacing variable nodes with statements.
9. The developed ISM model is reviewed to check for conceptual inconsistency and necessary modifications are made.

5.4 Results and discussions

5.4.1 Structural Self-Interaction Matrix (SSIM)

Keeping in view the contextual relationships in eleven enablers (design requirements), the existence of a relationship between two elements, (i and j) and the associated direction of relationship has been identified. The procedural steps for ISM are listed as follows:

1. Identification of variables: On the basis of prioritisation of nine design requirements from the house of quality, the variables are identified.
2. Contextual Relationship: From the identified elements in step 1, a contextual relationship is identified among them with respect to whom pairs of variables would be examined. After resolving the system design requirement set under consideration and the contextual relation, a structural self-interaction matrix (SSIM) is prepared. Four symbols are used to denote the direction of relationship between the criterion (i and j):

   V - For the relation from element i to element j and not in both directions.

   A - For the relation from element j to element i and not in both directions.

   X - For both the directional relations from element i to element j and j to i.

   O - If the relation between the elements did not appear valid.

Table 5.1 Structural self-interaction matrix (SSIM)

MEDICAL TOURISM ENABLERS (Design Requirements)	11	10	9	8	7	6	5	4	3	2	1
1. Medicine Insurance Coverage	V	A	A	A	A	A	V	X	A	O	
2. Research in Medicine & Pharmaceutical Science	V	A	O	O	O	V	V	V	V		
3. Medical Tourism Market	V	A	A	O	A	V	V	V			
4. Healthcare Infrastructure Facilities	V	A	A	A	A	X	V				
5. International Healthcare Collaboration	A	O	A	A	O	O					
6. Global Competition	V	A	A	A	A						
7. Transplantation Law	V	A	A	A							
8. Top Management Commitment	V	V	A								
9. National Healthcare Policy	V	V									
10. Competent Medical and Para-medical staffs	O										
11. Efficient Information system											

Based on the experts' judgements, interaction among the various elements is established using the contextual relationships and the SSIM matrix for 1 to 11 design requirements are described in Table 5.1. The relation V means design requirement 2 (Research in medicine & pharmaceutical science) helps to achieve design requirement 3 (Medical tourism market). The meaning of A shows that design requirement 3 (Medical tourism market) helps to achieve design requirement 1 (Medicine insurance coverage). Similarly, the relation X in design requirement 1 (Medicine insurance coverage) and 4 (Healthcare infrastructure facilities) means that both design requirements help to achieve each other. The relation O shows the relation between the design requirements is not valid.

3. Initial Reachability matrix: The design requirements of the system in the SSIM is transformed into a binary matrix called the initial reachability matrix by substituting V, A, X, O with 1 and 0 using the following the following four substitution of 1's and 0's are:
   - If the (i, j) entry in the SSIM is V, then the (i, j) entry in the reachability matrix becomes 1 and the (j, i) entry becomes 0.
   - If the (i, j) entry in the SSIM is A, then the (i, j) entry in the reachability matrix becomes 0 and the (j, i) entry becomes 1.
   - If the (i, j) entry in the SSIM is X, then the (i, j) entry in the reachability matrix becomes 1 and the $(j, i))$ entry also becomes 1.
   - If the (i, j) entry in the SSIM is O, then the (i, j) entry in the reachability matrix becomes 0 and the (j, i) entry also becomes 0.

The above rules applied in the initial reachability matrix for the design requirements shown in Table 5.2.

Table 5.2 Initial reachability matrix

MTE (design requirements)	1	2	3	4	5	6	7	8	9	10	11
1	1	0	0	1	1	0	0	0	0	0	1
2	0	1	1	1	1	1	0	0	0	0	1
3	1	0	1	1	1	1	0	0	0	0	1
4	1	0	0	1	1	1	0	0	0	0	1
5	0	0	0	0	1	0	0	0	0	0	0
6	1	0	0	1	0	1	0	0	0	0	1
7	1	0	1	1	0	1	1	0	0	0	1
8	1	0	0	1	1	1	1	1	0	1	1
9	1	0	1	1	1	1	1	1	1	1	1
10	1	1	1	1	0	1	1	0	0	1	0
11	0	0	0	0	1	0	0	0	0	0	1

4. Final Reachability Matrix: The reachability matrix obtained in step 3 is converted into the final reachability matrix by scrutinizing it for transitivity. If the transitivity rule is not found to be satisfied, the SSIM is reviewed and modified by the specific feedback about transitive relationship from the experts. From the revised SSIM, the reachability matrix is again worked out and tested for the transitivity rule. The transitivity of the contextual relation is a basic assumption in ISM which states that if element A is related to B and B is related to C, then A is related to C. After checking transitivity, the final reachability matrix is shown in Table 5.3.

Table 5.3 Final reachability matrix

MTE (design requirement)	1	2	3	4	5	6	7	8	9	10	11	Driver Power
1	1	0	0	1	1	1*	0	0	0	0	1	5
2	1*	1	1	1	1	1	0	0	0	0	1	7
3	1	0	1	1	1	1	0	0	0	0	1	6
4	1	0	0	1	1	1	0	0	0	0	1	5
5	0	0	0	0	1	0	0	0	0	0	0	1
6	1	0	0	1	1*	1	0	0	0	0	1	5
7	1	0	1	1	1*	1	1	0	0	0	1	7
8	1	1*	1*	1	1	1	1	1	0	1	1	10
9	1	1*	1	1	1	1	1	1	1	1	1	11
10	1	1	1	1	1*	1	1	0	0	1	1*	9
11	0	0	0	0	1	0	0	0	0	0	1	2
Dependents	9	4	6	9	11	9	4	2	1	3	10	
* Transitivity												

5. Level Partition Reachability Matrix: The reachability and antecedent set for each element is found out from final reachability matrix. The reachability set includes criteria itself and

others which it may help to achieve and antecedent set consists of itself and other criterion which helps in achieving it. Subsequently, the intersection set is derived and the variable having reachability and intersection set same is given top level in ISM hierarchy. Table 5.4 shows the first iteration where international healthcare collaboration is found at level I, therefore it would be positioned at the top of the ISM hierarchy.

Table 5.4 Partition of reachability matrix: First iteration

MTE	Reachability set	Antecedent set	Interaction set	Level
1	1,4,5,6,11	1,2,3,4,6,7,8,9,10	1,4,6	
2	1,2,3,4,5,6,11	2,8,9,10	2	
3	1,3,4,5,6,11	2,3,7,8,9,10	3	
4	1,4,5,6,11	1,2,3,4,6,7,8,9,10	1,4,6	
5	5	1,2,3,4,5,6,7,8,9,10,11	5	I
6	1,4,5,6,11	1,2,3,4,6,7,8,9,10	1,4,6	
7	1,3,4,5,6,7,11	7,8,9,10	7	
8	1,2,3,4,5,6,7,8,10,11	8,9	8	
9	1,2,3,4,5,6,7,8,9,10,11	9	9	
10	1,2,3,4,5,6,7,10,11	8,9,10	10	
11	5,11	1,2,3,4,6,7,8,9,10,11	11	

The top level element in the hierarchy would not help to achieve any other element above its own level. Once the top level element is found out, it is separated from other elements. Similar iteration process is repeated to find the criteria in the next level and is continued till the level of each element is found. Table 5.5 shows the second iteration where in efficient information system is found at level II. Table 5.6 describes the third iteration where in medicine insurance coverage, healthcare infrastructure facilities and global competition is found in level III.

Table 5.5 Second iteration

MTE	Reachability set	Antecedent set	Interaction set	Level
1	1,4,6,11	1,2,3,4,6,7,8,9,10	1,4,6	
2	1,2,3,4,6,11	2,8,9,10	2	
3	1,3,4,6,11	2,3,7,8,9,10	3	
4	1,4,6,11	1,2,3,4,6,7,8,9,10	1,4,6	
6	1,4,6,11	1,2,3,4,6,7,8,9,10	1,4,6	
7	1,3,4,6,7,11	7,8,9,10	7	
8	1,2,3,4,6,7,8,10,11	8,9	8	
9	1,2,3,4,6,7,8,9,10,11	9	9	
10	1,2,3,4,6,7,10,11	8,9,10	10	
11	11	1,2,3,4,6,7,8,9,10,11	11	II

Table 5.6 Third iteration

MTEs	Reachability set	Antecedent set	Interaction set	Level
1	1,4,6	1,2,3,4,6,7,8,9,10	1,4,6	III
2	1,2,3,4,6	2,8,9,10	2	
3	1,3,4,6	2,3,7,8,9,10	3	
4	1,4,6	1,2,3,4,6,7,8,9,10	1,4,6	III
6	1,4,6	1,2,3,4,6,7,8,9,10	1,4,6	III
7	1,3,4,6,7	7,8,9,10	7	
8	1,2,3,4,6,7,8,10	8,9	8	
9	1,2,3,4,6,7,8,9,10	9	9	
10	1,2,3,4,6,7,10	8,9,10	10	

The fourth iteration where in medical tourism market is found in level IV is shown in Table 5.7. Research in medicine and pharmaceutical science and transplantation law is positioned in fifth iteration and is found in level V is shown in Table 5.8. Similarly Table 5.9 shows the sixth iteration where in competent medical and para-medical staff is found in level VI. Table 5.10 shows seventh and eighth iteration, where in top management commitment and national healthcare policy is found in level VII and level VIII respectively.

Table 5.7 Fourth iteration

MTEs	Reachability set	Antecedent set	Interaction set	Level
2	2,3	2,8,9,10	2	
3	3	2,3,7,8,9,10	3	IV
7	3,7	7,8,9,10	7	
8	2,3,7,8,10	8,9	8	
9	2,3,7,8,9,10	9	9	
10	2,3,7,10	8,9,10	10	

Table 5.8 Fifth iteration

MTEs	Reachability set	Antecedent set	Interaction set	Level
2	2	2,8,9,10	2	V
7	7	7,8,9,10	7	V
8	2,7,8,10	8,9	8	
9	2,7,8,9,10	9	9	
10	2,7,10	8,9,10	10	

Table 5.9 Sixth iteration

MTEs	Reachability set	Antecedent set	Interaction set	Level
8	8,10	8,9	8	
9	8,9,10	9	9	
10	10	8,9,10	10	VI

Table 5.10 Seventh and eighth iteration

MTEs	Reachability set	Antecedent set	Interaction set	Level

8	8	8,9	8	VII
9	8,9	9	9	VIII

Results for the iteration process are summarized and shown in Table 5.11. The resulting levels help in building the digraph and the final model.

Table 5.11 Levels of medical tourism enablers in India

MTEs	Reachability set	Antecedent set	Interaction set	Level
1	1,4,5,6,11	1,2,3,4,6,7,8,9,10	1,4,6	III
2	1,2,3,4,5,6,11	2,8,9,10	2	V
3	1,3,4,5,6,11	2,3,7,8,9,10	3	IV
4	1,4,5,6,11	1,2,3,4,6,7,8,9,10	1,4,6	III
5	5	1,2,3,4,5,6,7,8,9,10,11	5	I
6	1,4,5,6,11	1,2,3,4,6,7,8,9,10	1,4,6	III
7	1,3,4,5,6,7,11	7,8,9,10	7	V
8	1,2,3,4,5,6,7,8,10,11	8,9	8	VII
9	1,2,3,4,5,6,7,8,9,10,11	9	9	VIII
10	1,2,3,4,5,6,7,10,11	8,9,10	10	VI
11	5,11	1,2,3,4,6,7,8,9,10,11	11	II

6. Development of Diagraph for ISM Model: The levels of the Medical Tourism enablers shown in Table 5.11 along with the final reachability matrix (Table 5.4) are used to draw up the Diagraph ISM model. Digraph is a term derived from Directional Graph, and as the name suggests, is a graphical representation of the elements, their directed relationships, and hierarchical levels (Khurana et al., 2010). The lower triangular matrix obtained after iterations is compiled and is shown in Table 5.12. Thereafter the initial digraph is prepared on the basis of the canonical form of reachability matrix.

Table 5.12 Lower triangular matrix

MTEs	5	11	1	4	6	3	2	7	10	8	9
5	1	0	0	0	0	0	0	0	0	0	0
11	1	1	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	0	0	0	0	0	0
4	1	1	1	1	1	0	0	0	0	0	0
6	1	1	1	1	1	0	0	0	0	0	0
3	1	1	1	1	1	1	0	0	0	0	0
2	1	1	1	1	1	1	1	0	0	0	0
7	1	1	1	1	1	1	0	1	0	0	0
10	1	1	1	1	1	1	1	1	1	0	0
8	1	1	1	1	1	1	1	1	1	1	0
9	1	1	1	1	1	1	1	1	1	1	1

This is then pruned by removing all transitivities to form a final digraph. The links between MTEs are shown and arrows indicating the direction of each impact shown in Figure 5.4.

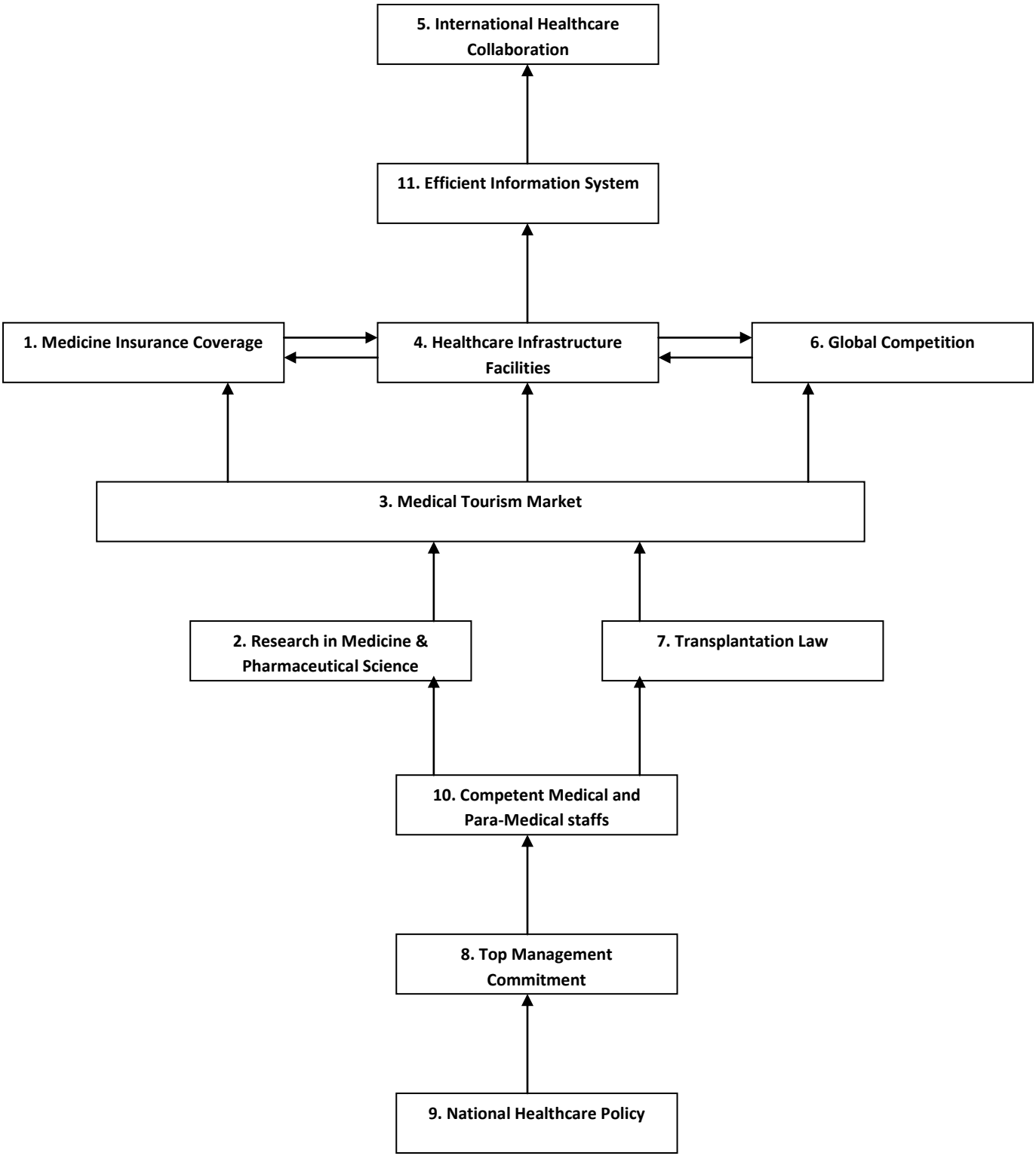


Figure 5.4 Diagraph ISM model of medical tourism enablers in India

The Diagraph ISM model for medical tourism enablers show that national healthcare policy is at the bottom implying that this factor can influence other factor like top management commitment directly and most other factors indirectly while it cannot be influenced by any other enabler. Hence, it can be concluded that the national healthcare policy is an important enabler that merits attention right at the beginning. It could also be inferred that a successful national healthcare policy with medical tourism advantages will certainly encourage the medical tourism players in India. The next level enabler is top management commitment. This enabler too exerts influence on other factors and aggravates them while it itself can be influenced by national healthcare policy. Competent medical and para-medical staff is the next level enabler. It can be influenced by the previously discussed enablers and at the same time it directly affects research in medicine and pharmaceutical science, transplantation law and other enablers indirectly. Medical tourism market forms the hub of the system. It directly influences a large number of enablers and is amenable to be influenced by other enablers. Hence, it can be concluded that medical tourism market is an extremely important enabler requiring major management involvement. The next level enablers are medicine insurance coverage, healthcare infrastructure facilities and global competition. Effective information system is the penultimate level enabler. Finally, the top-level enablers are amenable to be influenced and hence controlled by other enablers, i.e. the medical tourism industry can influence and reduce the challenge posed by these enablers.

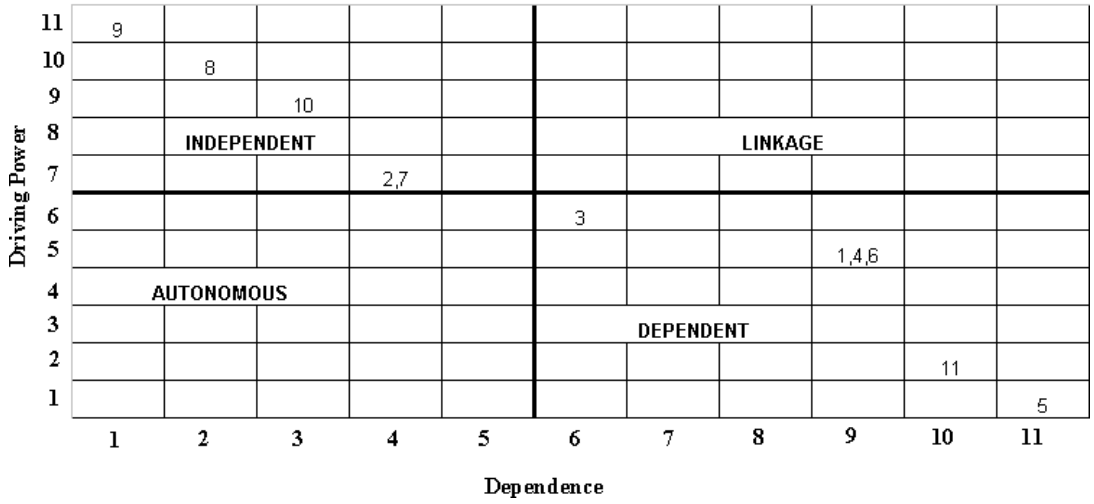


Figure 5.5 Driving power and dependence diagram

The MICMAC analysis has been done by drawing a simple two dimensional graph (Figure 5.5). The objective of the MICMAC analysis is to analyze the driver power and dependence

power of variables. This driving power and dependence diagram (also known as MICMAC) helps to classify various MTEs into four clusters viz. AUTONOMOUS enabler, DEPENDENT enabler, LINKAGE enabler and INDEPENDENT enabler. The first cluster is located in the South-West quadrant. It consists of the 'autonomous enablers' that have weak driving power and weak dependence. No medical tourism enabler comes under this category. The second cluster lies in the South-East quadrant and has weak driving power but strong dependence on other benefits. These enablers primarily come at the top of the ISM model. Top level enablers such as "International healthcare collaboration", "Efficient information system", "Medicine insurance coverage", "Healthcare infrastructure facilities", "Global competition" and "Medical tourism market" enablers come under this category. Such a result forces the government, policy makers and management to give greater consideration to this enabler and carry out a deeper analysis of this medical tourism enablers. Third cluster lie in the North-East quadrant. The linkage factors have strong driving power and also strong dependence. These enablers are unstable because of the fact that any action on these enablers will have an effect on other enablers and also a feedback on themselves. According to Jha and Devaya (2008), these are the most important enablers and would require maximum management attention. In the study, there are no enablers falling under this quadrant. Fourth cluster includes the independent enablers having strong driving power but weak dependence. Independent enablers are the medical tourism challenge enablers that are located in the North-west quadrant. Bottom level enablers such as top management commitment, national healthcare policy, competent medical and para-medical staffs, research in medicine and pharmaceutical science, and transplantation law come under this category. These are the very important enablers and need maximum management attention since they can influence other enablers to the maximum extent.

5.4.2 Integration of ISM and FMICMAC

According to Saxsena et al. (1992), the enablers having strong direct impact in the direct relationship matrix can suppress hidden factors. These hidden or low-key enablers at times may substantially influence the model under consideration. Such indirect inter-relationship between enablers may have an impact on the model through influence chains and reaction loops or feedback. ISM - FMICMAC method enables study of the diffusion of impacts through reaction paths and loops for developing hierarchy of the enablers. It depicts in the identification of key enablers and their classification.

The direct and indirect relationships among the enablers for medical tourism in India are carried out by ISM and FMICMAC. The procedural steps for ISM and FMICMAC are listed as follows:

1. Developing Binary Direct Reachability Matrix (BDRM): BDRM is obtained by examining the direct relationship among the MTEs in the ISM (Table 5.2). The transitivity (Table 5.3) is ignored and the diagonal entries are converted to zero. The final BDRM is shown in Table 5.13.

Table 5.13 Binary direct reachability matrix

MTE	1	2	3	4	5	6	7	8	9	10	11
1	**0**	0	0	1	1	**0**	0	0	0	0	1
2	**0**	**0**	1	1	1	1	0	0	0	0	1
3	1	0	**0**	1	1	1	0	0	0	0	1
4	1	0	0	**0**	1	1	0	0	0	0	1
5	0	0	0	0	**0**	0	0	0	0	0	0
6	1	0	0	1	**0**	**0**	0	0	0	0	1
7	1	0	1	1	**0**	1	**0**	0	0	0	1
8	1	**0**	**0**	1	1	1	1	**0**	0	1	1
9	1	**0**	1	1	1	1	1	1	**0**	1	1
10	1	1	1	1	**0**	1	1	0	0	**0**	**0**
11	0	0	0	0	1	0	0	0	0	0	**0**

2. Introduction of Fuzzy Set Theory: The analysis can be further improved by considering the possibility of reachability instead of the mere consideration of reachability used so far. Conventional MICMAC considers only binary type of relationships, so we have used fuzzy set theory to increase the former's sensitivity. In FMICMAC, an additional input of possibility of interaction between the elements is introduced. The possibility of interaction can be defined by qualitative consideration on 0–1 scale shown in Table 5.14.

Table 5.14 Possibility of numerical value of the Reachability

Possibility of Reachability	No	Negligible	Low	Medium	High	Very High	Full
Value	0	0.1	0.3	0.5	0.7	0.9	1

3. Developing Fuzzy Direct Relationship Matrix (FDRM): The possibility of numerical value of the reachability is superimposed on the direct relationship matrix (Table 5.13) to obtain a fuzzy direct relationship matrix (FDRM). The FDRM pertaining to Medical Tourism enablers are shown in Table 5.15 and Table 5.16.

Table 5.15 Fuzzy direct reachability matrix 1

MTE	1	2	3	4	5	6	7	8	9	10	11
1	0	0	0	L	M	0	0	0	0	0	H
2	0	0	VH	M	H	L	0	0	0	0	L
3	M	0	0	L	M	H	0	0	0	0	H
4	H	0	0	0	H	VH	0	0	0	0	L
5	0	N	0	0	L	0	0	0	N	0	0
6	VH	0	0	H	0	0	0	0	0	0	M
7	M	0	N	L	0	H	0	0	0	0	M

8	M	0	0	H	M	L	M	0	0	H	M
9	H	0	M	N	M	L	H	L	0	M	H
10	L	VH	H	M	0	H	M	0	0	0	0
11	0	0	0	0	VH	0	0	0	L	0	0

0 = No, N = Negligible, L = Low, M = Medium, H= High, VH = Very High

Table 5.16 Fuzzy direct reachability matrix 2

MTE	1	2	3	4	5	6	7	8	9	10	11
1	0	0	0	0.3	0.5	0	0	0	0	0	0.7
2	0	0	0.9	0.5	0.7	0.3	0	0	0	0	0.3
3	0.5	0	0	0.3	0.5	0.7	0	0	0	0	0.7
4	0.7	0	0	0	0.7	0.9	0	0	0	0	0.3
5	0	0.1	0	0	0.3	0	0	0	0.1	0	0
6	0.9	0	0	0.7	0	0	0	0	0	0	0.5
7	0.5	0	0.1	0.3	0	0.7	0	0	0	0	0.5
8	0.5	0	0	0.7	0.5	0.3	0.5	0	0	0.7	0.5
9	0.7	0	0.5	0.1	0.5	0.3	0.7	0.3	0	0.5	0.7
10	0.3	0.9	0.7	0.5	0	0.7	0.5	0	0	0	0
11	0	0	0	0	0.9	0	0	0	0.3	0	0

4. Conducting Fuzzy MICMAC Analysis: The FDRM becomes an input to FMICMAC analysis. The matrix is multiplied repeatedly up to a power until the hierarchies of the driver power and dependence are stabilized. The Stabilized Fuzzy Matrix is shown in Figure 5.6. The driving power of the enablers in FMICMAC is derived by summing the entries of possibilities of interactions in the rows, and the dependence of the criterion is determined by summing the entries of possibilities of interactions in the columns. The ranks of the driving power of the MTEs decide the hierarchy of MTEs. The stabilized matrix in FMICMAC for medical tourism enablers is achieved in the fifth stage.

MTCF	1	2	3	4	5	6	7	8	9	10	11	Driving Power	Rank
1	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	**3.3**	6
2	0.7	0.3	0.3	0.3	0.7	0.7	0.3	0.3	0.3	0.3	0.7	**4.9**	2
3	0.7	0.3	0.3	0.7	0.7	0.3	0.3	0.3	0.3	0.3	0.7	**4.9**	2
4	0.7	0.3	0.3	0.7	0.7	0.3	0.3	0.3	0.3	0.3	0.7	**4.9**	2
5	0.1	0.1	0.1	0.1	0.3	0.1	0.1	0.1	0.1	0.1	0.1	**1.3**	7
6	0.7	0.3	0.3	0.3	0.7	0.7	0.3	0.3	0.3	0.3	0.3	**4.5**	4
7	0.7	0.3	0.3	0.7	0.3	0.3	0.3	0.3	0.3	0.3	0.1	**3.9**	5
8	0.7	0.3	0.3	0.7	0.3	0.7	0.3	0.1	0.3	0.3	0.7	**4.7**	3
9	0.7	0.3	0.3	0.5	0.7	0.7	0.3	0.3	0.1	0.3	0.5	**4.7**	3
10	0.7	0.1	0.3	0.7	0.7	0.7	0.3	0.3	0.3	0.3	0.7	**5.1**	1
11	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	**3.3**	6
Dependence	**6.3**	**2.9**	**3.1**	**5.3**	**5.7**	**5.1**	**3.1**	**2.9**	**2.9**	**3.1**	**5.1**		
Rank	1	6	5	3	2	4	5	6	6	5	4		

Figure 5.6 Fuzzy MICMAC stabilized matrix

5. Classifying of Medical tourism enablers using Driving power – Dependence Graph: Based on the information derived from the FMICMAC stabilized matrix (Figure 5.6) the enablers were classified in to four sectors in the Driver-Dependence Graph is shown in Figure 5.7. The enablers with the greatest driver power in the stabilized matrix are the key enablers. The key enabler that is nearest to the origin in the graph represents the highest driver power. Identification and classification of the key enablers is essential for management to decide the course of action to be taken for the medical tourism in India.

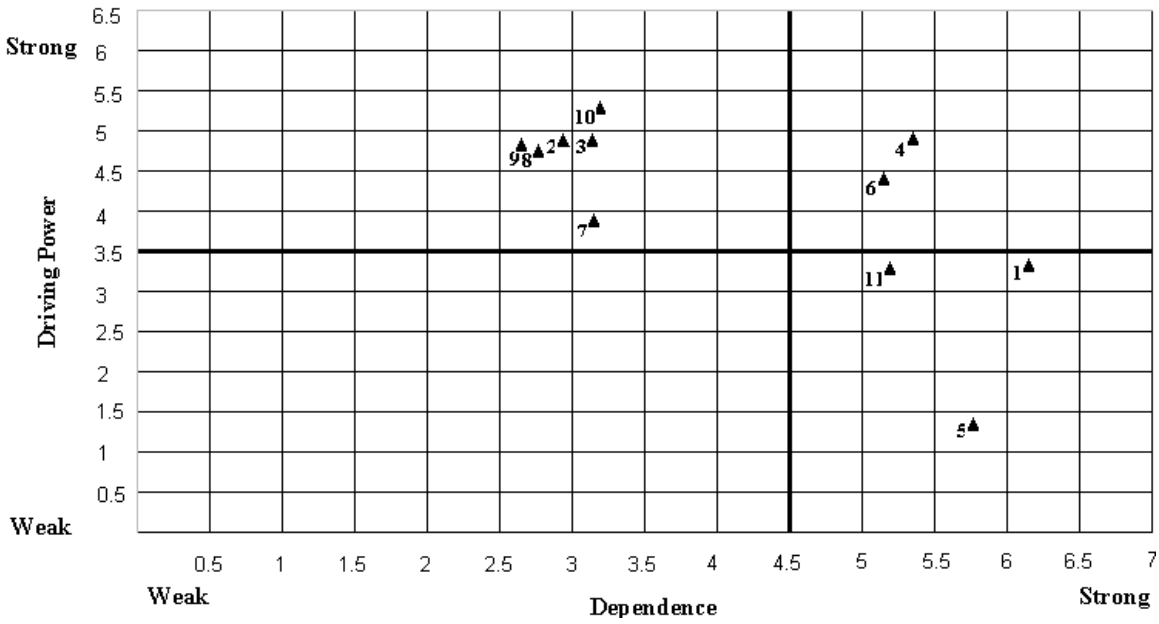


Figure 5.7 Driving power-dependence graph

Finally, the medical tourism enablers are classified in various factors and are shown in Table 5.17.

Table 5.17 Classification of medical tourism enablers

Factors	Enablers
Independent Factor	2, 3, 7, 8, 9, 10
Autonomous Factor	Nil
Linkage Factor	4, 6
Dependent Factor	1, 5, 11

5.5 Conclusions

Medical tourism enablers such as medicine insurance coverage, international healthcare collaboration and efficient information system are found to be dependent enablers. These enablers are also called result enablers. These enablers, located in the south-east quadrant are little influent on medical tourism. The enablers have a weak driving power, but strong dependence on other medical tourism enablers. This indicates that they require all of other enablers to come together for overcoming the medical tourism challenges. The managers should critically investigate dependence of these enablers on other related enablers while implementing medical tourism strategies. The south-west quadrant, quite above the diagonal is known as secondary acting enablers or autonomous enablers. These enablers are considered to have some influence on medical tourism process. Therefore, decision makers cannot take them lightly for successful implementation of medical tourism. No enabler is found to be autonomous enablers. Enablers with strong driving power and strong dependence are placed on the north-east quadrant. These Linkage enablers are at the same time very influent and very dependent. Any action on these enablers will have impact on others. In present research there are two enablers' viz., healthcare infrastructure facilities and global competition. Both the enablers are unstable among all other enablers therefore it can be studied even more carefully than the others. Research in medicine and pharmaceutical science, medical tourism market, transplantation law, top management commitment, national healthcare policy, competent medical and para-medical staffs are found as the independent enablers having maximum driving power. These enablers are altogether very influent and little dependent. These enablers are located in the north-west quadrant. The prosperity of the medical tourism industry thus depends on these enablers. They condition the rest of the system and are also called Independent or determinant enablers or entry enablers. Conventional MICMAC considers only binary type of relationships, so we have used fuzzy set theory to increase the former's sensitivity. The FMICMAC analysis revealed that the MTE 10 i.e. "competent medical and para-medical staffs" has the highest driver power and is ranked as 1. This implies that "competent medical and para-medical staffs" is the key enabler in the medical tourism industry in India. The entire medical tourism industry will be influenced by its behavior, but shall not be influenced itself.

This research has identified all the important enablers of medical tourism in India by reviewing a number of research articles. A total of eleven enablers were finally identified in Indian context and ISM approach has been applied to analyze them. In this research, we have developed integrated model of medical tourism enablers using ISM and the FMICMAC

approach, which may be helpful to government, ministry of health and healthcare decision makers to employ this model in order to identify and classify the important enablers and to reveal the direct and indirect effects of each enabler on medical tourism in India. The enablers identified in this model are quite generic and with some adjustments can be used for the growth of medical tourism. This finding provides important guidelines to the decision makers that they should evaluate various medical tourism enablers in India. Accordingly decision makers may also strategically plan its long-term growth strategy to meet the global medical tourism demand. Further research can also include more number of experts from academia, industry and government who have substantial experience in the field of medical tourism service quality. New scope of research can be identified considering the enablers as well as obstacles faced by the current Indian medical tourism sector.

CHAPTER 6

AN INTEGRATED APPROACH FOR SERVICE QUALITY IMPROVEMENT IN MEDICAL TOURISM

6.1 Introduction

Extensive literature review in Chapter 2 reveals that several generic methodologies adopted in healthcare and medical tourism industries fail to capture the industry-specific features. Furthermore, they limit the applicability to provide a clear guidance to medical tourists and the medical tourism service providers. To overcome these issues, a more balanced approach incorporating both industry-specific and patient centric in the medical tourism industry is required. The decision makers of medical tourism industry need to identify the functional aspects of service provision in medical tourism and develop an in-depth understanding of service elements that customers estimate to be critical in medical tourism service. This research is conducted to link the customer requirements and design factors as a way to map medical tourists' requirements into service providers' practices in a structured manner. This chapter aims to calculate the weights of design requirements of medical tourism which medical tourism service providers provide to meet patients' customer needs in order to prioritize the improvements and propose specific directions for such actions. Specifically, this research develops a construct for medical tourism service quality in India (Chapter 4). Further, the medical tourism design requirements are being identified through extensive literature review and expert opinion discussed in Chapter 5. These design requirements are prioritized employing an integrated approach of QFD (Quality functional deployment) and ISM (Chapter 5). This integrated approach reveals the design requirements that need most urgent improvement and help to achieve the highest levels of medical tourists' satisfaction to promote their reputations as well as gain edge over competitors. Moreover, this integrated framework would help the medical tourism service providers, decision makers and health-care managers in understanding of medical tourists' needs and assist them for designing their marketing strategies. Moreover this framework will develop practical suggestions to improve medical tourists' satisfaction and their perception towards medical tourism service quality.

6.2 An integrated framework

EFA (Chapter 4), ISM (Chapter 5) and QFD have been carried out to develop an integrated framework for Medical tourism service quality in Indian context as discussed in section 6.2.1.

6.2.1 Medical tourism service quality construct using EFA

Service quality is measured through analysis of responses provided by patients about their experience (Weingart et al., 2005). Hence, a survey using questionnaire is used to measure international patient's perception about service quality in medical tourism. The first stage of questionnaire development involved a qualitative study of patients to get an insight into issues that are important to them. The second stage involved a comprehensive review of literature

related to patient perception of quality and potential scale items from these studies were selected (Rao et al., 2006; Weingart et al., 2005; Boos et al., 2001; Haddad et al., 1998; Hansen et al., 2008; Alen et al., 2006; Brady et al., 2002; Duong et al., 2004; Fowdar, 2008). This led to an initial list of scale items. In the third stage, this list was reviewed by medical tourism experts and academicians and finally fifty two items covering various aspect of service quality selected for this study (Table 4.1, Chapter 4). The useful responses were tested to examine the validity and reliability of the scale to obtain a quantitative and statistically proven identification of the responses. EFA of responses is performed using SPSS 18.0. The factor analysis uses the principal component extraction method followed by Varimax rotation. In the initial application, the number of variables is reduced from fifty two to thirty six. In the second application, these thirty two variables are classified under ten dimensions based on their factor-loading score (Table 4.2, Chapter 4). The instrument consist of thirty six variables that are classified into ten dimension defined as accessibility/convenience, treatment satisfaction, courtesy, physical environment features, technical quality of care competency, promptness, facility premises, alternative therapy, finance factors for medical services and pharmaceutical services. The medical tourism service quality model is shown in Figure 4.3.

6.2.2 Interrelationship of design requirements using ISM

The contextual relationship was undertaken through brain storming process of experts from industry and academia. A total of twelve experts from various facets of the industry (such as healthcare industry, healthcare institutions and medical tourism consultancy firms) were consulted for the development of contextual relationship of different enablers using ISM methodology. The experts were chosen according to their experience (about 20 years on an average) in the industry and their willingness to participate. First, introductory brain storming session and personal interview was held to introduce the research agenda and its significance. Final brainstorming session was conducted after a week wherein many enablers identified through literature review were discussed and finally eleven enablers were compiled for the modeling. The eleven enablers are viz. Medicine insurance coverage, research in medicine and pharmaceutical science, medical tourism market, healthcare infrastructure facilities, international healthcare collaboration, global competition, transplantation law, top management commitment, national healthcare policy, competent medical and para-medical staffs and efficient information system. Secondly, the eleven enablers were then sought and their responses used to apply the ISM technique to the enablers in order to place them in a hierarchy and show their contextual relationships leads to the development of initial relationship matrix and final relationship matrix.

Further, the same responses have been used in the MICMAC analysis as well. The final diagraph ISM model medical tourism enablers in India are shown in Figure 5.4, Chapter 5.

6.2.3 Prioritization of design requirements using QFD

Having found out important ten factor of medical tourism service quality (Chapter 4) and eleven medical tourism enablers (Chapter 5), it is necessary to design a system which fulfils the requirements and prioritization of the system design requirements so that proactive measures can be taken. The goal of QFD is to translate often subjective quality criteria into objective ones that can be quantifiable and measurable. These can then be used to design a system for medical tourists' satisfaction in order to promote medical tourism service provider's reputations as well as enhance their competitiveness. It is a complimentary method for determining how and where the priorities are to be assigned in a system design. QFD uses a series of matrices to document information collected and represent the QFD team's plan for a customer demands and system design requirements.

In this research, ten dimensions found through the exploratory factor analysis viz. Accessibility/convenience, treatment satisfaction, courtesy, physical environment features, technical quality of care competency, promptness, facility premises, alternative therapy, finance factors for medical services and pharmaceutical services are treated as customer demands or voice of customers (VoC). Keeping in view of the stated customer demands, the eleven system design requirements found in the SSIM (Table 5.1, Chapter 5) are considered. This research has finally employed QFD methodology for translating and integrating customer demands and design requirements into the medical tourism quality characteristics. It proposes a formal and efficient methodology for improving medical tourism services in India using quality function deployment (QFD), for the development of conceptual alternatives.

The House of Quality (HoQ matrix) is the most recognized form of QFD. House of Quality (HoQ) is constructed from five major components as explained below.

- Customer demands (WHATs): A structured list of requirements derived from experts feedback
- Design requirements (HOWs): A structured set of relevant and measurable services/ characteristics which are required for fulfilling WHATs.
- Planning matrix (Left matrix): Gives customer/expert perceptions observed in surveys. It includes the relative importance of requirements.
- Interrelationship matrix (Centre matrix): Gives the expert's perceptions of interrelationships between design requirements and customer demands. An appropriate

scale is applied and illustrated using symbols or figures. Filling this portion of the matrix involves discussions.

- Design correlation (Top) matrix: Used to identify where design requirements support or impede each other in the system or product design.

6.3 Results and discussions

The various steps involved in QFD methodology:

Step 1: This step identifies ten dimensions of medical tourism service quality from the results of exploratory factor analysis i.e. customer needs (WHATs). The items are entered into HoQ in the room called VoC shown in Figure 6.1.

Step 2: Priorities the customer demands (Medical Tourism Service Quality items) using a number that reflects the importance of medical tourism perspective.

Step 3: An exhaustive analysis to assess the relationship between each item of the customer demands. The interrelation are typically defined as strong ($\circ$ = 0.8), moderate ($\oplus$ = 0.6), weak (Δ = 0.4) and very weak ($\bullet$ = 0.2). The interrelationship matrix is attached to left side of the HoQ.

Step 4: Keeping in view of stated items of Medical Tourism Enablers, the eleven design requirements are considered through literature reviews and discussions with experts from the academics and industry.

Step 5: A correlation matrix is formed which indicates how the system designs are related to one another. The scale used in step 3 is used here for describing the same and is entered on the top of HoQ which form top matrix of the house is called interrelation between how's.

Step 6: Determine relationships between WHATs and HOWs. Construct the matrix using the intersection of each row (what) with each column (how), which represents the strength of relationship between each what and each how.

Step 7: A revised rating is determined from the left matrix of using Equation 6.1 and is placed at right side of HoQ.

$$\text{Rating}_i = Z_i + \frac{1}{n-1} \sum_{j \neq i}^{n} B_{ij} Z_j \qquad (6.1)$$

Where Z_i is the initial customer rating for customer need i and B_{ij} denotes the interrelationship between customer demands i and j.

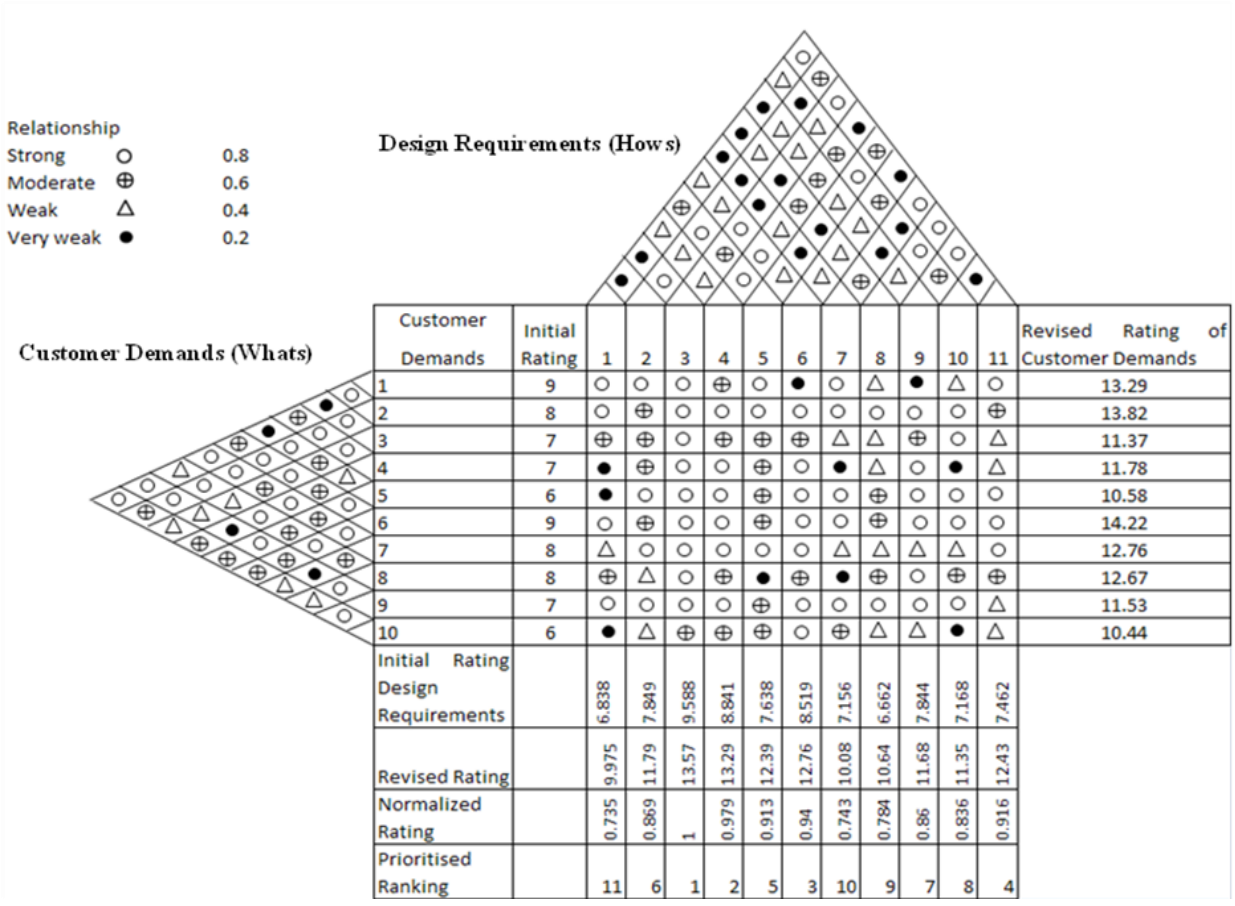
Step 8: The individual rating for each design requirement is calculated using Equation 6.2 and placed at the bottom row 1 of the HoQ.

$$\text{Individual Rating}_i = \sum_j^n A_{ij} X_j \qquad (6.2)$$

where A_{ij} and X_j denote the relative importance of the i^{th} characteristic with respect to the j^{th} customer demand in the relationship matrix and the importance of the j^{th} customer demand perceived by the customer i.e. the customer rating and n is the number of customer needs.

Step 9: A revised rating for each design requirement is determined as for requirement (customer) needs using Equation 6.1 and is entered in row 2 at bottom of HoQ.

Step 10: The final ratings of design requirements are normalized by dividing each rating with maximum available rating. The final ratings are tabulated in row 3 at bottom of HoQ. Using final ratings, the design requirements are prioritized as per their importance.



Customer Demands	Initial Rating	1	2	3	4	5	6	7	8	9	10	11	Revised Rating of Customer Demands
1	9	○	○	○	⊕	○	●	○	△	●	△	○	13.29
2	8	○	⊕	○	○	○	○	○	○	○	○	⊕	13.82
3	7	⊕	⊕	○	⊕	⊕	⊕	△	△	⊕	○	△	11.37
4	7	●	⊕	○	○	⊕	○	●	△	○	●	△	11.78
5	6	●	○	○	○	⊕	○	○	⊕	○	○	○	10.58
6	9	○	⊕	○	○	⊕	○	○	⊕	○	○	○	14.22
7	8	△	○	○	○	○	○	△	△	△	△	○	12.76
8	8	⊕	△	○	⊕	●	⊕	●	⊕	○	⊕	⊕	12.67
9	7	○	○	○	○	⊕	○	○	○	○	○	△	11.53
10	6	●	△	⊕	⊕	⊕	○	⊕	△	△	●	△	10.44
Initial Rating Design Requirements		6.838	7.849	9.588	8.841	7.638	8.519	7.156	6.662	7.844	7.168	7.462	
Revised Rating		9.975	11.79	13.57	13.29	12.39	12.76	10.08	10.64	11.68	11.35	12.43	
Normalized Rating		0.735	0.869	1	0.979	0.913	0.94	0.743	0.784	0.86	0.836	0.916	
Prioritised Ranking		11	6	1	2	5	3	10	9	7	8	4	

Figure 6.1 Medical tourism House of Quality

The revised rating for each design requirement is calculated for the customer needs using equation 5.1. The final rating of design requirements are normalized by dividing each rating with the maximum available rating. The final ratings are shown in Figure 6.1. Using the normalized ratings, the design requirements are prioritized as per their importance of design requirements. It is shown that design requirement 3 (Perception of Medical Tourism Industry in India) is the most prioritized design requirement whereas design requirement 1 (Medical Insurance Coverage) is least prioritized design requirement.

6.4 Conclusions

With rising medical tourist's perception with regard to health, medical tourism service providers now need to pay more attention to satisfying the needs and demands of medical tourists. It is therefore important for the medical tourism industry to realize the actual requirements of medical tourists so as to be better able to focus resources on the most important items. The integrated approach of this paper develops a construct of medical tourism service quality with thirty six variables classified under ten dimensions using factor analysis and Varimax rotation. The dimensions are accessibility/convenience, treatment satisfaction, courtesy, physical environment features, technical quality of care competency, promptness, facility premises, alternative therapy, finance factors for medical services and pharmaceutical services. The aforesaid dimensions are treated as voice of customers (VoC) as an input to draw the quality functional deployment. The design requirements have been extracted from extensive literature review. The inter-relationship of the eleven design requirements (medical tourism design requirements) is established through QFD. QFD finds out the medical tourism service quality items that need most urgent improvement and can achieve the highest levels of medical tourists' satisfaction to promote their reputations as well as enhance their competitiveness. The priority improvement sequence is as follows: perception of medical tourism market in India, healthcare infrastructure facilities, global competition, efficient information system, international healthcare collaboration, research in medicine and pharmaceutical science, national healthcare policy, competent medical and para-medical staffs, top management commitment, transplantation law and medicine insurance coverage. This research suggests that medical tourism service providers should seek the government professional agencies to transform the negative perceptions about Indian medical tourism market with regard to hygiene standards, prevalence of contagious diseases in India, quality of healthcare services provided, and waste management practices and counter the positive vibes created by the cost competitiveness of Indian healthcare system, infrastructural facilities and technological updated information systems. In contrast, to provide a guarantee of service quality for medical tourists in India, the

Indian Ministry of Health should be aggressive in accreditation of hospitals by JCI, a renowned international accrediting agency for health quality. Another issue is that the foreign insurance companies are not willing to extend their coverage for treatments in low cost countries such as India because they have concerns about the quality of health services offered. The insurers are also concerned with absence of malpractice law in a foreign jurisdiction in which case the patient will have no recourse to his/her healthcare expenses. Indian policy-makers need to find ways to improve upon the existing situation in the medical tourism sector and to make equitable, affordable and quality health care accessible to the medical tourists. The medical tourism service quality construct has several limitations. There is lack of literature for the dimension of alternative therapy. The reliability and validity of the design requirements related to medical tourism service improvement was not obtained. Future research should consider alternative methods of assessing reliability and validity of the design requirements when the outcome is medical tourism service quality improvement. Future studies should assess the validity of the proposed models and evaluate ways to reduce the gap between actual practice and documentation of that practice in the healthcare premises.

CHAPTER 7

BENCHMARKING OF MEDICAL TOURISM SERVICE PROVIDERS

7.1 Introduction

Healthcare institutions worldwide are increasingly the subject of analyses aimed at defining, measuring and improving the organizational efficiency. Efficiency has been the subject of research in a wide range of production activities. Indian medical tourism sector is no exception. After the globalization and privatization of Indian healthcare sector, the flow of the medical tourists to India has increased drastically. Even as there are many promising factors for the growth of medical tourism in India, the country faces several challenges. These challenges threaten the sector's survival and financial viability. Decision makers, Government and performance improvement professionals are therefore active in determining if the medical tourism sector is operating efficiently and effectively. This sector also lacks comprehensive information due to wide variability in operations and a scale through which medical tourism service providers can make the performance comparison arduous. It is also difficult to compare performance of different medical tourism service providers due to the multiple input-output variables. Therefore, the prime concern for the decision makers and healthcare managers is to evaluate medical tourism performance. Benchmarking is a method of improving performance by increasing revenues, augmenting quality, and/or reducing operating costs (Sherman and Zhu, 2006). In this study the decision making units (DMUs) of medical tourism sector is compared to identify best-practices on efficiency dimensions that can be adopted to improve the sector performance. This chapter applies data envelopment analysis model, a nonparametric tool, to evaluate the efficiency of a DMU relative to other DMUs for assessing Indian medical tourism performance. This method focuses on relative efficiency and identifies a realizable benchmark for all DMUs. Inefficiencies are identified in the form of slack in input, output, or both (Lynch et al., 1994). This slack represents a surplus in production, and is used to identify the vital parameters that contribute most to the DMU's inefficiency. The analysis provides an insight to the policy makers and managers towards the areas to improve in order to become efficient.

In this chapter, the DEA model is run for each medical tourism service providers i.e. the DMUs to determine the set of input-output weights, which maximizes the efficiency of that unit subject to the condition that no unit can have a relative efficiency score greater than unity for that set of weights. Thus, the DEA model calculates a unique weight for each DMU on each of the inputs and outputs to present the DMU under consideration in the best of light. Since the DMUs have the liberty of choosing the weights, they generally choose higher weight on the parameters in which they are doing well and there is also a tendency of neglecting the parameters in which they do not perform well. This leads to a situation where there are many zeros in the weight matrix. In real life problems, all the DMUs must perform at some minimum

level in all the parameters under consideration. Therefore, DEA “assurance region” (AR) method is used to make sure that all the DMUs take some minimum weight in all the parameters. A comparison is made to establish the performance level of each DMU using DEA and DEA-AR technique.

7.1.1 Selection of inputs and outputs

DMU refers to hospitals providing medical tourism service. Thirty nine DMUs are selected on the basis of stratified random sampling method. The ranking of DMUs is made based on total score summed over perceptual score and factual score obtained from each DMU. The benchmarking of medical tourism performance considers ten inputs (V) and three outputs (U) as shown in Table 7.1. All the items are relevant for evaluating medical tourism performance not only in Indian context but are quite generic to be adopted anywhere. The responses under each item are collected through field visits to all organizations. The items selected may likely to improve the medical tourism performance. Each item is expressed in several units is averaged over last three years (2009-2012).

Table 7.1 Inputs and output parameters for medical tourism performance

Inputs (V)	
	Number of Doctors (V_1)
	Number of Nurses (V_2)
	Ratio of Nurse to patient (V_3)
	Average cost of Treatment (V_4) (In Indian Rupees)
	Average Waiting time (V_5) (In minutes)
	Average Treatment time (V_6) (In Days)
	Tie up with Tour Promoter (V_7)
	Floor Space (V_8) (In Square Meters)
	Distance from Airport/City (V_9) (In Kilometers)
	No. of Bed (V_{10})
Outputs (U)	Customer Returns (U_1) (In percentage)
	Customer Satisfaction (U_2) (In percentage)
	Success Rate (U_3) (In percentage)

The customer returns is defined as the number of medical tourists revisiting a specific medical tourism service provider for further checkup or follow-up after undergoing treatment in the same premises. The output - customer returns (U_1) is the ratio of number of medical tourists revisits to the total number of medical tourist undergone treatment with a specific service provider in a year. Therefore, customer return is quantified by averaging for three years (during 2009-2012). This indicates tourists’ behavioral intention and brand loyalty in availing effective medical tourism service quality. Output - customer satisfaction (U_2) is expressed as medical

tourist's satisfaction captured in a scale between 0 to 100. The medical tourists are advised to provide with their level of satisfaction on the scale and the responses are averaged over last three years. The output Success rate (U_3) is expressed as the percentage of tourists successfully discharged from the medical tourism service provider after availing healthcare services in a year and averaged over last three years. This indicates the accomplishment in term of appropriate health recovery for the number of medical tourists admitted to a specific medical tourism service provider.

7.2 Results and discussions

The objective of the study is to develop a valid model for assessing medical tourism performance of DMUs across India. Initially two types of models such as constant return to scale (CRS) and variable return to scale (VRS) are used. Later DEA-AR approach has been used to increases the differentiability among the unit scores by reducing the number of efficient DMUs.

7.2.1 DEA with CRS scale assumption

A DMU is regarded as a benchmark unit when its objective function i.e. TE becomes unity. The general input-oriented maximization CRS-DEA model is used to obtain efficiency score. LINDO 6.1 version is used to solve the model. The CRS assumption consists of non-additive combination of pure TE and scale efficiency. The results thus obtained are summarized in Table 7.2. The result shows that in a scale of 0-1 the mean efficiency score for the medical tourism service providers is 0.95 with a standard deviation of 0.084 when CRS model is used. This indicates that there is a large scope for improvement of medical tourism performance in India. The first column of the table represents the selected DMUs arranged in a sequential manner. The second column specifies the efficiency score of the corresponding DMUs. Based on the efficiency score, the DMUs are ranked as shown in the third column. The fourth column shows the peers or the benchmarking units for the corresponding DMUs. The fifth column indicates the weight of each of the peers or the benchmarking unit. The last column shows the peer count of the DMUs. Ranking based on relative efficiency scores indicate that twenty seven DMUs out of thirty nine DMUs have emerged as benchmarking units for the other twelve DMUs. The efficient or benchmarking units are listed as DMU_1, DMU_2, DMU_3, DMU_4, DMU_7, DMU_9, DMU_{10}, DMU_{11}, DMU_{12}, DMU_{14}, DMU_{15}, DMU_{16}, DMU_{17}, DMU_{19}, DMU_{21}, DMU_{23}, DMU_{25}, DMU_{27}, DMU_{28}, DMU_{29}, DMU_{30}, DMU_{31}, DMU_{32}, DMU_{33}, DMU_{36}, DMU_{37} and DMU_{39} as shown in Table 7.2. The efficiency score for these DMUs approach unity while that of DEA-inefficient DMUs show relative efficiency less than unity. The inefficient units can refer the DMUs listed in column four with corresponding peer weight given in column five for the improvement in medical tourism

performance. For example, DMU_8 having efficiency score of 0.890776 can refer DMU_4, DMU_{15}, DMU_{25} and DMU_{37}. DMU_8 can assign a weightage of 0.3997 to DMU_4, 0.4822 to DMU_{15}, 0.1980 to DMU_{25} and 0.1082 to DMU_{37} to become a benchmark unit.

It is evident from column four that there are six DMUs (DMU_5, DMU_6, DMU_{18}, DMU_{24}, DMU_{26}, and DMU_{35}) consult three benchmarking units. Four DMUs (DMU_8, DMU_{13}, DMU_{20}, and DMU_{34}) which can refer four different DEA-efficient units with varying degree of weightages. It is interesting to note that DMU_{38} is the only DMU that has two reference units (DMU_{23} and DMU_{39}. It is further observed that DMU_4, DMU_{15}, DMU_{25}, and DMU_{37} have become peer units 4, 8, 6 and 3 times respectively. It is to be noted that DMU_{13} is ranked last having efficiency score 0.688619 denoted as most inefficient unit. The Table 7.2 also shows the peer group and peer weights for the inefficient medical tourism service providers. This is useful for benchmarking for the inefficient DMUs. They can identify the parameters in which they lack and take necessary steps for improvement. The peer group for the inefficient medical tourism service providers indicates the efficient medical tourism service providers to which the inefficient medical tourism service providers are closer in its combination of inputs and outputs. DMU_{15} is ranked as most efficient unit as it has efficiency score of one and more number of referring DMUs as far as medical tourism performance is concerned. However, this medical tourism service provider is likely to be efficient with respect to a large number of factors and is probably a good example of an exemplary operating performer.

Table 7.2 Results of DEA (CRS) model

DMU	Efficiency	Ranking by DEA	Benchmarking with	Peers Weight	Peers Count
DMU_1	1	1	DMU_1	1	0
DMU_2	1	1	DMU_2	1	1
DMU_3	1	1	DMU_3	1	0
DMU_4	1	1	DMU_4	1	4
DMU_5	0.851209	34	DMU_{23},DMU_{25}, DMU_{37}	0.1125, 0.911, 0.0515	0
DMU_6	0.838934	35	DMU_4, DMU_{15}, DMU_{25}	0.344, 0.4723, 0.1633	0
DMU_7	1	1	DMU_7	1	2
DMU_8	0.890776	31	DMU_4, DMU_{15},DMU_{25}, DMU_{37}	0.3997, 0.4822, 0.1980, 0.1082	0
DMU_9	1	1	DMU_9	1	0
DMU_{10}	1	1	DMU_{10}	1	0
DMU_{11}	1	1	DMU_{11}	1	1
DMU_{12}	1	1	DMU_{12}	1	1
DMU_{13}	0.688619	39	DMU_7, DMU_{15}, DMU_{30}, DMU_{36}	0.1032, 0.4205, 0.2296, 0.3218	0
DMU_{14}	1	1	DMU_{14}	1	0
DMU_{15}	1	1	DMU_{15}	1	8
DMU_{16}	1	1	DMU_{16}	1	0
DMU_{17}	1	1	DMU_{17}	1	1

DMU_{18}	0.766569	37	DMU_{12}, DMU_{15}, DMU_{36}	0.3915, 0.4562, 0.522	0
DMU_{19}	1	1	DMU19	1	2
DMU_{20}	0.739056	38	DMU_{7}, DMU_{15}, DMU_{17}, DMU_{37}	0.0375, 0.775, 0.145, 0.4	0
DMU_{21}	1	1	DMU_{21}	1	0
DMU_{22}	0.875	33	DMU_{15}	1	0
DMU_{23}	1	1	DMU_{23}	1	1
DMU_{24}	0.96847	29	DMU_{15}, DMU_{19}, DMU_{39}	0.3042, 0.3004, 0.5703	0
DMU_{25}	1	1	DMU_{25}	1	6
DMU_{26}	0.991945	28	DMU_{11}, DMU_{19}, DMU_{25}	0.2422, 0.7227, 0.1460	0
DMU_{27}	1	1	DMU_{27}	1	0
DMU_{28}	1	1	DMU_{28}	1	0
DMU_{29}	1	1	DMU_{29}	1	0
DMU_{30}	1	1	DMU_{30}	1	1
DMU_{31}	1	1	DMU_{31}	1	0
DMU_{32}	1	1	DMU_{32}	1	0
DMU_{33}	1	1	DMU_{15}	1	0
DMU_{34}	0.882665	32	DMU_{2}, DMU_{4}, DMU_{15}, DMU_{25}	0.0228, 0.2647, 0.7395, 0.0596	0
DMU_{35}	0.820351	36	DMU_{4}, DMU_{15}, DMU_{25}	0.0736, 0.838, 0.2224	0
DMU_{36}	1	1	DMU_{36}	1	2
DMU_{37}	1	1	DMU_{37}	1	3
DMU_{38}	0.933333	30	DMU_{23}, DMU_{39}	0.1363, 0.8181	0
DMU_{39}	1	1	DMU_{39}	1	2

Note : Mean Efficiency (CRS) - 0.95, Minimum - 0.689, Standard Deviation - 0.084

7.2.2 Effect of changes in inputs on outputs

Although this model (Table 7.2) is quite capable of distinguishing performing and non-performing DMUs, it is prudent to analyze effect of changes in inputs on output. To this end, each input variable is changed by 10 % from its base value in a systematic manner and output is noted down. As shown in Table 7.3, all the inputs are decreased by 10 % for the most inefficient unit (DMU_{13}). It has been observed that DMU_{13} becomes efficient after four steps.

Table 7.3 Changes in efficiency when all inputs of DMU13 is decreased by 10 percent

DMU_{13}	V_1	V_2	V_3	V_4	V_5	V_6	V_7	V_8	V_9	V_{10}	Efficiency
Base Value	64	110	0.25	35000	7.5	2.8	4	150000	15	210	0.688619
Step-1	57.6	99	0.225	31500	6.75	2.52	3.6	135000	13.5	189	0.7651328
Step-2	51.84	89.1	0.2025	28350	6.075	2.268	3.24	121500	12.15	170.1	0.8501475
Step-3	46.656	80.19	0.1823	25515	5.4675	2.0412	2.916	109350	10.935	153.09	0.9446083
Step-4	41.99	72.171	0.164	22964	4.9208	1.8371	2.6244	98415	9.8415	137.78	1

Next, effect of changes in each input on output is considered. Table 7.4 depicts the output when each input is decreased from its base value by 10 % systematically keeping other inputs at their base value for the most inefficient unit (DMU_{13}). It is evident from the table that DMU_3 becomes efficient in several steps.

Table 7.4 Changes in efficiency when each input of DMU_{13} is decreased by ten percent

Inputs	Base Value	Steps to become efficient
V_1	64	Step-17
V_2	110	Step-12
V_3	0.25	Step-7
V_4	35000	Step-11
V_5	7.5	Step-8
V_6	2.8	Step-6
V_7	4	Step-38
V_8	150000	Step-23
V_9	15	Step-8
V_{10}	210	Step-17
Efficiency	0.688619	1

It is clearly evident that average treatment time (V_6) is relatively more sensitive for improving medical tourism performance whereas Ratio of nurse to patient (V_3) and distance from airport/city (V_9) moderately influence the medical tourism performance because less number of steps is required to become efficient one. Other inputs also cause in improving performance. It is evident that it is possible for a medical tourism service provider to become efficient if it achieves exceptionally better results in terms of one input but performs below average in other inputs. The sensitivity of DEA efficiency score can be tested by dropping one input/output or by dropping one efficient DMU at a time from DEA analysis (Sreekumar and Mahapatra, 2011). In the sensitivity analysis, first the input “no of doctors”, “floor space” and “distance from airport/city” is dropped one by one from the analysis and TE of DMUs is calculated, similarly the output “customer satisfaction” is dropped from DEA CRS model. Later, the most efficient unit DMU_{15} is dropped to calculate the CRS efficiency. The results of sensitivity analysis are tabulated in Table 7.5.

Table 7.5 Sensitivity Analysis

DMU	Efficiency DEA (CCR)	Dropping DMU_{15}	Dropping V_1	Dropping V_8	Dropping V_9	Dropping U_2
DMU_1	1	1	1	1	1	1
DMU_2	1	1	1	1	1	1
DMU_3	1	1	1	1	1	0.9278425
DMU_4	1	1	1	1	1	1
DMU_5	0.851	0.851	0.851	0.851	0.851	0.851

DMU_6	0.839	0.839	0.839	0.839	0.839	0.827
DMU_7	1	1	1	1	1	1
DMU_8	0.891	0.891	0.891	0.891	0.882	0.884
DMU_9	1	1	0.933601	1	1	0.9469775
DMU_{10}	1	1	1	1	1	1
DMU_{11}	1	1	1	1	1	1
DMU_{12}	1	1	1	1	1	1
DMU_{13}	0.689	0.7803697	0.689	0.716	0.689	0.689
DMU_{14}	1	1	1	1	0.6898799	1
DMU_{15}	1	-	1	1	1	1
DMU_{16}	1	1	1	1	1	1
DMU_{17}	1	1	1	1	0.893	1
DMU_{18}	0.767	0.7829564	0.767	0.767	0.767	0.767
DMU_{19}	1	1	1	1	1	1
DMU_{20}	0.739	0.7939428	0.739	0.739	0.7289543	0.739
DMU_{21}	1	1	1	1	1	1
DMU_{22}	0.875	0.997802	0.875	0.875	0.797	0.875
DMU_{23}	1	1	1	1	1	1
DMU_{24}	0.968	1	0.968	0.95	0.887	0.862
DMU_{25}	1	1	1	1	1	1
DMU_{26}	0.992	0.992	0.992	0.992	0.9684211	0.889
DMU_{27}	1	1	1	1	1	0.9628136
DMU_{28}	1	1	1	1	1	1
DMU_{29}	1	1	1	1	0.998	0.9948215
DMU_{30}	1	1	1	1	1	1
DMU_{31}	1	1	1	1	1	1
DMU_{32}	1	1	1	1	1	1
DMU_{33}	1	1	1	1	1	1
DMU_{34}	0.883	1	0.883	0.883	0.883	0.883
DMU_{35}	0.82	0.9802744	0.82	0.82	0.82	0.82
DMU_{36}	1	1	1	1	1	1
DMU_{37}	1	1	1	1	1	1
DMU_{38}	0.933	0.933	0.8414376	0.9333	0.9333	0.9333
DMU_{39}	1	1	1	1	1	1

The table shows that dropping the input “floor space” causes no significant change in the TE score of DMUs and efficient units are remaining efficient. However, while dropping inputs “no of doctors” and “distance from airport/city” one by one, change in efficiency score is observed in the analysis. DMU_9 which is efficient DMU is becoming inefficient when “no of doctors” is not considered for CRS efficiency. Similarly, efficient units DMU_{14}, DMU_{17} and DMU_{29} are considered as inefficient DMUs by omitting the input “distance from airport/city”. These indicate that “no of doctors” and “distance from airport/city” are important inputs for medical tourism service providers. This table also specifies that there is a significant change in the TE scores of DMUs while dropping the output “customer satisfaction”. CRS efficient DMUs viz. DMU_3, DMU_9, DMU_{27} and DMU_{29} are found inefficient. This implies that the output “customer satisfaction” is of

vital importance for assessing the medical tourism performance. Later in the analysis, the most efficient DMU is dropped. It is observed that the efficient units are remaining efficient as such when DMU_{15} is dropped from the DEA analysis but inefficient units such as DMU_{24} and DMU_{34} becomes efficient units for CRS model.

7.2.3 DEA with VRS scale assumption and DEA-AR

The VRS scale measures the pure TE. In contrast to CRS model, ten DMUs (DMU_5, DMU_6, DMU_8, DMU_{13}, DMU_{18}, DMU_{20}, DMU_{22}, DMU_{24}, DMU_{34}, and DMU_{35}) with corresponding efficiency scores are found to be the DEA-inefficient units in VRS model. The inefficient units can make adjustments in their inputs/outputs looking into their peer groups to become efficient unit. These units may adopt either input-oriented strategy or output-oriented strategy to become efficient. The input-oriented strategy emphasizes on achieving current level of output using less inputs than the current level whereas output-oriented strategy rests on achieving higher level of output by same level of inputs. The latter strategy is not only preferred but also suitable for medical tourism performance in India. The relative efficiency scores indicate that ten DMUs out of thirty nine DMUs have emerged as inefficient units. The average score for the medical tourism service providers is found 0.975 (which happen to be more than that of CRS-model) with a standard deviation of 0.06 when VRS model is used (shown in Table 7.6). Similarly, when the AR model is used, the average score is 0.418 with a standard deviation of 0.262. Based on the efficiency scores obtained from CRS, VRS and AR, it is interesting to note that four DMUs (DMU_{11}, DMU_{15}, DMU_{23} and DMU_{39}) have become efficient units in all the models. Comparison with the DEA-CRS and DEA-VRS models, the DEA-AR model showed a relatively low efficiency score and capability for a detailed measurement.

Table 7.6 Result of DEA (VRS model) and DEA (AR model)

DMU	Efficiency DEA(VRS)	Efficiency DEA(AR)
DMU_1	1	0.2645678
DMU_2	1	0.1707073
DMU_3	1	0.7992416
DMU_4	1	0.2077267
DMU_5	0.9	0.1693605
DMU_6	0.872114249	0.2551721
DMU_7	1	0.1640725
DMU_8	0.987155451	0.1380807
DMU_9	1	0.1485708
DMU_{10}	1	0.5673399
DMU_{11}	1	1
DMU_{12}	1	0.675464
DMU_{13}	0.701364016	0.2015624
DMU_{14}	1	0.5165074
DMU_{15}	1	1

DMU_{16}	1	0.2949214
DMU_{17}	1	0.2159617
DMU_{18}	0.888888889	0.3142329
DMU_{19}	1	0.6783109
DMU_{20}	0.883867745	0.1686531
DMU_{21}	1	0.6276843
DMU_{22}	0.875	0.3138853
DMU_{23}	1	1
DMU_{24}	0.978596002	0.582973
DMU_{25}	1	0.249607
DMU_{26}	1	0.2854413
DMU_{27}	1	0.2902465
DMU_{28}	1	0.7901599
DMU_{29}	1	0.450902
DMU_{30}	1	0.2893464
DMU_{31}	1	0.5630694
DMU_{32}	1	0.3483713
DMU_{33}	1	0.1257826
DMU_{34}	0.934530807	0.2860134
DMU_{35}	0.99496476	0.158505
DMU_{36}	1	0.6748635
DMU_{37}	1	0.2168884
DMU_{38}	1	0.4063198
DMU_{39}	1	1

Note: Mean Efficiency (VRS) - 0.975, Minimum - 0.701, SD - 0.06; Mean Efficiency (AR) - 0.418, Minimum - 0.126, SD - 0.262.

In order to highlight for existence of significant difference between medical tourism performance scores calculated using DEA models (CRS, VRS and AR), three sets of paired sample t-test for means is carried out. The three hypothesis set is as follows:

Hypothesis 1:

Null hypothesis: H0: TE from DEA (CRS) = TE from DEA (VRS).

Alternate hypothesis: H1. TE from DEA (CRS) ≠ TE from DEA (VRS).

Hypothesis 2:

Null hypothesis: H0: TE from DEA (CRS) = TE from DEA (AR).

Alternate hypothesis: H1. TE from DEA (CRS) ≠ TE from DEA (AR).

Hypothesis 3:

Null hypothesis: H0: TE from DEA (AR) = TE from DEA (VRS).

Alternate hypothesis: H1. TE from DEA (AR) ≠ TE from DEA (VRS).

The t-test is conducted using SPSS VERSION 19.0 software. For hypothesis 1, the result shows a Paired t (38) = -2.841, p = 0.007 allowing us to reject the null hypothesis with α (probability of type I error) value as low as 0.05. Similarly, for hypothesis 2 and 3 the result is

Paired t (38) = 12.959, p <. 001 and Paired t (38) = 12.982, p < 0.001 respectively. This indicates the rejection of null hypothesis in the entire hypothesis and allows us to accept the alternate hypothesis as there is a significant difference between efficiency scores obtained through CRS, VRS and AR models. The tests imply that a DEA models can produce results significant different based on assumption of scale. The manager must study the behavior of input and output variables before making any assumption on scale.

7.6 Conclusions

This chapter attempts to provide a framework for assessing medical tourism performance in India based on DEA approach. The methodology helps to identity benchmarking units in the same sector so that the best practices of peers can be implemented to become efficient one. Non-parametric technique viz. “DEA” with three variants - CRS, VRS and AR are used to evaluate the efficiency. DEA is a powerful, comprehensive and efficient mechanism that has been utilized for assessing the efficiency of multiple-input multiple-output medical tourism service providers in India. The methodology facilitates in identifying the benchmarked medical tourism service providers for the inefficient units. The process of benchmarking is useful in identifying the best business practices and formulating the winning strategies. The DEA methodology can be quite useful for Medical tourism service providers in identifying their position relative to their peers, and in formulating strategies for improvement by right mix of inputs and outputs. Initially two approaches of DEA known as CRS and VRS are considered to obtain efficiency of medical tourism service providers. Twenty seven units out of thirty nine DMUs have emerged as benchmarking units for the other twelve DMUs in the CRS model whereas twenty nine units are found to be efficient in VRS model. Many DMUs appear to be relatively efficient and many of those not on the efficiency frontiers are close to efficiency scores of one. Ten DMUs (DMU_5, DMU_6, DMU_8, DMU_{13}, DMU_{18}, DMU_{20}, DMU_{22}, DMU_{24}, DMU_{34} and DMU_{35}) have become inefficient units in both CRS and VRS model based on their efficiency scores. It is clearly evident from the analysis that Average Treatment Time (V_6) is relatively more sensitive for improving medical tourism performance whereas Ratio of nurse to patient (V_3) and Distance from airport/city (V_9) moderately influence the medical tourism performance. The results of sensitivity analysis shows that dropping the input “floor space” causes no significant change in the TE score of DMUs and efficient units are remaining efficient. However, while dropping inputs “no of doctors” and “distance from airport/city” one by one, change in efficiency score is observed in the analysis. $DMU_{9,}$ the efficient DMU is becoming inefficient when “no of doctors” is not considered for CRS efficiency. Similarly, efficient units DMU_{14}, DMU_{17} and DMU_{29} are considered as inefficient DMUs by omitting the input “distance from

airport/city". It is also evident that there is a significant change in the TE scores of DMUs while dropping the output "customer satisfaction". CRS efficient DMUs viz. DMU_3, DMU_9, DMU_{27} and DMU_{29} are found inefficient. This implies that the output "customer satisfaction" is of vital parameter for the medical tourism performance.

The efficiency scores obtained by CRS and VRS models are compared using a paired sample t-test. It has been demonstrated that statistical difference exists on ranking of units in both models. Therefore, managers must be cautious regarding the use of scale assumption. A thorough understanding of behavior of input and output variables is needed while assuming scale. Secondly, to avoid large variability in the weights for above DEA models, weight restrictions in the CRS model has been incorporated. The Assurance Region model that is used includes upper and lower limit of weights of input and output variables that separates inefficient DMU from efficient DMU judged by CRS. It is interesting to note that four DMUs (DMU_{11}, DMU_{15}, DMU_{23} and DMU_{39}) have become efficient units in all the models. This study considers thirteen parameters relevant for benchmarking medical tourism.

The DEA approach can be utilized based on accreditation to gauge its performance over time. With data available for several numbers of years, every year might be considered as a single DMU. By conducting such analysis the medical tourism industry would be able to quantitatively determine whether or not the medical tourism performance is getting better over time so as to become most preferred global medical tourism destination. Even though the results in this chapter is based on data collected from thirty nine DMUs, the methodology would suggest a much broader geographical applicability on evaluating medical tourism performance amongst all the medical tourism service providers. The appropriate factors, such as quality of care, investment pattern of medical tourism service provider, profit etc. could have been incorporated in the model for calculating efficiency score for improving medical tourism performance in a specific context. As the DEA is affected by sample size, more number of medical tourism service providers may be considered for better insight into the problem.

CHAPTER 8

INTERRELATIONSHIP BETWEEN SERVICE QUALITY AND SERVICE LOYALTY IN MEDICAL TOURISM

8.1 Introduction

A review of healthcare literature in Chapter 2 reveals an abundance of studies on service quality (Antoniotti et al., 2009; Haddad et al., 1998; Hansen et al., 2008; Andaleeb, 2008; Boos et al., 2001; Wu et al., 2008). Research has identified new dimensions of healthcare service quality (different from the traditional service quality dimensions) such as physical environment, interaction/courtesy, treatment cure, technical quality care competency, accessibility, promptness (waiting time), finance factor (cost), facility premises (Zifko-Balig and Krampf, 1997; Tam, 2007; Tomes and Chee Peng, 1995; Evans and Lindsay, 1999; Dansky and Miles, 1997; Carman 2000; Risser, 1975; Ware et al., 1983; Baker, 1990; Rao et al., 2006). The aforesaid new dimensions of healthcare service quality are extended to investigate the medical tourist's perception towards service quality. As a result, these dimensions are proposed to be significant for medical tourism service quality (MTSQ):

Hypothesis 1: Accessibility is a significant dimension of MTSQ.

Hypothesis 2: Treatment Satisfaction is a significant dimension of MTSQ.

Hypothesis 3: Courtesy is a significant dimension of MTSQ.

Hypothesis 4: Physical Environment is a significant dimension of MTSQ.

Hypothesis 5: Technical Quality Care is a significant dimension of MTSQ.

Hypothesis 6: Promptness is a significant dimension of MTSQ.

Hypothesis 7: Facility Premises is a significant dimension of MTSQ.

Hypothesis 8: Finance Factor is a significant dimension of MTSQ.

It is evident from the service literature that there is a paucity of literature in investigating service loyalty. Measuring service loyalty in healthcare is quite difficult due to rare and infrequently purchases (Oppermann, 1999) and clandestine behavior in intention to revisit in future (Jones and Sasser, 1995). Extensive literature review supported that loyal customers are most likely to publicize the company and its products through positive word of mouth and through a desire to maintain that relationship (Hennig-Thurau et al., 2002; Bloemer and De Ruyter, 1998). There are no articles on the measurement of service loyalty for medical tourism sector. Primarily, the medical tourism studies, to date have not addressed and examined the construct of service loyalty. For this research, therefore, it is crucial to develop an all encompassing measurement for medical tourism service loyalty (MTSL) considering various scales developed for service loyalty construct. Finally, the authors endeavor in this research to present an ultimate scale developed for MTSL in Indian context utilizing a confirmatory factor analysis (CFA) model.

In conceptualizing MTSL, the authors propose an integration of behavioral measures, attitudinal measures and cognitive measures. Behavioral loyalty measure is expressed by the actual revisiting the service provider, brand allegiance, price elasticity, share of category, number of times a service is purchased in a given period, price until switching, exclusive purchase, hard-core loyalty, repeat purchase probability and share of category requirements (Russell-Bennett et al., 2007; De Wulf and Odekerken-Schro¨der, 2003; Uncles et al., 2003; Rundle-Thiele and Mackay, 2001). The attitudinal loyalty measures include attributes such as word-of mouth, complaining behavior, purchase intentions (De Ruyter et al., 1998), willingness to recommend (Selnes, 1993) and commitment towards the service provider (Jacoby and Chestnut, 1978, p. 80). The cognitive loyalty component includes attributes like preference to the service organization (service that first comes to mind when making a purchase decision), the belief that the service organization provides best offer and suiting customer needs (Harris and Goode, 2004; Bellenger et al., 1976) and the product or service that is a customer's first choice among alternatives (Ostrowski et al., 1993). Based on the review of the aforesaid literature, the authors identified the MTSL constructs into the three dimensions for scale construction process. As a result, these dimensions are proposed significant for MTSL:

Hypothesis 9: Behavioral Loyalty (BHL1) is a significant dimension of MTSL

Hypothesis 10: Attitudinal Loyalty (BHL2) is a significant dimension of MTSL

Hypothesis 11: Cognitive Loyalty (BHL3) is a significant dimension of MTSL

The increasing recognition of perceived service quality has been attributed to its positive effects on service loyalty which in turn affect the corporate business performance such as profitability and market share (Zeithaml, 2000). The effects of different service quality dimensions on service loyalty have also been tested in different service contexts of technology based banking (Ganguli and Roy, 2011), tourism (Baloglu, 2001), package tour operators (Andreassen and Lindestad, 1998), call centers (Dean, 2002), multi-service scenario (Zeithaml et al., 1996) and internet services (Parasuraman et al., 2005). Previous research has suggested that the quality of customer's service experience aids them to develop positive value perceptions about the service provider that leads to loyalty. However, causal relationship of medical tourism service quality and service loyalty has been only conceptually or superficially discussed. Additionally, conceptual clarification, distinctions, and logical linkages among the constructs have been lacking. Consequently, an integrated model using structural equation modeling (SEM) is proposed to clarify these interrelationships. Hence we suggest the following hypotheses as:

Hypothesis 12: MTSQ has a positive effect on MTSL

Hypothesis 13: Treatment satisfaction has direct and positive influence on MTSL

Hypothesis 14: Accessibility has direct and positive influence on MTSL

Hypothesis 15: Courtesy has direct and positive influence on MTSL

Hypothesis 16: Physical Environment has direct and positive influence on MTSL

Hypothesis 17: Facility Premises has direct and positive influence on MTSL

Hypothesis 18: Finance Factor has direct and positive influence on MTSL

Hypothesis 19: Technical Quality Care has direct and positive influence on MTSL

Hypothesis 20: Promptness has direct and positive influence on MTSL

8.2 Data collection

A questionnaire survey was conducted at seven Indian hospitals providing healthcare services to medical tourists. Out of seven hospitals, four hospitals are JCI accredited hospitals. The survey items were developed for all constructs based on past literature and review by experts in the field of health care service quality management. Expert opinion indicated that the scales had adequate content validity. Based on comments by the experts, modifications have been made on the items to better fit the medical tourism in Indian context. The respondents were randomly chosen medical tourists to seven hospitals. Medical tourists, who were seriously ill, admitted in intensive care unit could not provide reliable information and these responses were excluded. Respondents were advised to state their level of agreement on each item using a five-point Likert-type scale ranging from “strongly disagree” to “strongly agree”. Responses were screened based on completeness, rational scoring and adherence to scale. Out of five hundred ninety six responses, five hundred thirty four were usable resulting in 89.6% response rate which is considered to be reasonable for a survey of this type. Further, the sample was split into two sub-samples as sample I (n = 289) and sample II (n = 245). The items for MTSQ and MTSL are shown in Table 4.1 (Chapter 4) and Table 8.1 respectively.

Table 8.1 Survey items for medical tourism service loyalty

Construct	Measurement Items	Source
MTSL	Transact with this medical tourism service provider again for future needs	Jacoby and Chestnut (1978)
	Try new services that are provided by this medical tourism service provider	Sudhahar et al. (2006)
	Say positive things to other people about the services provided at this medical tourism service provider	De Ruyter et al. (1998)
	Continue to patronize this medical tourism service provider even if the service charges are increased moderately	Rundle-Thiele and Mackay (2001)
	Have strong preference to this medical tourism service provider	Sudhahar et al. (2006)
	Keep patronizing this medical tourism service provider	Sudhahar et al. (2006)

	regardless of everything being changed somewhat	
	Likely to pay a little bit more for using the services of this medical tourism service provider	Rundle-Thiele and Mackay (2001)
	Patronize this medical tourism service provider for a long period of time	Sudhahar et al. (2006)
	Deal exclusively with this medical tourism service provider	Sudhahar et al. (2006)
	Think of this medical tourism service provider as my healthcare services	Sudhahar et al. (2006)
	The medical tourism service provider I patronize reflect a lot about who I am	Sudhahar et al. (2006)
	This medical tourism service provider would rank first among the other medical tourism service provider	Zeithaml et al. (1996); Ostrowski et al. (1993)
	Switch to a competitor if you experience a problem with current medical tourism service provider	Zeithaml et al. (1996); De Ruyter et al. (1998)

8.3 Results and discussions

Amongst two hundred forty five respondents, one hundred forty eight (61%) are male and ninety seven (39%) are female. The average age was 42.6 years with the range between 22 years and 70 years. 52% of the medical tourists are employed in service, 37% are self-employed and 11 % are found housewives. Out of the total two hundred forty five medical tourists interviewed, eighty four (34%) are from the United Arab Emirate (UAE), forty five (19%) from European countries, thirty four (14%) from USA (United States of America) and Canada, fifty two (21%) from SAARC countries, twenty (8%) from African countries and rest 10 (4%) from other countries. Eighty four (34%) medical tourists have income level less than USD 10000, ninety six (39%) have income level between USD 10000-20000, fifty six (23%) have between USD 20000- 30000, seven (3%) have between USD 30000-50000 and only two (1%) patients have income level more than USD 50000 per annum. Out of the two hundred forty five respondents, one hundred forty eight (61%) are married, seventy four (30%) are single and rest twenty three (9%) are divorced. The medical tourists are admitted to various inpatient departments of the selected hospitals for treatment of various ailments like Gastroenterology (9%), ENT (3%), Urology (11%), Cardiology (26%), Orthopedics (15%), Gynecology (13%), Nephrology (6%), General Surgery (8%) and Ophthalmology (9%).

Both exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were used to assess the reliability and validity of the instrument. Data analysis proceeds in three steps. EFA was first used to assess the validity of each latent variable. These variables include the dimensions of MTSQ as accessibility/convenience, treatment satisfaction, courtesy, physical environment features, technical quality of care competency, promptness, facility premises, alternative therapy, finance factors for medical services and pharmaceutical services. Other latent variables include dimensions of MTSL such as behavioral loyalty, attitudinal loyalty and

cognitive loyalty. The exploratory factor analysis is used to identify the underlying dimensions of MTSQ and MTSL for Medical tourism in India. Next, confirmatory factor analysis was used to confirm the factor structure of the constructs and validate EFA results. Finally, SEM is employed to examine the hypothesized relationships.

8.3.1 Exploratory factor analysis

Given the validity of individual latent variables, two EFA were conducted. The exploratory factor analysis was performed on the fifty two items of the medical tourism service quality and the other one included thirteen items of medical tourism service loyalty measurement scale. EFA was performed on sample I using SPSS. The criteria used for factor extraction is twofold- the eigen value should be greater than one but more importantly the factor structure should be meaningful, useful and conceptually sound (Pett et al., 2003). The result of factor analysis with Varimax rotation for medical tourism service quality is presented in Table 8.2.

In the initial application, the number of items is reduced from fifty two to thirty six. In the second application, these thirty six items are classified under ten factors discussed in Chapter 4 viz., accessibility/convenience, treatment satisfaction, courtesy, physical environment features, technical quality of care competency, promptness, facility premises, alternative therapy, finance factors for medical services and pharmaceutical services. All main loadings are higher than 0.60 and cross loadings are less than 0.40, which indicates the validity of the measurement instruments. Sixteen items measuring service quality were removed because of their low loadings to any factor.

Table 8.2 Exploratory factor analysis of medical tourism service quality

Factors	Measurement items	Factor Loading	Cronbach Alpha	Cumulative % of Variance
Accessibility/Convenience	AC_1: Website provides adequate information	0.795	0.89	13.78
	AC_2: The 24/7 contact centre	0.843		
	AC_3: Medical visa assistance	0.629		
	AC_4: High level of transparency	0.748		
	AC_5: Excellent recreational service	0.715		
Treatment Satisfaction	TS_1: Transparency in communication	0.693	0.95	26.181
	TS_2: Communicate positive things	0.754		
	TS_3: Recommend	0.809		
	TS_4: Follow up treatments	0.801		
Courtesy	C_5: Consistently courteous and respectful	0.741	0.86	35.397
	C_6: Emotional & psychological confidence	0.744		

	C_7: Trustworthy	0.673		
	C_8: Provide undivided attention	0.606		
Physical environment features	PE_1: Guaranteed reservation	0.808	0.88	44.898
	PE_2: Adequate information / travel desk	0.683		
	PE_3: Adequate information on cultural heritage	0.684		
	PE_4: Confidential treatment records	0.771		
	PE_5: Safety and security	0.708		
Technical quality of care competency	TQC_1: Tie-up with insurance companies	0.688	0.91	52.196
	TQC_2: Global accreditation	0.729		
	TQC_3: State of art diagnostic centre	0.671		
	TQC_4: Health care infrastructure	0.645		
	TQC_5: Highly qualified doctors	0.61		
Promptness	PMT_1: Waiting time	0.737	0.83	57.201
	PMT_2: Short time stay in hospital	0.788		
	PMT_3: Faster in admission and discharge procedures	0.671		
	PMT_4: Routine visit of doctors and staffs	0.736		
Facility Premises	PR_1: Foreign exchange facilities	0.824	0.81	62.519
	PR_2: 24x7 internet connectivity	0.755		
	PR_3: 24x7 STD / ISD connectivity	0.771		
Alternative Therapy	AT_1: Hospital offers alternative therapy	0.772	0.71	67.099
	AT_2: Spiritualism / meditation program	0.844		
Finance factors for medical services	FF_1: Significant cost saving	0.881	0.86	70.591
	FF_2: Good value for money	0.686		
Pharmaceutical services	PS_1: Availability of prescribed medicines	0.614	0.73	73.935
	PS_2: Round the clock pharmaceutical service	0.664		

The same analysis was conducted for the latent variables comprising of medical tourism service loyalty. All items measuring medical tourism service loyalty loaded into three factors as shown in Table 8.3. The items MTL_1, MTL_2, MTL_3, MTL_4, MTL_5 and MTL_6 measure behavioral loyalty. MTL_7, MTL_8, MTL_9, MTL_{10} and MTL_{11} measure attitudinal loyalty. Items such as MTL_{12} and MTL_{13} measure the cognitive loyalty. The average variance explained is 76.34%, much higher than 60%. Eigen values are higher than 1.0, ranges from 1.041 to 7.404. The value of Cronbach's alpha for all dimensions is 0.918. Cronbach's alpha values for behavioral loyalty,

attitudinal loyalty and cognitive loyalty are 0.933, 0.924 and 0.826, higher than the cutoff value of 0.80. This result provides sufficient evidence of the reliability and the validity of the measurement instruments for MTSL.

Table 8.3 Exploratory factor analysis of medical tourism service loyalty

Factors	Measurement items	Factor Loading	Cronbach Alpha	Cumulative % of Variance
Behavioral Loyalty (BHL_1)	MTL_1: Transact with this medical tourism service provider again for future needs	0.862	0.933	35.327
	MTL_2: Try new services that are provided by this medical tourism service provider	0.812		
	MTL_3: Recommend other people to patronize to this medical tourism service provider	0.792		
	MTL_4: Say positive things to other people about the services provided at this medical tourism service provider	0.755		
	MTL_5: Continue to patronize this medical tourism service provider even if the service charges are increased moderately	0.783		
	MTL_6: Have strong preference to this medical tourism service provider	0.767		
Attitudinal Loyalty (BHL_2)	MTL_7: Keep patronizing this medical tourism service provider regardless of everything being changed somewhat	0.804	0.924	67.444
	MTL_8: Likely to pay a little bit more for using the services of this medical tourism service provider	0.846		
	MTL_9: Patronize this medical tourism service provider for a long period of time	0.869		
	MTL_{10}: Deal exclusively with this medical tourism service provider	0.798		
	MTL_{11}: Think of this medical tourism service provider as my healthcare services	0.772		
Cognitive Loyalty (BHL_3)	MTL_{12}: The medical tourism service provider I patronize reflect a lot about who I am	0.787	0.824	76.337
	MTL_{13}: This medical tourism service provider would rank first among the other medical tourism service provider	0.903		

8.3.2 Confirmatory factor analysis

After identifying ten factors and three factors of MTSQ and MTSL respectively through exploratory factor analysis, the next stage is to confirm the factor structure on sample II. This is

applied to provide a more rigorous procedure for testing unidimensionality (Anderson and Gerbing, 1988). Structural equation modeling (SEM) using AMOS 18.0 was used to perform the confirmatory factor analysis. Initially CFA was run for the MTSQ construct. The model (Model 1) consisted of thirty-six observed variables with ten latent variables is shown in Figure 8.1. Eleven multivariate outliers (with Mahalanobis distance statistics p<.001) were identified and excluded from the analyses. The Cronbach's alpha value of the latent variable alternative therapy and pharmaceutical services are found just above the cut off score of 0.7 (Hair et al., 2006). Moreover most of the items are self-developed in those variables. The results of the CFA analysis indicated a bad fit between the model and the data (Chi-square ($\chi 2$) = 1430.379, Degree of freedom (df) = 406, $p < 0.001$; $\chi^2/df = 3.523$ (>3); Comparative fit index (CFI) = 0.839; Tucker-Lewis index (TLI) = 0.816; IFI = 0.840; Normed fit index (NFI) = 0.790; Parsimony normed fit index (PNFI) = 0.690; Parsimony comparative fit index (PCFI) = 0.733 and Root mean square error of approximation (RMSEA) = 0.093).

The traditional chi- square statistic for this measurement model is 1430.379 which doesn't support an acceptable match between the theory implied covariance matrix and the sample data covariance matrix. The significant chi-square statistic does not definitively mean a poor model fit because the chi-square statistics tends to be large with large samples (Jöreskog, 1993). Chi-square/degree of freedom is therefore applied in this study to adjust the sensitivity of chi-square to sample size. The chi-square/degree of freedom value for this measurement model is more than the cutoff value 3.0 (Simon and Paper, 2007). In short, the measurement model do not confirm to the ten-factor structure of the medical tourism service quality instrument. Therefore, Alternative therapy and Pharmaceutical services are excluded from the model 1. Moreover, the AMOS output for standardized residual covariance identified large residual values between PMT_4 and TQC_5 (4.530), AC_4 and TS_1 (5.122), and AC_5 and TQC_1 (3.868). Removing large residual items from the existing model suggests in obtaining an improved model. Model 2 was estimated accordingly and is shown in Figure 8.2. The eight factors were hypothesized to be correlated. The results from the CFA showed a better model fit ($\chi 2 = 560.374$, df = 268, $p < 0.001$; $\chi 2/df = 2.091$ (<3); CFI = 0.954; TLI = 0.944; IFI = 0.955; NFI = 0.916; PNFI = 0.756; PCFI = 0.787and RMSEA = 0.068). In addition, all the indicators loaded significantly on the latent constructs. The values of the fit indices indicate a reasonable fit of the measurement model with data (Byrne, 2001). Another absolute fit index, the standardized root mean square residual (SRMR) is also examined and its value of 0.022 is lower than the cutoff value 0.05 (Segars and Grover, 1993). The goodness of fit index (GFI) is 0.85 for this measurement model, higher than the cutoff value 0.80; adjusted goodness of fit index (AGFI) is 0.803, higher than the

desirable value 0.80 (Gefen et al., 2000). All their values are higher than the benchmark 0.90 for NFI and CFI (Anderson and Gerbing, 1988; Mulaik et al., 1989) and 0.75 for PNFI (Sivo et al., 2006). Therefore, these fit indices indicate the acceptability of the measurement model.

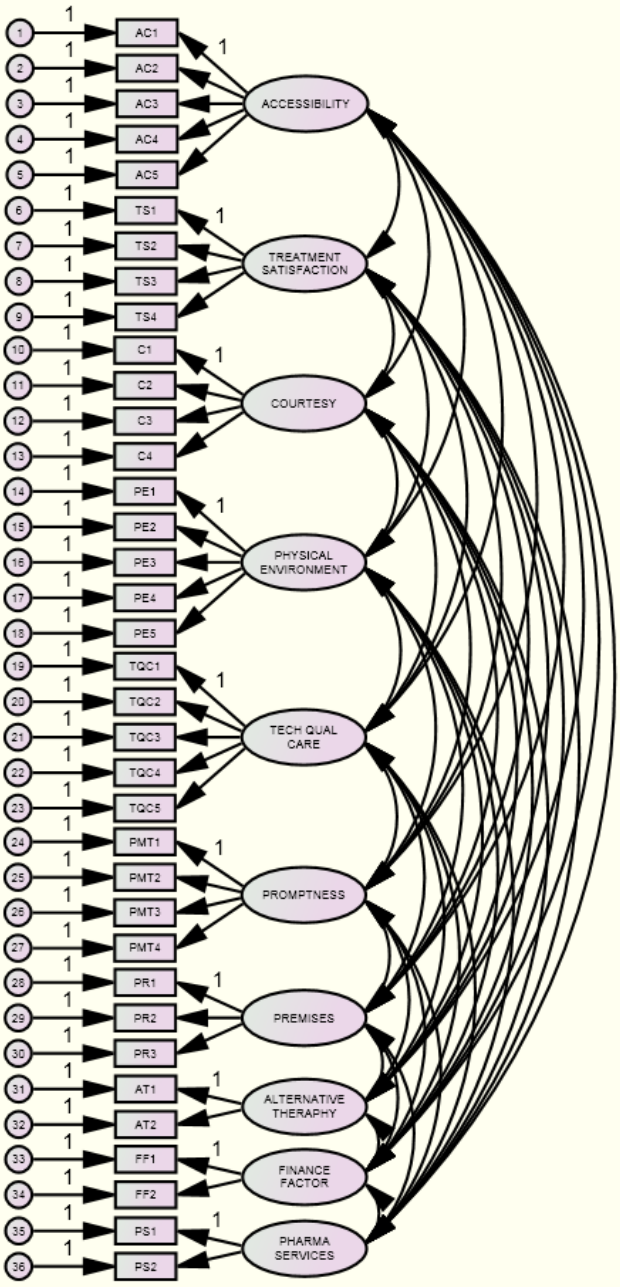


Figure 8.1 Measurement model for MTSQ

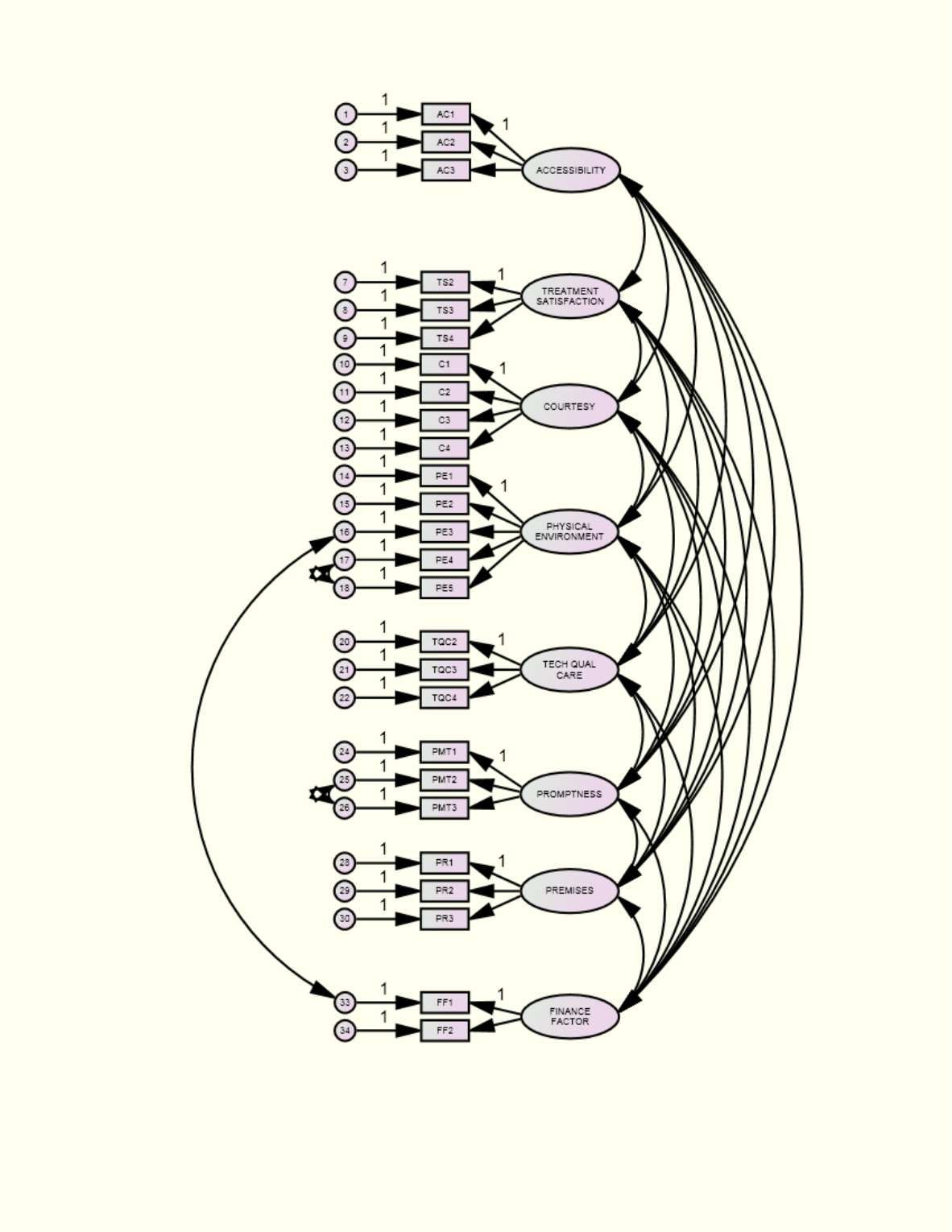


Figure 8.2 Final measurement model for MTSQ

The measurement model 2 confirms to the eight-factor structure of the medical tourism service quality instrument. A second order CFA was conducted to test the relationships between medical tourism service quality and its potential dimensions. The measurement model revealed an adequate model fit with the data (χ^2 = 732.479, df = 290, p < 0.001; χ2/df = 2.526 (<3); GFI = 0.908; SRMR = 0.032; CFI = 0.931; TLI = 0.922; IFI = 0.931; NFI = 0.901; PNFI = 0.795; PCFI = 0.830 and RMSEA = 0.08). The path coefficients between medical tourism service quality and its eight dimensions range from 0.735 to 0.934 is shown in Table 8.4, all significant at 0.01 levels. All eight dimensions were significant and positively related to the latent variable medical tourism service quality. The previously selected fit indices support the contention that this second order measurement model of medical tourism service quality is acceptable. It is also observed all standardized factor loadings are greater than 0.4 and significant at α = 0.05. The reliabilities of the individual dimensions ranged from 0.88 to 0.95 which exceeds the recommended level of 0.7. The Cronbach's alpha for the service quality instrument was 0.93 which is acceptable and shows that the instrument is reliable.

Table 8.4 Standardized loading for measurement model MTSQ

Path			Standardized Loading
FINANCE_FACTOR	<---	MTS Quality	0.851
PROMPTNESS	<---	MTS Quality	0.878
ACCESSIBILITY	<---	MTS Quality	0.735
TREATMENT_SATISFACTION	<---	MTS Quality	0.761
COURTESY	<---	MTS Quality	0.888
PHYSICAL_ENVIRONMENT	<---	MTS Quality	0.934
TECH QUAL_CARE	<---	MTS Quality	0.801
PREMISES	<---	MTS Quality	0.871
AC3	<---	ACCESSIBILITY	0.762
AC2	<---	ACCESSIBILITY	0.874
AC1	<---	ACCESSIBILITY	0.880
TS4	<---	TREATMENT_SATISFACTION	0.851
TS3	<---	TREATMENT_SATISFACTION	0.906
TS2	<---	TREATMENT_SATISFACTION	0.813
PR3	<---	PREMISES	0.904
PR2	<---	PREMISES	0.904
PR1	<---	PREMISES	0.848
C4	<---	COURTESY	0.804
C3	<---	COURTESY	0.952
C2	<---	COURTESY	0.913
C1	<---	COURTESY	0.816
PE5	<---	PHYSICAL_ENVIRONMENT	0.715
PE4	<---	PHYSICAL_ENVIRONMENT	0.673
PE3	<---	PHYSICAL_ENVIRONMENT	0.863
PE2	<---	PHYSICAL_ENVIRONMENT	0.867
PE1	<---	PHYSICAL_ENVIRONMENT	0.811
TQC4	<---	TECH QUAL_CARE	0.919
TQC3	<---	TECH QUAL_CARE	0.969
TQC2	<---	TECH QUAL_CARE	0.908
PMT3	<---	PROMPTNESS	0.968

PMT2	<---	PROMPTNESS	0.914
PMT1	<---	PROMPTNESS	0.870
FF2	<---	FINANCE_FACTOR	0.912
FF1	<---	FINANCE_FACTOR	0.939

Further evidence of the reliability of the scale is provided in Table 8.5, which shows the Cronbach alpha, composite reliability and average variance extracted scores of the different factors obtained. Composite reliability (CR) of all the latent variables is greater than the acceptable limit of 0.70 (Carmines and Zeller, 1988). The average-variance extracted for all the factors is greater than or equal to 0.5 which is acceptable (Fornell and Larcker, 1981).

Table 8.5 Measurement Model MTSQ Results

Construct	Measurement Items	Standardized estimates	Cronbach Alpha	p-value	AVE	CR
Accessibility/Convenience	AC_1	0.880	0.876	*	0.76	0.93
	AC_2	0.874		*		
	AC_3	0.762		*		
Treatment Satisfaction	TS_2	0.813	0.888	*	0.71	0.79
	TS3	0.851		*		
	TS_4	0.906		*		
Courtesy	C_1	0.816	0.924	*	0.73	0.89
	C_2	0.913		*		
	C_3	0.952		*		
	C_4	0.804		*		
Physical environment features	PE_1	0.811	0.900	*	0.57	0.86
	PE_2	0.867		*		
	PE_3	0.863		*		
	PE_4	0.673		*		
	PE_5	0.715		*		
Technical quality of care	TQC_2	0.908	0.953	*	0.87	0.95
	TQC_3	0.969		*		
	TQC_4	0.919		*		
Promptness	PMT_1	0.870	0.938	*	0.82	0.93
	PMT_2	0.914		*		
	PMT_3	0.968		*		
Facility Premises	PR_1	0.848	0.916	*	0.78	0.91
	PR_2	0.904		*		
	PR_3	0.904		*		
Finance factors for medical services	FF_1	0.939	0.923	*	0.86	0.92
	FF_2	0.912		*		

Construct validity is the extent to which a set of measured variables actually reflects the latent construct which are designed to measure (Hair et al., 2006). Construct validity is established by face validity, convergent validity and discriminant validity. Face validity was established by adopting the measurement items used in the study from the existing literature and adapting the same to the present research context. Convergent validity was assessed by

examining the factor loadings and average variance extracted of the constructs as suggested by Fornell and Larcker (1981). All the indicators had significant loadings onto the respective latent constructs ($p < 0.001$) with values varying between 0.673 and 0.969 (Table 8.5). In addition, the average variance extracted (AVE) for each construct is greater than or equal to 0.50 which further supports the convergent validity of the constructs. Fornell and Larcker (1981) state that discriminant validity can be assessed by comparing the average variance extracted (AVE) with the corresponding inter-construct squared correlation estimates. From Table 8.6, it can be inferred that the square root of the AVE values of all the medical tourism service quality factors (diagonal values) are greater than the inter-construct correlations which supports the discriminant validity of the constructs. Thus, the measurement model reflects good construct validity and desirable psychometric properties.

Table 8.6 Discriminant Validity

	Courtesy	Accessibility	Treatment satisfaction	Physical Environment	Tech. Qual. Care	Promptness	Premises	Finance Factor
Courtesy	0.874							
Accessibility	0.638	0.841						
Treatment Satisfaction	0.647	0.740	0.857					
Physical Environment	0.706	0.712	0.774	0.790				
Tech Qual Care	0.711	0.684	0.625	0.727	0.933			
Promptness	0.792	0.575	0.598	0.703	0.713	0.906		
Premises	0.727	0.582	0.644	0.769	0.665	0.802	0.884	
Finance Factor	0.730	0.605	0.626	0.732	0.706	0.807	0.796	0.925

Next, confirmatory factor analysis was carried out for the medical tourist's service loyalty items. The chi-square/degree of freedom value for this measurement model is found more than the cutoff value 3.0. The CFA analysis indicated a bad fit between the model and the data (χ^2 = 202.240, df = 49, $p < 0.001$; χ^2/df = 4.127 (>3); CFI = 0.921; TLI = 0.894; IFI = 0.922; NFI = 0.900; PNFI = 0.668; PCFI = 0.684 and RMSEA = 0.116). In short, the measurement model do not confirm to the three-factor structure of the medical service quality instrument. Therefore, items MTL5, MTL7 and MTL8 are excluded from the model due to large residual values. Thus, final measurement model for medical tourist's service loyalty is estimated. The measurement model indicated an acceptable model fit of the data (χ^2 = 64.228, df = 28, $p < 0.001$; χ^2/df = 2.294 (<3); SRMR = .035; CFI = 0.977; TLI = 0.962; IFI = 0.977; NFI = 0.960; PNFI = 0.797; PCFI = 0.808; GFI = .947; AGFI= .905; and RMSEA = 0.075). The values of the fit indices

indicate a reasonable fit of the measurement model with data (Byrne, 2001) and confirms to the three-factor structure of the medical tourist's service loyalty instrument. The path coefficients between medical tourism service loyalty and its three dimensions range from 0.842 to 0.909 (Shown in Table 8.7), all significant at 0.01 levels. All three dimensions were significant and positively related to the latent variable medical tourism service loyalty. The previously selected fit indices support the contention that this measurement model of medical tourism service loyalty is acceptable. It is also observed that all standardized factor loadings are greater than 0.4 and significant at $\alpha = 0.05$. The reliabilities of the individual dimensions ranged from 0.81 to 0.92, which exceeds the recommended level of 0.7. The Cronbach's alpha for the service loyalty instrument was 0.912 which is acceptable and shows that the measurement model is reliable.

Table 8.7 Standardized loading for measurement model MTSL

	Path		Standardized Loading
BHL_1	<---	MTSL	0.909
BHL_2	<---	MTSL	0.905
BHL_3	<---	MTSL	0.842
MTL_1	<---	BHL_1	0.744
MTL_2	<---	BHL_1	0.553
MTL_3	<---	BHL_1	0.585
MTL_4	<---	BHL_1	0.668
MTL_6	<---	BHL_1	0.740
MTL_9	<---	BHL_2	0.797
MTL_{10}	<---	BHL_2	0.946
MTL_{11}	<---	BHL_2	0.950
MTL_{12}	<---	BHL_3	0.885
MTL_{13}	<---	BHL_3	0.771

8.3.3 Impact of MTSQ dimensions on MTSL

Structural equation modeling (SEM) is used to examine the hypothesized relationships. SEM is employed because it is generally considered more suitable for mathematical modeling that involves complicated variable relationships. SEM allows analysis of both the measurement model and the structural model. It can not only address measurement errors but also allows examining the factor analysis and hypothesis testing together (Gefen et al., 2000). The structural model with the MTSQ dimensions and MTSL dimensions is shown in Figure 8.3. Results of the structural equation modeling indicate an adequate model fit with the data (χ^2 = 1046.131, df = 574, $p < 0.001$; $\chi^2/df = 1.823$ (<3); SRMR = .034; CFI = 0.941; TLI = 0.935; IFI = 0.941; NFI = 0.878; PNFI = 0.8; PCFI = 0.857; GFI = .856; AGFI= .825; and RMSEA = 0.059 and Akaike information criterion (AIC) = 1230.131). Result of hypotheses testing is shown in Table 8.8.

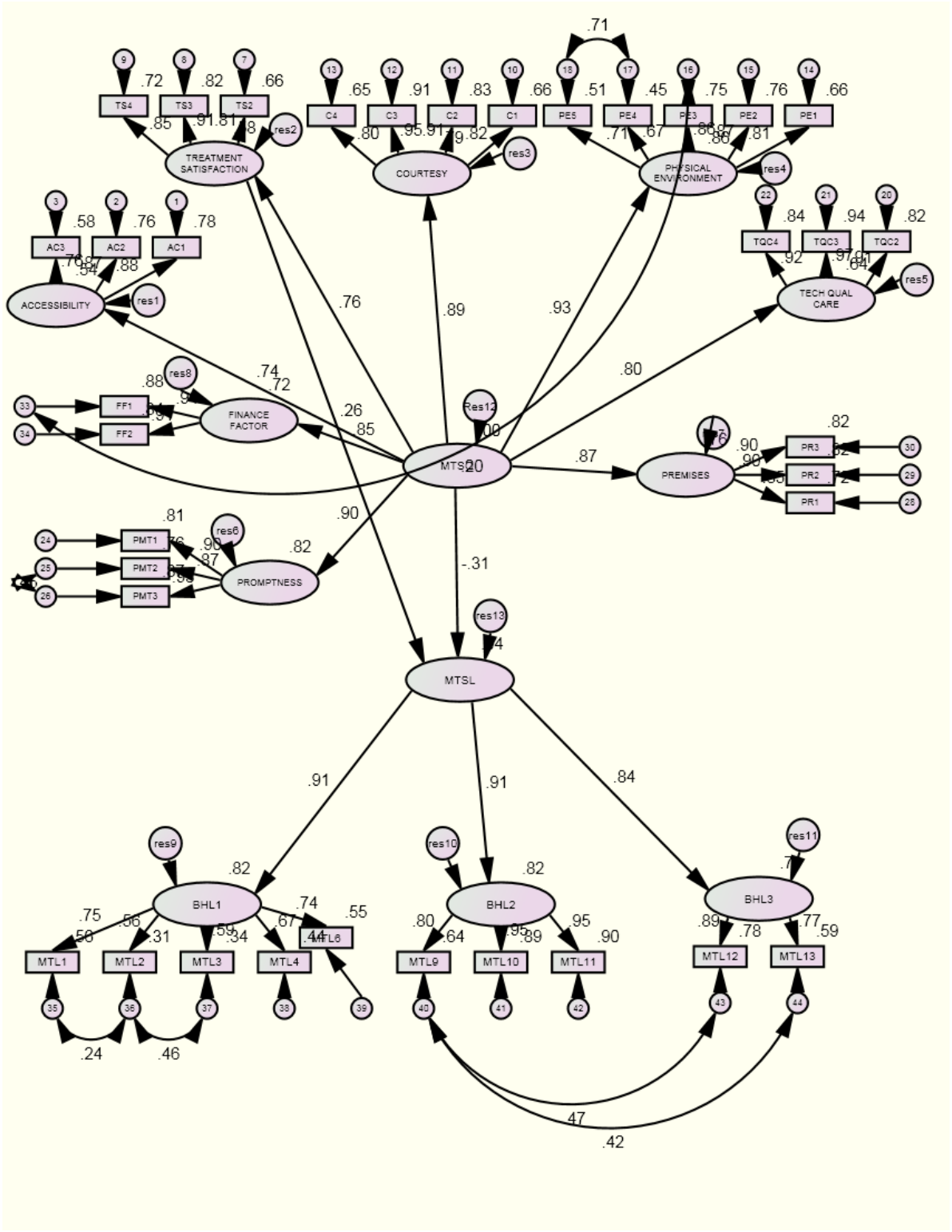


Figure 8.3 Structural Equation Modeling

Table 8.8 Result of Hypothesis testing

Hypothesis	Standardized path Co-efficient	p-value	Result
Hypothesis 1: Accessibility is a significant dimension of MTSQ	0.737	***	Accepted
Hypothesis 2: Treatment Satisfaction is a significant dimension of MTSQ	0.761	***	Accepted
Hypothesis 3: Courtesy is a significant dimension of MTSQ	0.888	***	Accepted
Hypothesis 4: Physical Environment is a significant dimension of MTSQ	0.930	***	Accepted
Hypothesis 5: Technical Quality Care is a significant dimension of MTSQ	0.801	***	Accepted
Hypothesis 6: Promptness is a significant dimension of MTSQ	0.905	***	Accepted
Hypothesis 7: Facility Premises is a significant dimension of MTSQ	0.870	***	Accepted
Hypothesis 8: Finance Factor is a significant dimension of MTSQ	0.850	***	Accepted
Hypothesis 9: BHL_1 is a significant dimension of MTSL	0.907	***	Accepted
Hypothesis 10: BHL_2 is a significant dimension of MTSL	0.906	***	Accepted
Hypothesis 11: BHL_3 is a significant dimension of MTSL	0.842	***	Accepted
Hypothesis 12: MTSQ has a positive effect on MTSL	-0.314	0.012*	Accepted
Hypothesis 13: Treatment satisfaction has direct and positively influences on MTSL	0.264	0.037*	Accepted
Hypothesis 14: Accessibility has direct and positively influences on MTSL	-0.970	0.412	Rejected
Hypothesis 15: Courtesy has direct and positively influences on MTSL	0.057	0.760	Rejected
Hypothesis 16: Physical Environment has direct and positively influences on MTSL	0.067	0.814	Rejected
Hypothesis 17: Facility Premises has direct and positively influences on MTSL	0.117	0.512	Rejected
Hypothesis 18: Finance Factor has direct and positively influences on MTSL	-0.143	0.346	Rejected
Hypothesis 19:Technical Quality Care has direct and positively influences on MTSL	-0.067	0.603	Rejected
Hypothesis 20: Promptness has direct and positively influences on MTSL	0.056	0.801	Rejected

*Implies significant at $p < 0.05$, ***Implies significant at $p < 0.001$

8.4 Conclusions

The current research makes important contributions to the field of medical tourism in India. The first contribution of the chapter lies in the identification of the medical tourism service quality dimensions in generic terms. This research provides insights in availing the healthcare services by the medical tourists in today's turbulent scenario of medical tourism industry which is leveraging upon their overall satisfaction and using it as a weapon for competitive differentiation. The first group of hypotheses is about the dimensions of medical tourism service quality. The dimensions of MTSQ identified in this research are accessibility/convenience, treatment satisfaction, courtesy, physical environment features, technical quality of care competency, promptness, facility premises, and finance factors. These dimensions will act as guidelines for the healthcare managers and administrators that help them to understand the particular dimensions that medical tourists consider while evaluating the medical tourism service delivery process. This is predominantly imperative because medical tourists' concern in choosing appropriate medical tourism service provider, evaluating the right destination and healthcare delivery, value for treatment and so on make it necessary for healthcare managers to have proper knowledge of medical tourist's perceptions of service quality dimensions in medical

tourism industry. The dimensions identified in this chapter can be employed by the service providers to project them as lucrative and preferred medical tourism destination and highlight their ranges of healthcare facilities, infrastructure details, safety aspects, quality control issues and country's rich heritage in order to enhance the medical tourist's self-assurance. This would help, to a great extent in enhancing the brand image of Indian medical tourism that continues to suffer in terms of poverty and poor hygiene to many patients associate it with (Bedge, 2008) and reduce medical tourist's perceived risk in availing medical tourism services. Since globalization and privatization of healthcare has changed the consumption pattern of the medical tourists, it is vital for the medical tourism service providers to create effective quality healthcare services and to develop sustainable customer relationship. The service loyalty is one of the key indicators of medical tourist's commitment to medical tourism service provider. Hence, the second contribution of this chapter is the examination of the differential impact of these medical tourism service quality dimensions on service loyalty in medical tourism. The results are consistent with the loyalty literature (Brady et al., 2002; Zeithaml et al., 1996; Russell-Bennett et al., 2007; Uncles et al., 2003; De Ruyter et al., 1998; Harris and Goode, 2004) in various service industries.

One of the medical tourism service quality dimensions found to be associated with Indian context is labeled as accessibility. This construct is concerned with medical tourists' convenience in obtaining healthcare. The dimension includes three items viz., assistance in medical visa, adequate information about the service provider and round the clock contact center. All the other items that aid to measure accessibility were removed because of poor reliability, validity and high cross loading. The removed items include high level of transparency and excellent recreational services. The medical tourists gather enormous information about the service provider by virtual tour of the websites, contact the service provider well in advance for appointment, consult with the doctors on illness status and obtain effective information for medical visa.

One of the most vital issues in the medical tourism services is satisfaction with the treatment and satisfaction with the decision to use that provider (Choi et al., 2004). Moreover, communicating about the treatment with a degree of positivity and optimism enhances the credibility of the service provider. These indeed build relationships between the medical tourists and employees at service provider, both during and post hospitalization. The second dimension found in the result has been labeled as treatment satisfaction that covers these concerns of medical tourists in India.

The third dimension is labeled as courtesy which consists of items concerning behavior of the service employees (Fowdar, 2008; Hansen et al., 2008; Duong et al., 2004; Andaleeb, 2008) that instill confidence to the medical tourists for early recovery and higher perception of satisfaction level. Besides, the medical tourists must acquire adequate knowledge and information in evaluating the healthcare services. Moreover guaranteed reservation boosts the medical tourist in availing more accurate diagnostic analysis and accelerating their recovery. The fourth dimension dealing with such items is labeled as physical environment features which improves medical tourist's perception of medical tourism service quality. The fifth dimension reflects the acceptance of medical tourist's decision in finalizing the medical tourism service provider. This dimension is tagged as technical quality care competency which consists of items related to global healthcare service accreditation, well equipped diagnostic center and healthcare infrastructure. Promptness is considered as the sixth of the dimensions of MTQS. If the actual waiting time is longer than the expected time, it results in dissatisfaction among medical tourists. Moreover, if duration of stay during hospitalization is short, their satisfaction is higher. The seventh dimension is known as facility premises that consist of items related to support services augmented to the core healthcare services. These support services, such as foreign exchange, internet services and telephone services, are essentially crucial for the medical tourists in connecting them to their friends and relatives overseas. The eighth dimension is labeled as finance factor that reflects the tradeoff between service costs and service received. The cost for medical tourists include both significant cost saving and value for money.

This research also verifies the reliability of the MTSL scale, thus developed. Initially, a maximum likelihood estimation method (MLE) for the parameter estimation was performed. An analysis of outliers was also done by eliminating the multivariate outliers and by examining the values of standardized residuals for each factor and was found that MTL_5, MTL_7 and MTL_8 crossed the recommended limit of 2.51 (Laroche et al., 2001). Therefore these high residuals are eliminated from further analysis.

The confirmatory factor analysis of the data collected, using Amos 18.0 version software indicated interesting insights in establishing the reliability assessment of MTSL scale construction. The path coefficients between MTSL and its three dimensions ranged from 0.842 to 0.909 (shown in Table 8.8) and were significant at 0.01 levels. It is also observed that all standardized factor loadings are greater than 0.4 and significant at $\alpha = 0.05$. The reliabilities of the individual dimensions ranged from 0.81 to 0.92, which exceeds the recommended level of 0.7. The Cronbach's alpha for the service loyalty instrument was 0.912, which is acceptable,

and thereby suggesting a high internal consistency and reliability for each MTSL dimension (Nunnally, 1988). The values of the fit indicates a reasonable fit of the MTSL model with data (Byrne 2001, pp. 79-86) and confirms that the three factors (behavioral loyalty, attitudinal loyalty and cognitive loyalty) are significant dimension of service loyalty. The chapter has also found the impact of these generic service quality dimensions on service loyalty. We found that, overall; MTSQ has positive impact on MTSL (Table 8.8). The interesting insight is that only "treatment satisfaction" dimension of MTSQ has direct and positive influence on MTSL.

This chapter provides useful insights for medical tourism industry. The service quality dimensions identified in this chapter are related to medical tourism in Indian context. This is useful for the healthcare manager to measure the medical tourist's perceptions of service quality on these dimensions as related to medical tourism performance. These dimensions can be used to track the relative performance of a service provider with respect to their competitors over a period of time. Similarly, medical tourism service loyalty construct has been introduced and its reliability is confirmed. The positive impact of healthcare service quality dimensions on loyalty has been highlighted in the literature (Andaleeb, 2001; Dagger et al., 2007). Hence, a fair understanding of the impact of these dimensions on service loyalty can help the healthcare managers to formulate proper strategies to instill in the medical tourists a sense of satisfaction and commitment. This study found that MTSQ has positive effect on MTSL and only treatment satisfaction has direct and positively influence on MTSL. This knowledge can help the healthcare managers to properly design their service delivery process with greater emphasis given to facilities associated with treatment satisfaction. The findings of this research can serve as a guide towards further research in this area by exploring such aspects as brand image, medical tourists' emotions, perceived value, and possibility of existence of a multi-tier service quality model for medical tourism. The replication of this study by future researchers in different medical tourism cultural contexts using a more representative sampling strategy could help to generalize the present findings.

CHAPTER 9

EXECUTIVE SUMMARY AND CONCLUSIONS

9.1 Introduction

The present study essentially revolves around the issues of medical tourism with special reference to service quality provided to medical tourists to India. The assessment and measurement of medical tourism service quality must be based upon the perceptions of medical tourists because they are directly involved in identifying, evaluating and availing the services. Although medical tourism is an emerging issue, the industries, at least in Indian environment, are not working towards improving service delivery system which may help in gaining insight into the problem and to propose corrective measures. Because of paucity of field data, the study undertakes a questionnaire survey to assess the perceived service quality of medical tourists to India. An attempt has been made to propose an instrument for assessing medical tourism service quality. Accreditation status of the organization and several other enablers influence medical tourism performance to a large extent. Therefore, it is imperative to identify and classify the medical tourism enablers so as to highlight the most important enabler requiring instant managerial attention. The study also contributes in providing an integrated approach for modeling medical tourists' perception to find deficient service quality items and propose an appropriate construct to benchmark medical tourism performance. Benchmarking helps to highlight deficiencies and evolve appropriate strategies to improve the service quality. The methodology proposed for benchmarking of medical tourism performance considers ten inputs and three outputs. The methodology characterizes the pattern of influence of input parameters on outputs parameters. Benchmarking helps the decision making units (DMUs) of medical tourism sector to identify the best practices on efficiency dimensions that can be adopted to improve the sectorial performance.

This study also seeks to demonstrate the conceptualization of medical tourism service loyalty construct. Further, it attempts to examine the effect of service quality dimensions on service loyalty dimensions of medical tourism based on research hypotheses. The validity and reliability of both the quality and loyalty instrument have been established. The studies provide some important guidelines on medical tourism service quality for improving the service level of the providers. The guidelines are also useful while formulating medical tourism policy in a specific situation. Therefore, in this research work, an attempt has been made to provide a general framework for designing the service quality as well as service loyalty instrument in medical tourism context and an evaluation methodology for classifying the medical tourism enablers. The following section states the summary of the results obtained in the study.

9.2 Summary of the findings

The important findings of this thesis are summarized as follows:

- The study presents evidence that medical tourism service quality in Indian context can be reliably measured with thirty six items loaded on ten quality factors defined as accessibility or convenience, treatment satisfaction, courtesy, physical environment features, technical quality of care competency, promptness, facility premises, alternative therapy, finance factors for medical services and pharmaceutical services.
- It is to be noted that accessibility or convenience is found to be most important factor with percentage of variance of 15.405 whereas pharmaceutical services is the least important factor with percentage of variance of 4.709.
- It is observed that Accreditation of healthcare (with highest average mean value of 4.4) and Short waiting time for medication (with average mean value of 4.39) are perceived by medical tourists as crucial in selecting the medical tourism service provider. The medical tourists accept the accreditation of the hospitals for safety and quality healthcare standards. The short waiting time for medication signify early diagnosis of the illness, prompt investigation and early recovery. The availability of prescribed medicines inside the premises entails time saving, relieving from anxiety in complex situations, timely consumption of medicines and transportation hindrance. The round the clock STD/ISD connectivity inside the premises enables the patients and their companions to interact with their friends and relatives at their home country. These two conditions were found to be the next important considerations of medical tourists in assessing service quality. The least average mean is found to be 3.46 for item 8 (Medical tourism provider's assistance in obtaining the medical visa). However, the service provider can ensure sufficient assistance in providing the M-visa to the patients by building rapport with the government agencies and the medical tourism intermediaries.
- The study revealed that the accredited medical tourism service providers were perceived more favorably than the non-accredited medical tourism service providers in almost all the items. The maximum difference is observed for item 13 i.e. Global accreditation of medical care unit and item 23 (Employees of the hospital are consistently courteous and respectful). However, mean score for non-accredited hospital is more than the accredited hospitals in two items such as item 21 (Good value for money against the medical tourism travel) and item 34 (The prescribed medicines are available inside the premises). Interestingly, mean score is same for both accredited service providers and non-accredited service providers for item 52 (Willingness to visit the hospital for further/follow up treatments). This indicates that the medical tourists to India are

interested to maintain continuity with the healthcare services rendered to them irrespective of accreditation.

- To find out the interrelationship of design requirements i.e. the medical tourism enablers, interpretive structural modeling (ISM) method has been used in the study. Based on the extensive literature review, eleven medical tourism enablers are identified such as Medicine insurance coverage, Research in medicine and pharmaceutical science, medical tourism market, healthcare infrastructure facilities, international healthcare collaboration, global competition, transplantation law, top management commitment, national healthcare policy, competent medical and para-medical staffs and efficient information system. Firstly, ISM technique is used to rank order the enablers in order to place them in a hierarchy and show their contextual relationships. Secondly, to analyze the driver power and dependence power of variables, MICMAC analysis has been carried out. The enablers are placed in four different quadrants depending upon their driving power and dependence. Medical tourism enablers such as medicine insurance coverage, international healthcare collaboration and efficient information system are found to be dependent enablers. These enablers are also called result enablers and are located in the south-east quadrant. The enablers have a weak driving power but have strong dependence on other medical tourism enablers. The south-west quadrant (above the diagonal) is known as secondary acting enablers or autonomous enablers. These enablers are considered to have some influence on medical tourism process. No enabler is found to be an autonomous enabler. Enablers with strong driving power and strong dependence are called linkage enablers and placed on the North-east quadrant. These, enablers are very influential and dependent. Any action on these enablers will have impact on others. In the present research, there are two such enablers viz., healthcare infrastructure facilities and global competition. Research in medicine and pharmaceutical science, medical tourism market, transplantation law, top management commitment, national healthcare policy, competent medical and para-medical staffs are found to be the independent enablers having maximum driving power. These enablers are located in the north-west quadrant. The prosperity of the medical tourism industry depends on these enablers as they condition the rest of the system and known as independent or determinant enablers or entry enablers. Finally, FMICMAC analysis revealed that the medical tourism enabler 10 (Competent medical and para-medical staffs) has the highest driver power and is ranked as 1. This implies that competent medical and para-medical staffs are the key enabler in the medical tourism industry in India. The entire

medical tourism industry will be influenced by its behavior but shall not be influenced itself.

- Having found out ten factors of medical tourism service quality (treated as VoC) and eleven medical tourism enablers (treated as system design requirement); an integrated approach to design a system framework and prioritize the system design requirements has been proposed with the help of quality functional deployment. The priority improvement sequence is as follows: 1. Perception of medical tourism market in India, 2. Healthcare infrastructure facilities, 3. Global competition, 4. Efficient information system, 5. International healthcare collaboration, 6. Research in medicine and pharmaceutical science, 7. National healthcare policy, 8. Competent medical and para-medical staffs, 9. Top management commitment, 10. Transplantation law and 11. Medicine insurance coverage.
- Benchmarking of medical tourism performance helps to highlight deficiencies and possible strategies that can be evolved to improve the performance of non-performing units. The data envelopment analysis (DEA) “Assurance region” method is employed to make sure that all the decision making units take some minimum weight in all the parameters. A comparison is made to establish the performance level of each DMU using DEA and DEA-AR technique. Twenty seven units out of thirty nine DMUs have emerged as benchmarking units for the other twelve DMUs in the CRS model whereas twenty nine units are found to be efficient in VRS model. Ten DMUs (DMU_5, DMU_6, DMU_8, DMU_{13}, DMU_{18}, DMU_{20}, DMU_{22}, DMU_{24}, DMU_{34} and DMU_{35}) have become inefficient units in both CRS and VRS model based on their efficiency scores. Later the weight restriction AR model is used and it is found that four DMUs (DMU_{11}, DMU_{15}, DMU_{23} and DMU_{39}) are efficient units in all the models.
- This study has demonstrated the conceptualization of medical tourism service loyalty (MTSL) construct. The Cronbach’s alpha for the service loyalty instrument was found to be 0.912 suggesting a high internal consistency and reliability for each MTSL dimension. This confirms that the three factors (behavioral loyalty, attitudinal loyalty and cognitive loyalty) are significant dimensions of service loyalty. The study also examined the effect of service quality dimensions on service loyalty dimensions of medical tourism. The related hypotheses are tested using structural equation modeling. The results confirm an eight factor construct for medical tourism service quality and a three factor construct for medical tourism service loyalty. It is found that the treatment satisfaction dimension of service quality has positive and significant impact on medical tourism service loyalty

(with p-value 0.037, significant at $p < 0.05$). It is also observed that medical tourism service quality has positive impact on medical tourism service loyalty (p-value 0.012 significant at $p < 0.05$).

9.3 Contribution of the research work

The contributions of this thesis in light of above summary and findings have been discussed as follows:

- An instrument has been proposed for assessing medical tourism service quality in Indian context and differentiates between accredited/non-accredited healthcare service providers.
- The instrument is useful for improving the medical tourists' perception towards quality of care and their overall satisfaction. The instrument has been tested using statistical tools and can be utilized for comparative evaluation of medical tourism practices within and/or among medical tourism service providers.
- The interrelationship amongst the medical tourism enablers is established using ISM approach. These enablers are challenges faced by the medical tourism sector and therefore, influence the medical tourist's decision to avail medical tourism services. The classification of the enablers is made with a view to attract greater management attention to important enablers and the risk associated with it could be minimized.
- In order to design the service quality aspect of medical tourism sector, system design requirements have been proposed in this work using quality function deployment (QFD). The approach identifies the design requirements that need most urgent attention and helps to achieve enhanced level of medical tourists' satisfaction.
- Benchmarking of medical tourism practices is an important issue for improving performance. An extensive study on benchmarking based on data envelopment analysis (DEA) with assurance region has been demonstrated using thirty nine units to evaluate the medical tourism performance.
- The medical tourism service loyalty construct has been conceptualized. The reliability and validity of the quality factors and loyalty factors are checked through confirmatory factor analysis (CFA). The relationship between service quality and service loyalty dimensions are established using structural equation modeling (SEM) and the related hypotheses are tested. The effect of service quality on service loyalty in medical tourism has been verified.

9.4 Limitations of the study

The following are the limitations of the present study which can be addressed in further studies in this area.

- The sampling method and the sample size adopted in the study may not be adequate enough to eliminate the social and demographic bias completely.
- The study is confined to seven hospitals and needs to be extended to more hospitals providing medical tourism service. A detailed comparison of medical tourism performance of accredited and non- accredited hospitals can be useful for the decision makers in future.
- Data Envelopment Analysis (DEA) method can be extended to take care of other weight restriction methods since, in this study, only assurance region has been employed.
- In some cases, the perception of the medical tourist's companion present in the hospital has been taken into consideration when the patients are not in a state to be interviewed. This might have camouflaged the preference of the medical tourist to a certain extent.
- The final limitation is the time frame when the data is collected. As medical tourism is an emerging sector, many developments have taken place during and post data collection phase. Hence, the medical tourist's perceptions might not reflect the present scenario in the service quality of the sample hospitals.

9.5 Scope for future work

The present work leaves a wide scope for future investigators to explore medical tourism issues with special reference to service quality aspect. Some recommendations for future research include the following:

- To generalize the results the study can be replicated with a large sample.
- The study may be extended to include medical tourism intermediaries and other professionals to assess the service quality issues prevalent in medical tourism.
- Efforts may be directed to propose a comprehensive national policy on medical tourism through multilateral consultations.
- Benchmarking studies can be carried out considering more number of DMUs and also by increasing number of input and output parameters.
- Future research should consider DEA model with other weight restriction models.
- In order to improve the medical tourism service loyalty, future research may investigate issues such as customers' emotions, brand image, physical environment variables and so on.

- Future studies may highlight as to how awareness of cultural differences can be valuable for health care professionals to cater to the individual preferences of the medical tourists and thereby ensuring competitive advantage of their services.

9.6 Implications

9.6.1 Theoretical Implication

The theoretical implication of the work lies in bridging new ideas and previous work in two distinct fields such as healthcare and service quality. In the course of this research work, the author has gone through a number of service quality theories and models and concluded that research in service quality has been dominated by the SERVQUAL instrument. However, this instrument has been criticized by several researches (Ko and Pastore, 2005). Several studies advocate use of perception scores only for better representation of service quality (Cronin and Taylor, 1992). Therefore, the performance only (p-only) model has been extensively used in different service settings such as tourism, ecotourism, fast food business, hotel, hospitality and provides an improved consistent service quality constructs. There is a conspicuous scarcity in literature about medical tourism service quality. This thesis drew primarily on p-only model (Cronin and Taylor, 1992) in developing a medical tourism service quality construct in Indian context based on perception of medical tourists to India. It is evident from the service literature that service loyalty has not been thoroughly investigated. Measuring service loyalty in healthcare is quite difficult due to rare and infrequent purchases. Moreover, the medical tourism studies have not addressed and examined the construct of service loyalty. In this work, both exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) are used to develop and validate the medical tourism service quality and loyalty constructs. Moreover, the work suggests a methodology to establish interrelationship between the quality and loyalty dimensions in medical tourism employing structural equation modeling (SEM).

Secondly, this thesis identifies and classifies various medical tourism challenges (enablers) using interpretive structural modeling (ISM). However, the enablers having strong direct impact in the direct relationship matrix can suppress hidden factors that may substantially influence the model under consideration. Therefore, Fuzzy matrix cross-reference multiplication applied to a classification (FMICMAC) is introduced to check the sensitivity between the enablers and finally the key-enabler is identified. The thesis proposes a simple but reliable methodology for evaluating the performance efficiency of medical tourism service providers with multiple inputs and outputs using data envelopment analysis (DEA). The DEA model calculates the efficiency weights for each of the inputs and outputs for DMUs under consideration in the best of light. Since the DMUs have the liberty of choosing the weights, they generally choose higher weight

on the parameters in which they are doing well and neglect the parameters in which they do not perform well. In this process, the efficient DMUs may be considered as inefficient DMUs. However, in case of medical tourism all the parameters are equally important. Therefore, DEA with assurance region has been proposed to impose additional constraints on the relative magnitude of the weights so as to ensure that all the DMUs take some minimum weight in all the parameters.

9.6.2 Managerial Implications

International trade in health services namely medical tourism has fascinated a great deal of policy interest and media attention in recent years. The apparent growth in medical tourism has been fuelled by number of factors. The medical tourism service quality in Indian context can be reliably measured with a thirty-six item construct loaded on ten quality factors. The factors can be defined as accessibility or convenience, treatment satisfaction, courtesy, physical environment features, technical quality of care competency, promptness, facility premises, alternative therapy, finance factors for medical services and pharmaceutical services. It is to be noted that "accessibility or convenience" is found to be most important factor whereas "pharmaceutical services" is the least important factor. Accessibility is concerned with medical tourists' convenience in obtaining healthcare that includes three items viz. assistance in medical visa, adequate information about the service provider and round-the-clock contact center. The medical tourists gather enormous information about the service provider by virtual tour of the websites, contact the service provider well in advance for appointment, consult with the doctors on illness status and obtain effective information for medical visa.

The thirty-six items service quality instrument is a useful assessment tool for the healthcare manager to measure the medical tourist's perceptions of service quality. The dimensions help to track the relative performance of a service provider with respect to their competitors over a period of time. A fair understanding of the impact of these dimensions on service loyalty can assist the healthcare managers to formulate strategies to improve satisfaction of medical tourists. Moreover, the effect of quality dimensions on loyalty dimensions enable healthcare managers to properly design their service delivery process with greater emphasis given to facilities associated with treatment satisfaction. Such processes will enable the managers and decision makers of a given hospital to identify the points of strength and weakness, relative to competitors, and consequently investing the available resources in the dimensions that improve the medical tourism service quality and overall patient satisfaction.

Amongst the medical tourism enablers, "competent medical and para-medical staffs" is found as the key-enabler. The medical tourism service providers should focus to enhance their

responses to treat the medical tourists with high emotion and kindness, recruit high skilled and foreign trained competent employees, ensure amicable environment, instill cultural values and offer an excellent and constant level of service quality over time.

The framework for assessing medical tourism performance in India helps decision makers to identity benchmarking units in the same sector so that the best practices of peers can be transferred to become efficient one. The methodology facilitates in identifying the benchmarked medical tourism service providers for the inefficient units. By conducting such analysis, the medical tourism industry would be able to quantitatively determine whether or not the medical tourism performance is getting better over time so as to become most preferred global medical tourism destination.

Finally, training modules can be prepared for future managers and health care professionals in the field by incorporating the findings of the study.

9.7 Conclusions

India as a county is emerging as a preferred global medical tourism destination. However, there is a paucity of research to inspect the contextualized relationships among service quality, patient satisfaction and loyalty aspects in medical tourism industry. This study, examined the medical tourists' perceptions of medical tourism service quality and loyalty. Medical tourism generally involves multiple providers and facilities. Professionals, both inside and outside the industry, play a critical role in the success of the medical tourism process. Their perceptions and satisfaction level, therefore, may directly and significantly influence the medical tourism service quality. Future studies can address this issue.

Another critical issue that remains to be examined is medical tourists' expectations of the medical tourism service quality. Further work can be done to examine the expectations of the medical tourists in order to ensure customer-focused services in future. Medical tourists' perceptions of service quality are affected by social, economic, and cultural factors. For instance, medical tourists from Japan may be overly concerned about the services being offered to their companion during their stay in the hospital. The comparison of perception of medical tourism service quality for people from different cultures is another worthwhile proposition in the future, since these have important implications for global branding as well as advertising strategy. Periodic evaluation of medical tourism efficiency and benchmarking medical tourism performance on a regular basis would go a long way in continuous improvement processes in medical tourism industry.

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APPENDIX

Appendix 4.1

A Sample Questionnaire for measuring MTSQ

We are conducting a survey to assess medical tourism service quality in Indian medical tourism service provider. The Study is purely of academic nature. Your identity will not be disclosed and the data will be kept confidential. We request you to spare some of your valuable time in answering the questionnaire. Please read the following statements carefully and respond to all the statements. Each statement has five possible responses. Please circle the response you feel is the most appropriate by choosing from the following alternatives.

Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly Agree
1	2	3	4	5

The figures in the box indicate rating values in Likert scale						
Sl. No.	Items	Ratings				
1	Website provides adequate information on illness treatment	1	2	3	4	5
2	Online pre-consultation of doctors	1	2	3	4	5
3	Fast and errorless online registration facility	1	2	3	4	5
4	The 24/7 contact centre & toll free help lines always willing to help	1	2	3	4	5
5	Medical treatment location has excellent connectivity by air/railways	1	2	3	4	5
6	Adequate transportation facilities by the medical care unit	1	2	3	4	5
7	Guaranteed reservation by the medical care unit	1	2	3	4	5
8	Hospital provides sufficient assistance in obtaining the medical visa	1	2	3	4	5
9	High level of transparency by the employees of the hospital	1	2	3	4	5
10	High level of safety while availing the hospital facilities	1	2	3	4	5
11	Employees of hospital protects from crime & terrorist related problems	1	2	3	4	5
12	Good tie-up of the hospital with insurance companies	1	2	3	4	5
13	Accreditation of medical care unit is globally accepted	1	2	3	4	5
14	State of art diagnostic centre	1	2	3	4	5
15	Payment facility are easy and flexible	1	2	3	4	5
16	Healthy, neat and clean environment	1	2	3	4	5
17	Hospital provides sufficient employees for treatment	1	2	3	4	5
18	Employee in hospital regularly monitor & assure recovery	1	2	3	4	5
19	Highly qualified and globally trained doctors	1	2	3	4	5
20	Significant cost saving on the medical treatment	1	2	3	4	5

21	Good value for money against the medical tourism travel	1	2	3	4	5
22	Routine visit of doctors and staffs	1	2	3	4	5
23	Employee of the hospital are consistently courteous and respectful	1	2	3	4	5
24	The behavior of hospital employees build emotional & psychological confidence	1	2	3	4	5
25	Fast response to the questions & worries by the hospital's employees	1	2	3	4	5
26	Employees of the hospital are trustworthy	1	2	3	4	5
27	Employees of hospital provide undivided attention	1	2	3	4	5
28	Foreign exchange facilities are provided with in the premises	1	2	3	4	5
29	24x7 internet connectivity inside the premises	1	2	3	4	5
30	24x7 STD / ISD connectivity inside the premises	1	2	3	4	5
31	Quality and variety of food with multi cuisine dinning hall	1	2	3	4	5
32	Hospital offers alternative therapy	1	2	3	4	5
33	Spiritualism / meditation program is also provided with general treatment	1	2	3	4	5
34	The prescribed medicines are available inside the premises	1	2	3	4	5
35	Round the clock pharmaceutical service	1	2	3	4	5
36	Adequate information / travel desk counters to cater to specific needs	1	2	3	4	5
37	Hospital's information & advertisement about the country's cultural heritage is adequate	1	2	3	4	5
38	Hospital keeps my treatment confidential	1	2	3	4	5
39	The attitude of local people is excellent	1	2	3	4	5
40	Excellent recreational service during the period of therapy	1	2	3	4	5
41	Good tie up with external travel agencies	1	2	3	4	5
42	Waiting time for medication is short	1	2	3	4	5
43	Waiting time for the doctor's examination is short	1	2	3	4	5
44	Short time stay in hospital	1	2	3	4	5
45	Faster in admission and discharge procedures	1	2	3	4	5
46	Sufficient health care infrastructure	1	2	3	4	5
47	Employees in hospital clearly communicate about the diagnosed illness and treatment	1	2	3	4	5
48	Hospital keeps its promises it makes	1	2	3	4	5
49	Purpose of medical tourism travel is fulfilled	1	2	3	4	5
50	Communicate positive things about the hospital to other people	1	2	3	4	5
51	Recommend the hospital to friends, relatives & people who seek advice	1	2	3	4	5
52	Willingness to visit the hospital for further / follow up treatments	1	2	3	4	5

Thank you for your cooperation.

Appendix 4.2

Principal Component Factor Analysis

The prime applications of factor analysis techniques are to reduce the number of variables and to detect structure in the relationships between variables, i.e. to classify variables. Therefore, factor analysis is applied as a data reduction or structure detection method.

Terminologies of Factor Analysis

Factor Loadings, $L_i(j)$

It is the matrix representing the correlation between different combinations of variables and factors. $L_i(j)$ is the factor loading of the variable *j* on the factor *i* ,

Where $i = 1,2,3,\ldots,n$ and $j = 1,2,3,\ldots,n$.

Communality, h_i^2

It is the sum of squares of the factor loadings of the variable I on all factors:

$$h_i^2 = \sum_{j=1}^{n} L_{ij}^2$$

Eigenvalue

It is the sum of squares of the factor loadings of all variables on a factor.

Eigenvalue of the factor $j = \sum_{i=1}^{n} L_{ij}^2$

Note: The sum of the eigenvalues of all factors (if no factor is dropped) is equal to the sum of the communalities of all variables.

Factor Rotation

Since the original loadings may not be readily interpretable, the usual practice is to rotate them until a 'simple structure' is achieved. A simple structure means that each variable has very high factor loadings (as high as 1) on one of the factors and very low factor loadings (as low as 0) on the other factors. The communalities of each variable before and after factor rotation will be the same.

Significant Number of Factors

The main objective of factor analysis is to group the given set of input variables into minimal number of factors with the maximum capability of extracting information with the reduced set of factors. There are basically two criteria to determine the number of factors to be retained for future study:

Minimum Eigenvalue Criterion

If the eigenvalue (sum of squares of the factor loadings of all variables on a factor) of a factor is more than or equal to 1, then that factor is to be retained; otherwise, that factor is to be dropped.

Scree Plot Criterion

It is a plot of the eigenvalues of the factors by taking the factor number on X-axis and the eigenvalues on Y-axis. Then, identify the factor number at which the slope of the line connecting the points changes from steep to a gradual trailing off towards the right of the identified factor number. Such change in slope in the graph is known as 'scree' and the point is known as 'scree point'. The factors which are marked up to the right of the scree point are to be dropped from the study.

Factor Scores

Though a factor is not visible like an original input variable, it is still a variable which can be used to find the scores for respondents. At the initial stage, the respondents assign scores for the variables. After performing factor analysis, each factor assigns a score for each respondent. Such scores are called 'factor scores'.

The expression to compute the factor score of a respondent by the factor k is shown below. By substituting the standardized values of the input variables assigned by a respondent in this expression, the factor score of that respondent can be obtained:

$$F_k = w_{1k}X_1 + w_{2k}X_2 + w_{3k}X_3 + \ldots + w_{nk}X_n = \sum_{i=1}^{n} w_{ik}X_i$$

Where w_{ik} is the weight of the input variable X_i in the linear composite of the factor, k for $k = 1,2,3\ldots,n$.

Steps of Principal Component Method

This method maximizes the sum of squares of loadings of each identified factor. This is a popular technique which determines loadings of variables on different factors by using the standard normal values of the observations of the original (input) variables.

The steps of the principal components analysis are summarized as follows:

Step - 1: In the original sets of observation

$[a_{ij}]; i = 1,2,3,\ldots,m$ and $j = 1,2,3,\ldots,n$

Step - 2: Find the standardized sets of observations $[Z_{ij}]$ from $[a_{ij}]$ using the following formula:

$$Z_{ij} = \frac{a_{ij} \quad \overline{X_j}}{\sigma_j};\ i = 1,2,3,\ldots,m \text{ and } j = 1,2,3,\ldots,n$$

where Z_{ij} is the standardized observation of the i^{th} original observation under the variable j and σ_j is the standard deviation of the original observations of the variable j

Step - 3: Determine the weights of the different linear composites of factors $[w_{ij}]$ such that the variance of the unstandardized factor scores of the entire set of observations is maximal. These weights are nothing but directional cosines of the respective vectors.

Step - 4: Find the unstandardized factor scores using the following formula:

$$[f_{ij}]_{m\times n} = [z_{ij}]_{m\times n} \times [w_{ij}]_{n\times m}$$

Step - 5: Find the loadings of the variables on the factors L_{ij} is the correlation coefficient between the values in column *i* of matrix $[Z_{ij}]$ and that of column j of the matrix $[f_{ij}]$ for $i = 1,2,3,\ldots,n$ and $j = 1,2,3,\ldots,n$

Step - 6: Find the standardized factor scores using the following formula:

$$S_{ij} = \frac{f_{ij} - \overline{M_j}}{s_j};\ i = 1,2,3,\ldots,m \text{ and } j = 1,2,3,\ldots,n$$

where S_{ij} the standardized factor is score of the i^{th} set of observations on the factor j; $\overline{M}$, the mean of the unstandardized factor scores of the factor j and S_j is the standard deviation of the unstandardized factor scores of the factor j.

Step - 7: Find the prediction of the standardized original observations using the following formula:

$$[Z_{ij}]_{m\times n} = [S_{ij}]_{m\times n} \times [L_{ij}]_{n\times n}$$

Step - 8: Find the sum of squires of loadings of each column- j (principal component-j/factor- j) which is known as eigenvalue of that column j.

Step - 9: Drop insignificant principal components which have eigenvalues less than 1. Let the number of principal components retained be X.

Step - 10: Perform the rotation of the retained principal components for better interpretation. The rotation can be done by 'varimax rotation method'.

Step - 11: Assign each variable to the principal component (factor), with which it has the maximum absolute loading (irrespective of sign).

Step - 12: Find the sum of squares of loadings for each variable i (row i). It is denoted by h_1^2. Also, find the common variance, whose formula is given below:

$$\text{Common variance} = \sum_{i=1}^{X} h_1^2 ;$$

where X is the number of retained principal components.

Step - 13: For each retained principal component, $k(k = 1,2,3,\ldots, X)$, find the following and state inferences:

$$\text{Proportion of total variance of the principal component } k = \frac{\text{Eigenvalue of principal component } k}{\text{Total variance}}$$

Where the total variance is equal to the number of variables, n. Also,

$$\text{Proportion of common variance of the principal component } k = \frac{\text{Eigenvalues of principal component } k}{\text{Common variance}}$$

$$= \frac{\text{Eigenvalues of principal component } k}{\text{Sum of the eigenvalues of the ratained principal component}}$$

Appendix 4.3

Varimax method of factor rotation

Varimax rotation is the most popular form of factor rotation was developed by Kaiser (1958). For varimax a simple solution means that each factor has a small number of large loadings and a large number of zero (or small) loadings. This simplifies the interpretation because, after a varimax rotation, each original variable tends to be associated with one (or a small number) of factors, and each factor represents only a small number of variables. In addition, the factors can often be interpreted from the opposition of few variables with positive loadings to few variables with negative loadings.

Steps of Varimax method of factor rotation

Formally varimax searches for a rotation (i.e., a linear combination) of the original factors such that the variance of the loadings is maximized, which a mounts to maximizing

$$v = \frac{1}{p}\sum_{j=1}^{m}(\text{variance of squares of (scaled) loadings for } j^{th} \text{ factor})$$

Where $p \times m$ is a matrix of estimated factor loadings obtained. The steps of varimax rotation method for two factors are presented below:

Step - 1: Input the factor loading matrix. Number of variables $= n$. Number of principal components (factors) $= 2$. Angle of rotation $= q$.

Step - 2: Plot the factor loadings on a two-dimensional space, F_1 - F_2 plane, where F_1 and F_2 are factor-1 and factor-2 respectively. Let θ be the angle between the nearest axis F_1 or F_2 and each vector of factor loadings.

Step - 3: Rotate the F_1 - F_2 plane by an angle such that the factor loadings are revised to have a simple structure. A simple structure means that each variable has very high factor loading (as high as 1) on one of the factors and very low0.factor loading (as low as 0) on other factors. Let the rotated plane be F_1 - F_2.

Step - 4: Set variable number, $i = 1$.

Step - 5: Let a_i and b_i be the factor loadings of the variable i on F_1 and F_2 respectively. Find the magnitude of the vector C_i of the factor loadings of the variable i, using the following formula:

$$C_i = (a_i^2 + b_i^2)^{0.5}$$

Let the angle of the vector of factor loadings with the nearest part (positive side and negative side) of F_1 axis be α.

Step - 6: Find $\cos\theta$ and treat it as the factor loading on the nearest axis (a_i if the nearest axis as explained in step-1 is F_1 axis, b_i if the nearest axis is F_2 axis). Fix the sign of the revised loading depending on the side of the factor (plus for positive side and minus for negative side).

Step - 7: Find $\cos(90 - \theta)$ and treat it as the factor loading on the other axis (b_i if the nearest axis as explained in step-1 is F_1 axis, a_i if the nearest axis is F_2 axis). Fix the sign of the revised loading depending on the side of the factor (plus for positive side and minus for negative side).

Step - 8: $i = i + 1$

Step - 9: If $i \leq n$, then go to step-5; or else go to step-10.

Step - 10: Print the revised factor loading matrix.

Step - 11: Group variables into factors and make inferences.

Appendix 4.4

Determining the Sample Size

The formula for computing 'n', the sample size required to do the study, is (Nargunkar, 2008)

$$N = \left(\frac{Zs}{e} \right)^2$$

Z value represents the Z score from the standard normal distribution for the confidence level desired by the researcher.

s represents the population standard deviation for the variable to be measureed in the study.

e is called tolerance error. This can be decided only by the researcher. The lower the tolerance, the higher will be the sample size.

In this thesis, the questionnaire consists 52 items, all of them using this 5-point scale. Therefore, the variables to measure or estimate through the survey, which is being measured on a 5-point interval scale. The researcher wants a 95 percent confidence level in the estimate of medical tourist's perception of service quality level from the study. Then, from the standard normal distribution tables, (for a two-sided probability value of 0.95), the Z value is 1.96. The literature reveals that such a medical tourism service quality study was not conducted in the past. In such case, the researcher uses the rough approximation of range divided by 6 to estimate the sample standard deviation. This indicates that, the lower value of patient's perception is 1, and the highest value is 5. Thus, the range of values for this variable is 5 - 4=1 .Therefore, the estimated sample standard deviation becomes 4/6 = 0.7. The tolerance error is expressed in the same units as the variable being measured or estimated by the study. Thus, we have to decide how much error (on a scale of 1 to 5) we can tolerate in the estimate of average patient perception. Let us say, we put the value at +0.1. That means putting the value of e as 0.1. This means, the estimate of patient's perception to be within 0.1 of the actual value, with a confidence level of 95 percent.

So let us calculate 'n': (Assuming Z = 95% = 1.96, e = ± 1.0% and s = 0.7)

$$N = \left(\frac{Zs}{e} \right)^2 = (1.96 * 0.7 / 0.1)^2 = 189$$

Therefore, a sample size of 189 would give an estimate of patient's perception measured on a 1 to 5-point scale, with 95 percent confidence level, and error level maintained within +0.1 of the actual value. However, increasing the sample size could reduce the sampling error.

List of Publications

International journals (Published)

1. Debata, B.R., Patnaik, B., Mahapatra, S. S. and Sreekumar. (2011). Development of an Instrument for Measuring Service Quality of Medical Tourism in India. *International Journal of Indian Culture and Business Management*. 4(6), 589-608.
2. Debata, B.R., Patnaik, B, Mahapatra, S. S. and Sreekumar. (2012). An integrated approach for service quality improvement in medical tourism: An Indian perspective. *International Journal of Services and Operations Management*. 13(1), 119-144.
3. Debata, B.R., Patnaik, B, Mahapatra, S. S. and Sreekumar (2013). Efficiency measurement amongst medical tourism service providers in India. *International Journal for Responsible Tourism*. 2(1), 24-31.
4. Debata, B.R., Patnaik, B, Mahapatra, S. S. and Sreekumar (2013). Evaluating medical tourism enablers with interpretive structural modeling. *Benchmarking: An International Journal*. 20(6), 716-743.

International journals (Accepted)

1. Debata, B.R., Patnaik, B, Mahapatra, S. S. and Sreekumar. Interrelations of Service Quality and Service Loyalty Dimensions in Medical Tourism: A Structural Equation Modelling Approach. *Benchmarking: An International Journal*.

International journals (Communicated)

1. Debata, B.R., Patnaik, B, Mahapatra, S. S. and Sreekumar. Efficiency measurement in medical tourism: A DEA approach. *Journal of Modeling in Management*.

International conferences

1. Debata, B.R., Patnaik, B., Ernest Cyril de Run and Mahapatra, S.S. (2011). Modelling of medical tourism enablers in India. MAG SCHOLAR Conference, Christchurch, New Zealand, 30th-31th May.
2. Debata, B.R., Patnaik, B., Mahapatra, S.S. and Sreekumar (2011). A quality deployment framework for the service quality of medical tourism in India. 5th International Conference of the Asian Academy of Applied Business (AAAB), Phnom Penh, Cambodia, 9th-10th June.
3. Debata, B.R., Patnaik, B., Mahapatra, S.S. and Sreekumar (2013). Benchmarking of medical tourism service providers: A DEA approach. 6th International Conference of the Asian Academy of Applied Business (AAAB), Bandung, Indonesia, 30th May-1st June.