

Tourism Demand Forecasting and Management

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Abstract: *This paper underlines the trend of tourism demand which is a foundation on which all tourism related business decisions ultimately rest. The paper provides a medium-term estimation of foreign tourism demand at Agra for the period ending by 2016. The time-series analysis was used as one of the quantitative methods commonly applied in estimations. After determining the trend, the strategies are generated for managing the tourism. A case study of Agra is also presented to show the real-life applicability of the developed methodology.*

Keywords: *Tourism Demand, Time-series Analysis, SWOT analysis, AHP, Tourism Management.*

I. Introduction

Tourism, in the past few decades, has emerged as one of the major industries in the world economy by benefiting transportation, accommodation, catering, entertainment, retailing, employment and many other sectors. Thus action plan must be generated for effective planning and estimating tourism demand. With an appropriate forecasting model that could validly predict the tourism demand, the stakeholders would be able to plan an appropriate strategy for its economic welfare. Researchers have applied various methods for understanding the tourist demand patterns in different cities. Chen and Wang (2007) applied a neural network technique and support vector regression (SVR) to tourism demand forecasting. The feasibility of SVR in tourism demand forecasting was compared with back-propagation neural networks (BPNN) and the autoregressive integrated moving average (ARIMA) model. Cos hall and Charles worth (2011) used goal programming to offer planners a practical solution to tourism forecasting problems. The method is more adaptable than conventional minimization of prediction error as it permits practitioners to prioritize a series of management related goals. International tourism, now-a-days, has grown rapidly and has become a very interesting topic in tourism research. Lin, Chen and Lee (2011) developed a forecasting model of visitors to Taiwan using ARIMA, artificial neural networks (ANNs), and multivariate adaptive regression splines (MARS). In order to evaluate the appropriateness of the proposed modeling approaches, the dataset of monthly visitors to Taiwan was used as the illustrative example.

Dritsakis (2012) examined the relationship between economic growth and tourism development in seven Mediterranean countries. The purpose of this research was to investigate the long-run relationship between economic growth and tourism development in a multivariate model with tourism real receipts per capita, the number of international tourist arrivals per capita; real effective exchange rate, and real GDP per capita using the new heterogeneous panel cointegration technique. Huang and Ho (2012) used particle swarm optimization algorithm combined with a back-propagation neural network (PSOBPN) to establish a demand estimation model. The authors also used gray relational analysis to select factors highly correlated to travel demand. AGMM panel data estimation was used by Massidda and Etzo (2012) to investigate the main determinants of Italian domestic tourism demand as measured by regional bilateral tourism flows. The analysis was developed both at aggregate level and for the two traditional macroareas of the country, namely Centre-North and South. Petrevska (2012) provided an estimation of foreign tourism demand by investigating the case of Macedonia. The author applied the Box- Jenkins methodology and tested several alternative specifications in the modeling of original time series. Shahrabi, Hadavandi, and Asadi (2013) presented a new hybrid intelligent model, Modular Genetic-Fuzzy Forecasting System (MGFFS), by a combination of genetic fuzzy expert systems and data preprocessing. The System was developed in three stages: 1. data preprocessing, 2. extraction of the TSK type fuzzy rule-based system for each cluster by means of an efficient genetic learning algorithm, and 3. clustering the test data, and forecasting tourism demand by means of each cluster's fuzzy system. Cuhadar, Cogurcu, and Kukrer (2014) determined the forecasting method that provided the best performance when compared the forecast accuracy of Multi-Layer Perceptron (MLP), Radial Basis Function (RBF) and Generalized Regression neural network (GRNN) to estimate the monthly inbound cruise tourism demand to Izmir. The authors used the total number of foreign cruise tourist arrivals as a measure of inbound cruise tourism demand and monthly cruise tourist arrivals to Izmir Cruise Port in the period of January 2005- December 2013. Pai, Hung and Lin (2014) developed a novel forecasting system for accurately forecasting tourism demand by combing fuzzy c-means (FCM) with logarithm least-squares support vector regression (LLS-SVR) technologies. Genetic algorithms (GA) were optimally used to select the parameters of the LLS-SVR. Data on tourist arrivals

to Taiwan and Hong Kong were used. Yang et.al. (2015) used web search query volume to predict visitor numbers for a popular tourist destination in China, and compared the predictive power of the search data of two different search engines, Google and Baidu. The study verified the co-integration relationship between search engine query data and visitor volumes to Hainan Province. Gunter and Önder (2015) compared the predictive accuracy of various uni- and multivariate models in forecasting international city tourism demand for Paris from its five most important foreign source markets (Germany, Italy, Japan, UK and US). Different forecast models were applied and the accuracy of the forecast models was evaluated in terms of the RMSE and the MAE. A hybrid approach that combines the adaptive differential evolution (ADE) algorithm with BPNN, called ADE-BPNN, was designed by Wang, Zeng and Chen (2015) to improve the forecasting accuracy of BPNN. ADE was first applied to search for the global initial connection weights and thresholds of BPNN. Then, BPNN was employed to thoroughly search for the optimal weights and thresholds. In the present study, a forecasting model is developed to provide the tourism demand trends and forecast. This will further help in generating tourism policies for effective tourist management.

II. Material and Methods

The concept of tourism planning and management could not be applied if forecasting tourism demand is neglected. Thus this paper underlines a three phase methodology for estimating the tourism demand trend, explaining the driving factors behind the trend and defining strategies.

2.1 Time Series Analysis

A time series is an ordered set of observations on a variable taken at regular intervals. The intervals can represent any unit of time that is hour, day, week, month or year all in the same measurements). The aim of time series analysis is to find out a pattern in the historical data and then extrapolate the pattern into the future. In order to make forecasting based on the time series data, this paper uses moving average and exponential smoothing models.

Moving Averages

A moving average of order k, MA(k) is the value of k consecutive observations.

$$F_{t+1} = \hat{y}_{t+1} = \frac{(y_t + y_{t-1} + y_{t-2} + \dots + y_{t-k+1})}{K}$$

$$F_{t+1} = \frac{1}{k} \sum_{i=t-k+1}^t y_i$$

where K is the number of terms in the moving average.

Exponential Smoothing Methods

The exponential smoothing equation

$$F_{t+1} = \alpha y_t + (1 - \alpha)F_t$$

forecasts for the next period.

Where α = smoothing constant, y_t = observed value of series in period t , and F_t = old forecast for period t .

The forecast F_{t+1} is based on weighting the most recent observation y_t with a weight α and weighting the most recent forecast F_t with a weight of $1 - \alpha$

$$F_{t+1} = \alpha y_t + \alpha(1 - \alpha)y_{t-1} + \alpha(1 - \alpha)^2 y_{t-2} + \alpha(1 - \alpha)^3 y_{t-3} + \dots + \alpha(1 - \alpha)^{t-1} y_1$$

If this substitution process is repeated by replacing F_{t-1} by its components, F_{t-2} by its components, and so on the result is:

Therefore, F_{t+1} is the weighted moving average of all past observations

2.2 SWOT Analysis

In order to stay effective and successful in the marketplace, every organization has to be aware of internal and external forces which could impact their success or failure (Lee and Walsh, 2011). SWOT analysis is a tool used for analyzing both the internal and external environments in order to attain a systematic approach and support for decision situation (Kangas et al., 2003). Internal factors can be classified as strengths (S) or weaknesses (W) and external factors can be classified as opportunities (O) or threats (T). In tourism, the SWOT analysis will help in analyzing the advantages and disadvantages of the tourism and in designing strategic suggestions for tourism planning. This also helps in sound understanding of elements, process and practice of

local institutions in order to determine appropriate interventions. Following that, strategic alternatives are selected in the light of the strengths, weaknesses, threats and opportunities as determined through internal and external environment analysis (Yuksel and Dagdeviren, 2007). Conventional SWOT analysis reveals that the importance of factors is not quantified to provide the effect of each factor on the proposed strategy (Chang and Huang, 2006) and therefore needs to be utilised with other scientific techniques especially multi-criteria decision making and quantifying techniques.

The AHP is a multi-criteria measurement which helps to address the complicated decision problems and is based on three principles: structure of the model; comparative judgment of alternatives and decision making criteria; synthesis of the priorities (Saaty, 1980; Saaty, 1987). One of the advantages of AHP is that the method can convert intangible criteria into numerical values, and systematically evaluate weights of selected criteria in pairs through a series of comparisons. The process of AHP has been applied in a large number of complex decision making situations (Ramanathan, 2013; Ahmad and Tahar, 2014, Mangla, Kumar and Barua, 2015; Xu, Feng and Yang, 2016).

The time-SWOT Methodology

The developed methodology is a combination of time series analysis and SWOT analysis. Steps of the method are as follows:

Step 1: Analyze the current trend and estimate forecast of tourism demand using the moving average.

Step 2: Formation of expert group, and interdisciplinary respondent (IR) group.

Step 3: Identification of SWOT factors ($f_j, j=1, \dots, n$). Organizing these in a SWOT matrix under each group ($g_i, i=1, \dots, 4$)

Step 4: Formation of pairwise comparison SWOT (PCS) questionnaire for rating and ranking of g_i and f_j by IR group using 9-point scale (Saaty, 1980).

Step 5: Generation of pairwise comparison matrix (PCM) for each SWOT group and their corresponding factors using equations, as given below:

$$g_i^R = \left(\prod_{q=1}^Q x_{iq} \right)^{\frac{1}{Q}} \quad (1)$$

where x_{iq} represents the pairwise rating of i^{th} group by q^{th} respondent

$$f_j^R = \left(\prod_{q=1}^Q y_{jq} \right)^{\frac{1}{Q}} \quad (2)$$

where y_{jq} represents the pairwise rating of j^{th} group by q^{th} respondent

Step 6: Computation of group judgment weights (g_i^w) and factors judgment weights (f_j^w) using eigenvalue calculation framework.

Step 7: Computation of global judgment weights (f_j^{GW}) by multiplying g_i^w and f_j^w .

Step 8: Designing the strategies based on the computed f_j^{GW} and then performing satisfaction analysis.

The proposed time-SWOT methodology will be used for analyzing and managing tourism demand at Agra.

III. Tourism Demand at Agra

Uttar Pradesh, in India, is a state with many tourist places. Among different cities of the state, the Braj Region is a popular tourist destination as shown in Figure 1. The region is not only important for the domestic tourist but is also well known for the international tourists. Agra is one of the cities of the region with a good number of domestic and international tourists. Agra can boast itself to be a city with many tourists worthy spots. It is famed for being established on the World Tourist Map owing to the presence of the Taj Mahal, a UNESCO World Heritage Site. In addition, the city attracts a lot of tourists for other purposes like religious purpose, historical purposes and its proximity to states like Rajasthan and Uttaranchal; and the capital of India, Delhi. Agra also offers a huge range of activities to the potential tourist comprising historical monuments, wildlife sanctuaries, and pilgrim centers.

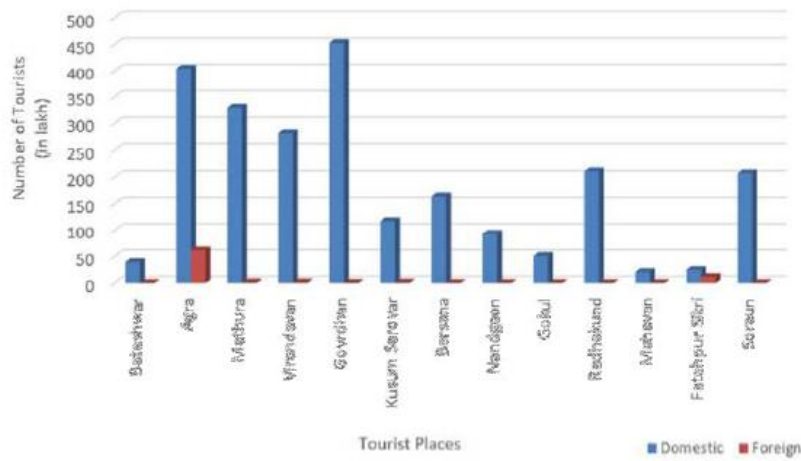


Figure 1: Tourists at Braj Region, Uttar Pradesh

Figure 2 and Figure 3 displays the domestic and international tourist visits at various monuments in Agra.

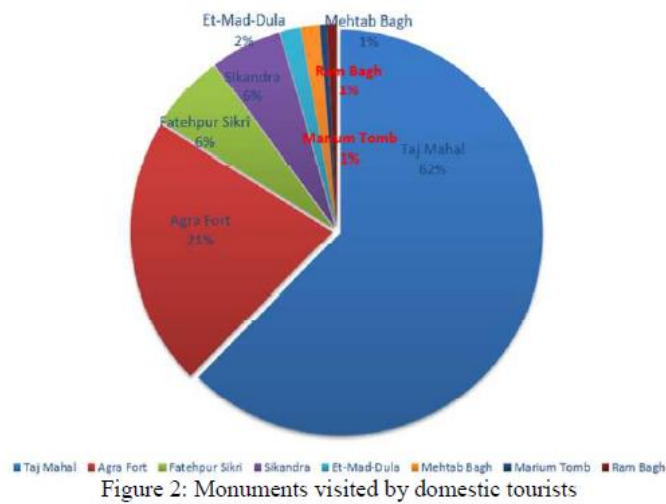


Figure 2: Monuments visited by domestic tourists

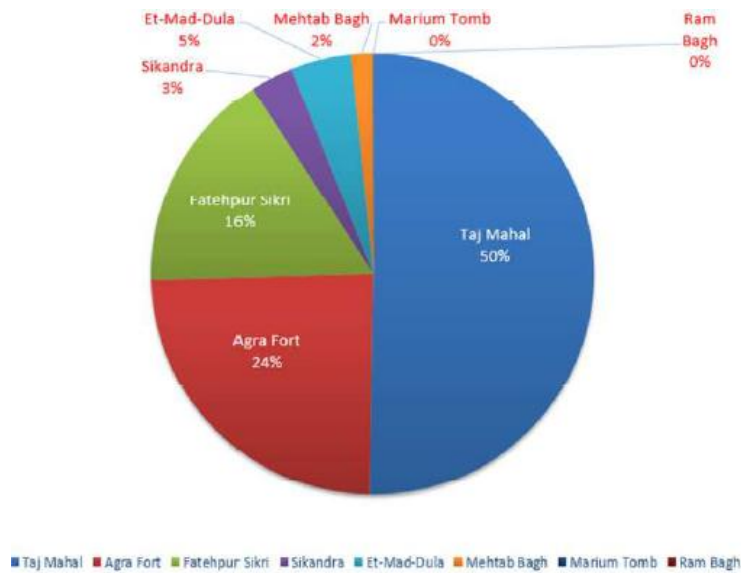


Figure 3: Monuments visited by foreign tourists

Application of time-SWOT methodology

The tourism data was collected from the official website of Uttar Pradesh Tourism from the year 2011 to the year 2016. Based on this data the future data is predicted for the next 5 years w.e.f 2017 to 2022 by using Time Series analysis.

After this analysis, the two main groups were formed. The expert group is composed of nine experts from tourism industry. The interdisciplinary respondent group is formed with forty seven members including tourist, tourist guide and travel agents.

The experts' opinions helped in identifying factors (f_j) relevant to tourism's internal and external environment which are categorised into four groups (g_i), namely: strengths, weakness, opportunities and threats. A SWOT matrix (Table 1) was formed using g_i 's together with their corresponding f_j 's.

Table 1: SWOT Matrix

Strengths (g_1)	Weaknesses (g_2)
(f_1) Destination characteristics: cultural, religious and heritage destinations, museums and beautiful nature parks; varied culture and hospitality; international recognition; cosmopolitan culture; distinct local foods	(f_6) Limited infrastructure: no international airport; traffic congestion; no proper parking and sanitary conditions
(f_2) Geographical location: proximity to religious city (Mathura) and birds' city (Bharatpur).	(f_7) Lack of professionalism in tourist services: lack of professionalism of individual workers; un-trained service providers
(f_3) Historic value: famous capital during Mughal Empire with various Mughal period monuments	(f_8) Poor coordination among tourism authorities: no government tourism policy; lack of public – private involvement in decision making
(f_4) Profile of tourism industry: foreign exchange earnings	
contribution in Indian economy; diverse and unique tourism products such as leatherwear, handicraft made of marbal, zari embroidery and inlay work	
(f_5) Cultural events: religious, festivals and cultural events year around	
Opportunities (g_3)	Threats (g_4)
(f_9) Potential for tourism development: eco-tourism (Keetham lake); health tourism (wide range of hospitals and medical services); MICE (meetings, incentives, conference, exhibitions) tourism; heritage tourism; to get familiar with the culture of three neighboring states (UP, MP and Rajasthan).	(f_{12}) Lack of active tourism controlling authorities: lack of tourism development plan
(f_{10}) International business opportunities: good market for foreign direct investment (FDI); shopping avenues.	(f_{13}) Regional competitive destinations: aggressive marketing by competitive destination; closeness to competitive tourism destination (like Jaipur)
(f_{11}) Geographic settings: not a disaster zone; close to national capital, Delhi.	(f_{14}) Lack of tourism friendly environment: harassment and cheating with tourists by touts; lack of safety, security and deteriorating law and order
	(f_{15}) Price hike during tourism season: considerable increase in the price of various services like local food, transportation, etc

Next a PCS questionnaire is formed and is rated by the IR group to generate PCM for each g_i and f_j using equation (1) and (2). Then the g_i^w and f_j^w are calculated for the groups and their corresponding factors. The CR values where <0.1 , therefor the PCMs were considered consistent. Finally the global judgment weights (f_j^{GW}) are calculated based on g_i^w and f_j^w .

PCM for SWOT groups

	g1	g2	g3	g4	g_i^w
g1	1.000	5.500	3.500	2.750	0.541
g2	0.182	1.000	0.457	1.500	0.112
g3	0.286	2.186	1.000	3.750	0.243
g4	0.364	0.667	0.267	1.000	0.104

Table 2: The f_j^{GW}

SWOT Groups	SWOT Factors	f_j^w	f_j^{GW}
Strengths g_1	(f_1) Destination characteristics	0.447	0.242
	(f_2) Geographical location	0.229	0.124
	(f_3) Historic value	0.165	0.089
	(f_4) Profile of tourism industry	0.095	0.051
	(f_5) Cultural events	0.064	0.035
Weaknesses g_2	(f_6) Limited infrastructure	0.573	0.064
	(f_7) Lack of professionalism in tourist services	0.339	0.038
	(f_8) Poor coordination among tourism authorities	0.088	0.0098
Opportunities g_3	(f_9) Potential for tourism development	0.620	0.151
	(f_{10}) International business opportunities	0.119	0.029
	(f_{11}) Geographic settings	0.260	0.063
Threats g_4	(f_{12}) Lack of active tourism controlling authorities	0.297	0.031
	(f_{13}) Regional competitive destinations	0.137	0.014
	(f_{14}) Lack of tourism friendly environment	0.501	0.052
	(f_{15}) Price hike during tourism season	0.065	0.007

These weights helped in generating the strategies for managing tourism. The designed strategies were discussed with the IR Group and the Expert group for acceptance testing. ANOVA test was applied for the same.

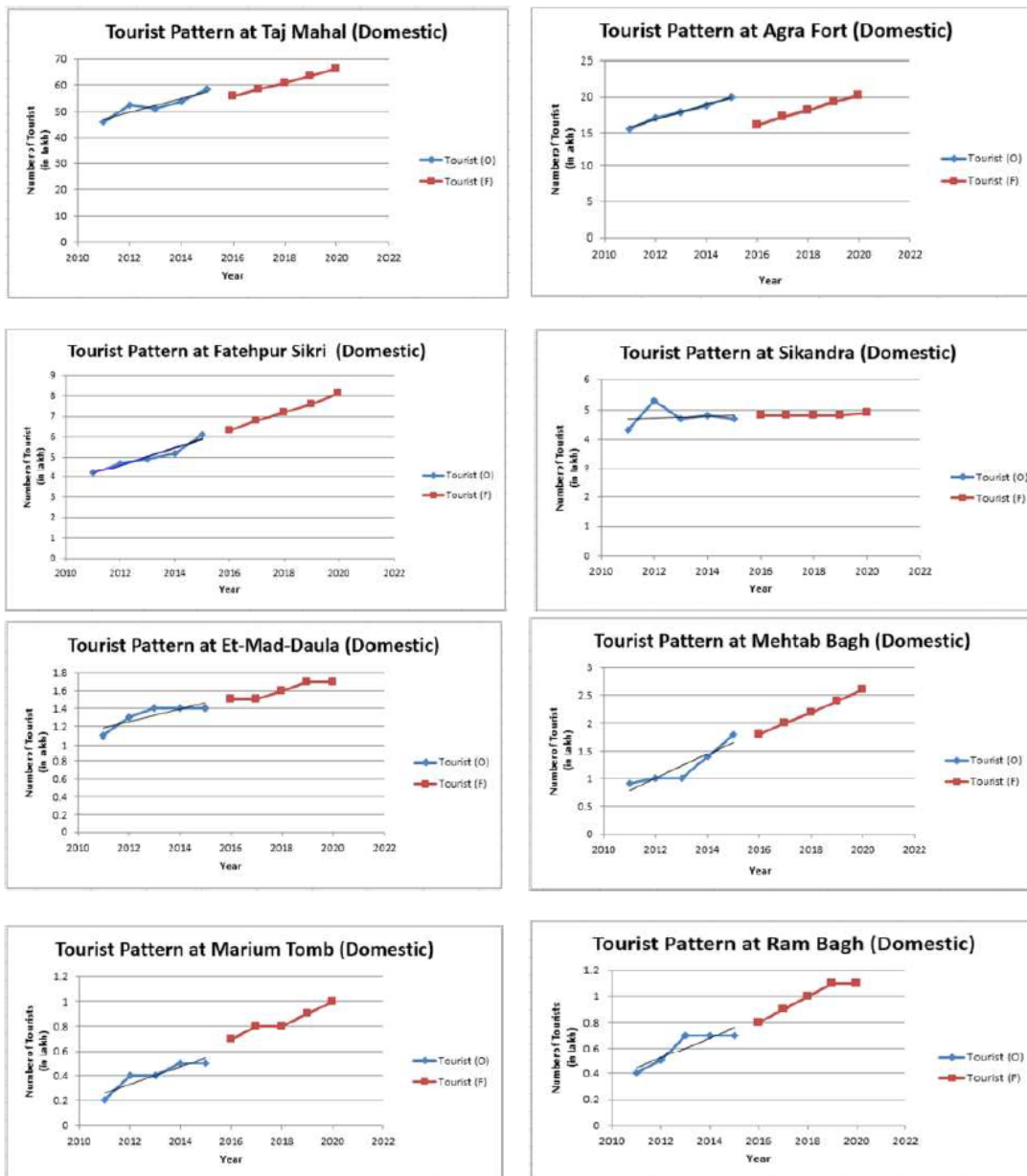


Figure 4: Tourists' pattern (domestic) at various tourist places in Agra

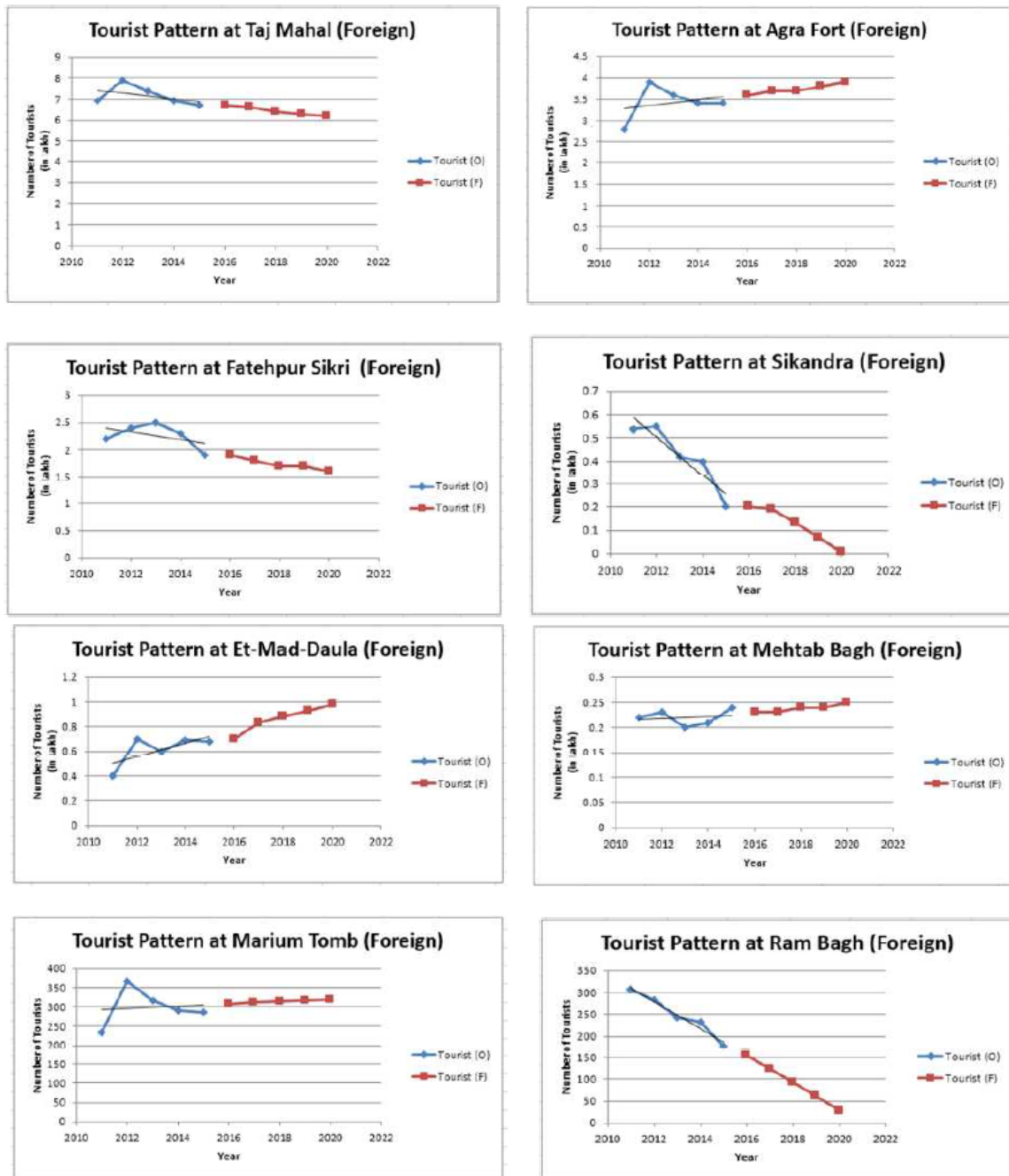


Figure 5: Tourists' pattern (international) at various tourist places in Agra

IV. Results

The growth rate of domestic visitor arrivals in Agra in 2015 was 16.98%. International visitor arrivals increased from 13.2 billion in 2011 to 13.3 billion in 2015. There is a continuous increase in the total tourist's arrival including domestic and foreign in Agra. However, the growth rate of international tourists is very less as compared to the domestic arrivals. The analysis reveals that future trend of international tourist visit is showing downward pattern. Forecasting tourism demand is a crucial issue in the tourism industry and is generally seen to be one of the most complex functions of tourism management. With the accurate forecasted trends and patterns that indicate the sizes, directions and characteristics of future international tourist flows, the government and private sectors can have a well-organized tourism strategy and provide a better infrastructure to serve the visitors. Based on the above computations and the f_j^{GW} weights following strategies are designed:

1. Updating Tourism Infrastructure
2. Strengthening Tourism Transport System
3. Development of New Tourism Destination
4. Human Resource Development

5. Encouragement to Hotel Industry
6. Improving Tourism Services
7. Ensuring Cleanliness at Tourism Destination and Surroundings
8. Assuring Safety of Tourists

These strategies were rated for acceptance testing using Likert's scale with different visitors. The mean value of strategy 1, 2, 6 and 8 was more than 4, which shows focus should be more on Updating Tourism Infrastructure, Strengthening Tourism Transport System, Improving Tourism Services, and Assuring Safety of Tourists to increase the international tourist visits.

- To update the tourism infrastructure
 - ✓ action plan must be prepared to improve sewage system, approach roads, and parking facilities;
 - ✓ special attention may be given to develop alternate tourism like yoga, naturopathy; or to develop of heritage arc and tourism circuits.
- To strengthen tourism transport system
 - ✓ action plans must be made to connect the tourist spots with good quality roads;
 - ✓ international airport can be constructed;
 - ✓ air taxi services may be introduced to facilitate easy travel of tourist;
 - ✓ traffic signage of national/international standards must be placed along the roads.
- To improve tourism services
 - ✓ high speed internet connections must be provided for booking hotels, flights, trains and even high-end sightseeing;
 - ✓ regular cleanliness drivers should be ensured;
 - ✓ training programs in the tourism sector should be mandatory to increase the availability of skilled manpower in this sector.

V. Conclusion

In this paper an attempt has been to develop a methodology for estimating the future tourism demand, and to identify the factors driving the tourism trends. These trends and factors helped in designing the strategies for improving the tourism demand. A case study of Agra is also taken to show the applicability of the method. Accurate prediction of tourism demand is a crucial issue for the tourism and service industry because it can efficiently provide basic information for subsequent tourism planning and policy making. Such a system will help to develop a suitable marketing strategy to gain benefit from the growing tourism.

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