

# Chapter 3

## Sifting Through Hashtags on Twitter for Enterprising Tourism and Hospitality Using Big Data Environment



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**Abstract** Big Data and its importance in inferencing a value out of it is not hidden from anyone. Social networking sites like Twitter proved to be abundant source of information. Like any other sector tourism data can also be extracted out from tweets posted by people all around. Data available on twitter can be in form of text, photographs, Customer preferences can be identified using twitter analytics which can help service providers to offer personalized services. If tour operator are able to predict trends they can easily set optimized price and prepare well in advance to provide unforgettable trip to their customers. Tour operators adopt list pricing policy for deciding price of the tourism product and also there is no set model available for this. The tour operators set the price which helps them to gain high profit, but due to non- availability of any standard formula the decided price varies with the price offered by competitors. Prices are kept high when season is at the peak and more and more tourists are visiting the place or purchasing the tourist products, similarly price is kept low when season is low. In this chapter authors have proposed pricing model considering different factors that decides rates of the product in the tourism sector. Real time analytics performed on the data available on the web portals or social networking sites are used to get the most trending tourist destination and the tour operators functioning at different destination can set price of their products using the proposed model. Real time analytics will help tour operators to analyze the demand in coming season.

**Keywords** Tourism · Pricing model · Big data analytics · MapReduce · Hadoop

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### 3.1 Introduction

Big Data is being used by service sector to identify the customer preferences and to offer personalized services to them. Big data not only deals with Volume of data, it also deals with Variety, Veracity, Value and Velocity, and in the center lays Complexity. Tourism data is available and can be extracted from various heterogeneous sources like tradition databases managed by tour operators, enterprise data warehouses and social networking sites. Tourism data is available in abundance but in scattered form. Tourism data has all the characteristics of big data (Fig. 3.1).

Tourism data is available and can be extracted from various heterogeneous sources like tradition databases managed by tour operators, enterprise data warehouses and social networking sites. Tourism data is available in abundance but in scattered form, therefore tools and technologies that can collaborate together to get the integrated view of data is needed. Sinha et al. [1] has proposed the framework for consolidating data from heterogeneous sources for effective data analytics using big data analytics (Fig. 3.2).

Besides other available data sources social networking is playing very important role in real time analytics for gaining competitive edge over competitors. Social networking sites like twitter, has proved a goldmine of data and used by many researchers for gaining the answer of their questions. Twitter data can be extracted using API provided by twitter for the developers based on keywords like twitter hastags like: #travelgram, #vacation, #visiting, #instatravel, #instago, #trip, #holiday, #travelling, #tourism, #tourist, #instatraveling, #mytravelgram, #travelingram, #travelgoals, #travel, #traveling, #travelingproblems, #travelingstress.etc. and from those most trending places can be identified. This information can be used the government or service providers for preplanning and setting effective price for their products.



Fig. 3.1 Characteristics of big data (Sinha et al. [1])

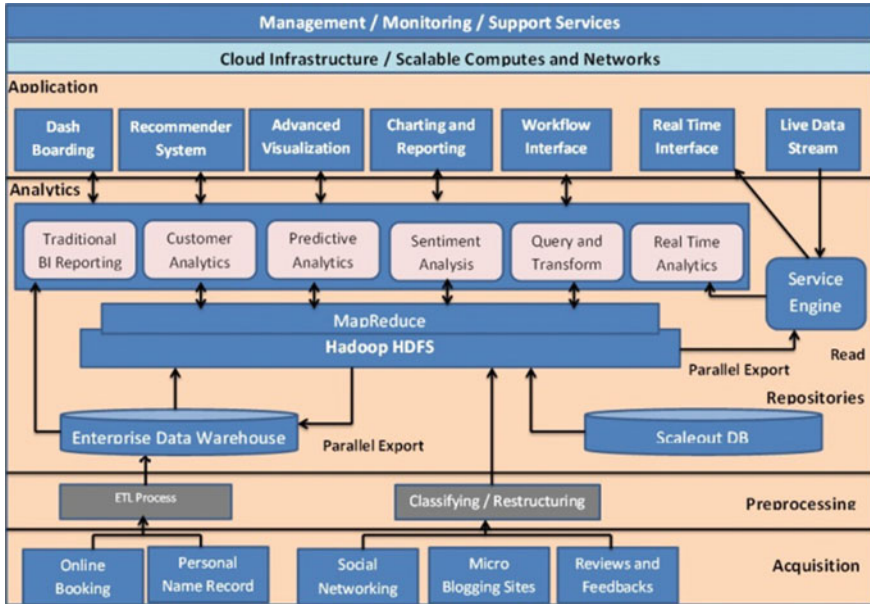


Fig. 3.2 Framework of tAdvisor (Sinha et al. [1])

Setting a right price for the tourism product is one of the challenging job. Right price of tourism products can lead to generation of huge profit whereas if product is priced wrongly then there is a chance that customers may drift away to new vendor.

Tourism sector depends on many factors like: Season, climate, infrastructure, facilities, services, political condition, tourist destinations and environment. Change of any one factor has impact on overall business. There are many pricing model available, but there is no specific pricing model available for tourism domain that keeps factors mentioned above into consideration.

Factors that are considered before setting a price are: position of the product and services in the market, target customers and cost. Position of product and services in the market helps to decide price that can be offered, if there are competitors in the market price should be kept around the price offered by the competitors. Information about the target customer helps to keep the base price of the product that is in reach of the target customers. Cost of the product or services can be used in addition to profit margin for deciding net price. The different types of existing pricing models are:

**Cost Plus Pricing:** It is a cost-based pricing method, in this total cost, labor cost is added with profit margin. This method has assured profit returns but ignores competitions.

**Value-Based Pricing:** It is a strategy for setting different price for different customers which they are willing to pay.

**Hourly Pricing:** It takes time and expense into consideration while setting a price, charges are set as per hourly bases.

**Portfolio-Based Pricing:** It identifies the tourism mix for the customers with different income group and then price is set for the identified tourism mix.

**Tiered and Volume Pricing:** In tiered pricing, prices are charged as per unit within the range and in volume pricing, price is charged for all units within the range (Fusebill [2]).

In this chapter, authors has proposed pricing model that can be used by stake holders to set price of the tourism product. MapReduce is used for implementation of proposed algorithm due to its compatibility to work on large scale data or big data. The chapter is divided into different sections to make is more organized. In Sect. 3.2, authors have presented literature survey, Sect. 3.3, discusses different players involved in tourism business, Sect. 3.4 contains description of factors involved in pricing, Sect. 3.5 consist of mathematical model considering all the factors of pricing. In Sect. 3.6 discusses about demand and supply in tourism sector, Sect. 3.7 discusses tour type and accommodation details. In Sect. 3.8 mark up percentage is discussed, Sect. 3.9 discusses about proposed algorithm using MapReduce programming framework. MapReduce is used for the implementation of algorithm because it can easily works on Hadoop, cost effective because Hadoop is freely available, hardware part can be accommodated using cloud environment, it uses HDFS which uses authentications, and Sect. 3.10 includes results and discussion, followed by Sect. 3.11 on conclusion and future work.

## 3.2 Literature Survey

Big data has started gaining its importance in tourism sector due to its increased impact inside the organization and within whole domain. In tourism sector big data analytics can be used to develop more customer centric applications (Song H., 3). In [4] author studied the perception of both domestic and international student towards the hotel industry.

Sinha et al. [1] has identified different challenges in the tourism sector, like the complexity of the available data in different silos, lack of standard platform for big data analytics and technological alignment. The authors have also proposed framework for big data analytics which will in-tegrate data from multiple sources and allow tourism industry to compre-hend customer preference and to develop strong bond with the customers by providing right service at right time.

The aim of any business is to gain revenue, which is directly related to the price set for the product. The revenue is directly related price and volume tradeoff. If the price set is too high, customers will not purchase that product but it also reflects the desirability of customer for the particular product [5]. Setting appropriate price maximizes the profit earned, where price relies on market demand, cost and competitions [6]. Kim et al. [7] proposed the mathematical model for optimal booking of patients to increase the profit to run the healthcare setup. In [8] authors have studied

the difference between activity based and volume based pricing, according to their study volume based costing system has flaws.

According to study conducted [9] the sector is using haphazard pricing strategies, there is no set pricing model used by tourism sector. The small business operators identify the floor price of the product and change it according to customer and price charged by their competitors. Avlonitis et al. [10] conducted the survey and found that list pricing- policy adopted by the majority of the surveyed companies. Companies are using customer's information for cash discount and competition based information for deciding trade discounts.

The key factor for getting success in the tourism sector is setting appropriate price of the product. The set price should be homogeneous, unambiguous and reasonable (Kotler et al. [11]). Pricing in Tourism is elastic in nature and there are many determinants that decides price of tourism product.

According to (Kotler et al. [11]) availability of alternate options, prices within budget of customer, travel category falls in necessity or luxury, duration of visit and change in rates is permanent or temporary. Kotler et al. [11] also discusses about life cycle of the tourism product, like other products tourism product life cycle consists of phases namely: Discovery, Launch, Stagnation and Decline. Discover is first phase of tourism product lifecycle, in this phase new destinations are explored. Second phase is the Launch, in this phase tourists start visiting the new explored destination. In third phase Stagnation, explored destination reach to maturity level and quality of services falls below due to peak exploitation of destination environment and resources.

In fourth phase is basically the dead phase in which profit falls to minimum level and service providers start withdrawing their business from that destination. There are different pricing strategies used while deciding price of tourism product, Premium pricing, Penetration Pricing, Economy Pricing and Price Skimming are the strategies (Kotler et al. [11]). Premium Pricing is charged for the luxury and when service provider has competitive edge over other competitors. Penetration Pricing are the initial price charged by service provider at the time of entering into the market and after getting stable in the market price is increased. Economy Pricing is very low price or minimum price. Price skimming is the high price charged by service provider, seeing which other competitors enter into the market and price falls due to increase supply.

This chapter discusses the need of pricing model which takes the entire factor into consideration, for this many research papers, literature available on internet and blogs were referred.

### 3.3 Players of Tourism Business

There are different players involved in functioning or running tourism business are:

#### **Retail Travel Agents**

Retail travel agents are also known as travel agents. The job of travel agents is to sell the product of tour operators to the customers. They work in association with tour operators and works for bringing the business for them. Retail agents, works in retails space and sells packages through their retail outlets. The source of earning of retail travel agents are the commissions from tour operators. Usually they get 10% of the retails price as a commission.

#### **Domestic and Overseas Wholesalers**

Domestic and overseas wholesaler's works through distribution networks of retail travel agents and online agents on behalf of tour operator. In return they also get commission for the business generated through them. Often they work as intermediary between tour operators and retail agents. 20% of the retails price is offered to them as a commission by tour operators.

#### **Inbound Tourism Operators**

Inbound tourism operators (ITOs) design and coordinate all travel arrangements on behalf of overseas agents and wholesalers. They negotiate price costs and other components of the tour like transportation and accommodations of the tourists. They also get commission for the business generated through them. Usually 25–30% of retail rate is offered to them as a commission by tour operators.

#### **Tour Operators or Suppliers**

Tour Operators are the actual supplier of the tourism product. They offer commissions to other players of the business for generating business for them. They set net rate and retail rate of the products offered by them. A tour operator appoints retail travel agents or wholesalers for selling their product on their behalf. All strategic decisions are taken by tour operators to run their business.

Domestic Customers takes services from tour operators or retail travel agents. The retail travel agents are connected to tour operators and wholesale agents, wholesalers also has tour operators network for generating business for them. Overseas Customers take services from tour operators, wholesaler travel agents or retail travel agents. Where wholesaler travel agents has network of tour operators and inbound tour operators and retail travel agents also has network of inbound tour operators and wholesaler agents which has tour operators network. Besides all above mentioned distribution channels both domestic and overseas customers can directly purchase product from internet.

Figures 3.3 and 3.4 shows the interconnection between different players for domestic and overseas customers.

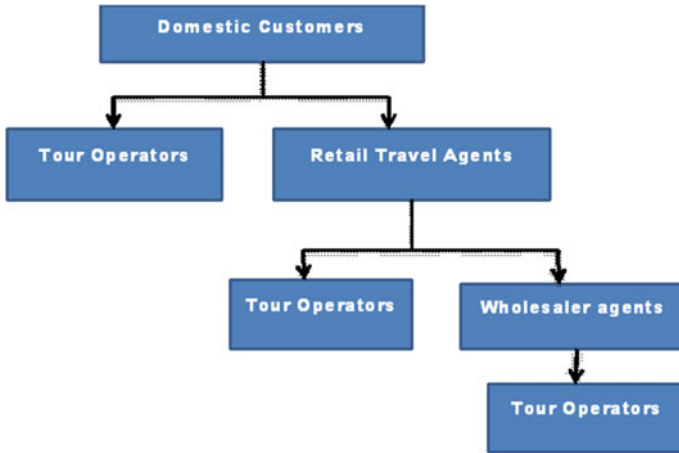


Fig. 3.3 Players involved in business for domestic customers

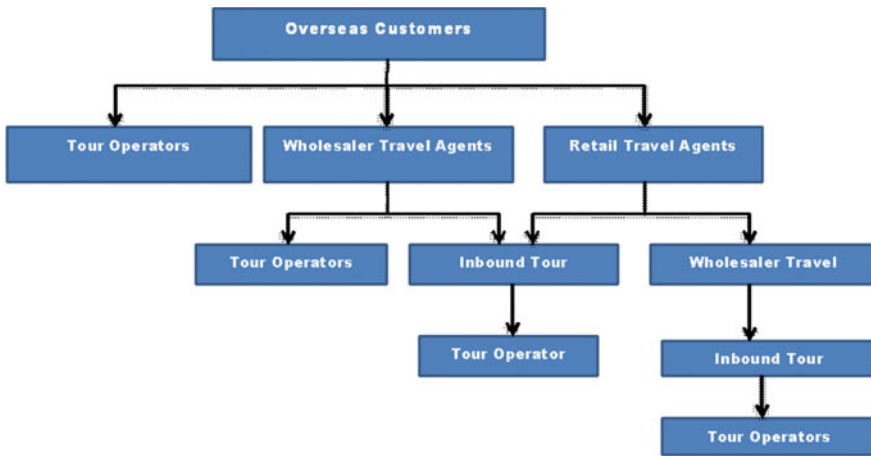


Fig. 3.4 Players involved in business for overseas customers

### 3.4 Key Factors of Pricing

Price is also known as Rate in tourism industry. There are two types of rates, namely net rate and retail rate. Net rate is the gross rate of shelf rate which includes operating cost and profit margin. It is the minimum rate of the product that can be offered to customer. Retail rate includes net rate plus commissions to be given to different players.

$$\text{Net Rate} = \text{Operating Cost} + \text{Profit}$$

$$\text{Retail Rate} = \text{Net Rate} + \text{Commissions}$$

### **Operating Costs**

Operating costs is the expenses incurred for running the business like cost of employee, infrastructure, network, advertisement, promotion, stationary, electricity etc. operating costs can be categorized into fixed cost and variable cost.

#### **Fixed Cost**

Fixed cost remains static that means it doesn't change with change of input or output. Fixed cost includes cost of building, rent, insurance, registrations, licenses and cost of infrastructure.

#### **Variable Cost**

Variable cost changes with the change of input or output. It includes cost of salary, electricity, maintenance, stationaries, linen, marketing and promotions etc.

### **Profit Margins**

Profit margins are the extra percentage of operating cost that is earned by any business. It is usually decided by the supplier after seeing the products offered by competitors and in which their product fits in.

### **Distribution Costs**

Distribution costs are the cost incurred in paying commission to retail travel agents, domestic and overseas wholesaler travel agents and inbound tourism operators.

### **Other Factors**

#### **Competition**

The price offered by competitors plays very important role in setting price. One can't set price too high or too low than the price offered by competitors. If the price is too high, customer will go to their competitor and if it is too low than it will be very difficult to get even the operating cost of the business.

#### **Demand**

Tourism business is also based on demand and supply theory. If demand is very high, tour operator has limited products to offer, than high price will paid by real desirable customers only. Profit can be earned which will compensate to the less profit during low demand period.

#### **Target Markets**

Target market means, customers to whom business is targeting. It can be domestic or overseas customers. Overseas customers generally go for package deals where



as domestic customers are interested in retails products. Profit margin increases if customers are from overseas.

### Seasonality

Season also decides flow of customers. Tour operator can charge good rate when season is in peak and can offer discount when season is off.

### Type of Tourism

There are different types of tourism, like business trips, recreational trips or educational trips. Different types of products can be offered depending of the type of tourism. Like if person is going for the business trip, to and fro ticket can be offered in subsidized rate. Similarly for educational trips, products with transport facilities and accommodations can be offered.

## 3.5 Dynamic Pricing Model for Merchandising Tourism and Hospitality

In the proposed model authors have considered all the factors that affect pricing of the tourism product. The proposed pricing model are as follows:

### 3.5.1 Seasonality (S)

**Natural (N):** There are many natural factors affects the tourism industry. People like to visit hill stations or cool places in summers and similarly to hot places in winters. The effect of natural factors can easily observed when people do not get accommodation due to overcrowded tourist destination. Hotels charge in haphazard manner from their customers and quality of services also degrades. The natural factors considered are:

Temperature =  $T * x_1$

Hours of Sunshine =  $HOS * x_2$

Latitude and Altitude =  $L\&A * x_3$

Climate, Rain/Snowfall =  $C * x_4$

Snow Depth =  $SD * x_5$

$$N = \frac{T * x_1 + HOS * x_2 + L\&A * x_3 + C * x_4 + SD * x_5}{T + HOS + L\&A + C + SD}$$

**Institutional (I):** Purpose of visit also has impact on pricing charged by tourism sector, like if person visits for Business purpose frequently they prefer to stay in same hotels which economical and provides good service. There may be other purpose too,

like: school holidays, religious place visit and calendar effects. All these factors are considered in the proposed model.

$$\text{School Holidays} = \text{SH} * x_6$$

$$\text{Religious Holidays} = \text{RH} * x_7$$

$$\text{Calendar Effects} = \text{CE} * x_8$$

$$\text{Business Seasons} = \text{BS} * x_9$$

$$I = \frac{\text{SH} * x_6 + \text{RH} * x_7 + \text{CE} * x_8 + \text{BS} * x_9}{\text{SH} + \text{RH} + \text{CE} + \text{BS}}$$

Thus the following factor can be calculated,  
 $x_n \rightarrow 0$  to 1 [ $n = 1$  to 39] and all others are constant

$$F1 = \frac{a * N + b * I}{a + b} \quad (3.1)$$

### 3.5.2 Business Operating Costs (BOC)

#### Fixed Cost Items (FCI)

FCI is the cost of items which do not change and remain same throughout the year. The items included in this category is:

$$\text{Salaries} = S * x_{10}$$

$$\text{Office Lease} = \text{OL} * x_{11}$$

$$\text{Interest and repayment on startup cost borrowing} = \text{I\&R} * x_{12}$$

$$\text{Trade association membership fees} = \text{TAM} * x_{13}$$

$$\text{Banking Services} = \text{BS} * x_{14}$$

$$\text{Professional Indemnity Insurance} = \text{PII} * x_{15}$$

$$\text{Web Hosting} = \text{WH} * x_{16}$$

$$\text{FCI} = \frac{S * x_{10} + \text{OL} * x_{11} + \text{I\&R} * x_{12} + \text{TAM} * x_{13} + \text{BS} * x_{14} + \text{PII} * x_{15} + \text{WH} * x_{16}}{S + \text{OL} + \text{I\&R} + \text{TAM} + \text{BS} + \text{PII} + \text{WH}}$$

#### Variable Cost Items (VCI)

VCI is the cost of the items which changes due to external factors like increase in taxes due to government policy, amount spent on marketing etc.

$$\text{Sales \& Marketing} = \text{SM} * x_{17}$$

$$\text{Marketing Campaign} = \text{MC} * x_{18}$$

$$\text{Cost of Sales} = \text{COS} * x_{19}$$

$$\text{Gas Bills} = G * x_{20}$$

$$\text{Electricity Bills} = E * x_{21}$$

$$\text{Cleaning, maintenance, repairs} = \text{CMR} * x_{22}$$

$$VCI = \frac{SM * x_{17} + MC * x_{18} + COS * x_{19} + G * x_{20} + E * x_{21} + CMR * x_{22}}{SM + MC + COS + G + E + CMR}$$

$$F2 = \frac{c*FCI + d*VCI}{c + d} \quad (3.2)$$

### 3.5.3 Competition (Comp)

Market Entry (ME)

New Entrants = NE \* x23

Professionalism = P \* x24

$$ME = \frac{NE * x_{23} + P * x_{24}}{NE + P}$$

Product Competition (PC)

Climate = CL \* x25

Safety = SAF \* x26

Reputation = REP \* x27

Accessibility = ACC \* x28

Price = PR \* x29

Value for Money = VFM \* x30

Attraction/Activities = AA \* x31

$$PC = \frac{CL * x_{25} + SAF * x_{26} + REP * x_{27} + ACC * x_{28} + PR * x_{29} + VFM * x_{30} + AA * x_{31}}{CL + SAF + REP + ACC + PR + VFM + AA}$$

Company Competition

Degree of Rivalry = DOR

$$F3 = \frac{e*ME + f*PC + g*DOR}{e + f + g} \quad (3.3)$$

## 3.6 Demand and Supply in Tourism

Like any other sector, this sector also works on demand and supply theory. If demand is high and supply is low, prices can be kept high so that only eligible customer can buy it. Similarly if demand is low prices are kept low.

### DEMAND

Individual (Education, awareness, paid holiday, family influence) = IND \* x32

Economic (Cost of travel, cost of product, competitive price, exchange rate) = ECO \* x33



Fig. 3.5 Relationship between marketing and promotion

Geographic (Seasonality, Location and distance, attraction available) = GEO \* x34

Destination (safety and security, quality of product, technology and development) = DES \* x35

Political (Visas formalities, health checkups, currency, transport facilities) = POL \* x36

$$DEM = \frac{IND * x_{32} + ECO * x_{33} + GEO * x_{34} + DES * x_{35} + POL * x_{36}}{IND + ECO + GEO + DES + POL}$$

**SUPPLY**

Infrastructure (telecommunication, accommodation) = INF \* x37

Superstructure (Facilities constructed primarily to support visitation and visitor activities) = SUP \* x38

Attraction (Theme parks, museums, buildings, ski-slopes) = ATT \*\* x39

$$SUP = \frac{INF * x_{37} + SUP * x_{38} + ATT * x_{39}}{INF + SUP + ATT}$$

Cumulative factor (Fig. 3.5)

$$F4 = \frac{h*DEM + i*SUP}{h + i} \tag{3.4}$$

**3.7 Tour Type and Accommodation Details**

**Tourism Type**

Tourism itself is a very broad term. There are various different types of tourisms. Each in its own significant way attracts a lot of tourists.

### 3.7.1 *Recreational*

It consists of various tourist offers which persuade people to visit an area. These offers cover a wide range of interests. There are a lot of other crowd pullers such as medicinal offerings, spiritual leaders and recreational parks such as Disneyland etc.

### 3.7.2 *Sports*

Sporting events greatly promote tourism to a country. There are a huge number of sports fans all over the world and thus significant tournaments and events attract tens of thousands of tourists. The world cups of various sports such as football, cricket, hockey; tennis grand slams and tours; sporting events such as the Olympic, commonwealth, asian, Pan-American games; all are very famous sporting events and bring with them a large number of tourists to their host cities.

### 3.7.3 *Business Trips*

Business trips also has significant share in the tourism in the country. By creating favorable policies for organizations to invest in a country, huge revenues are generated because of increase in job opportunities for local population as well as influx of people from the organizations to the country. People on business trip are very rich and therefore are able to spend a lot of money during their stay in the country.

Thus the factor considering tour type and can be calculated as,  $y_n \rightarrow 0$  to 1 [ $n = 1$  to 16] and all others are constant

$$\text{Recreation} = \text{REC} * y_1$$

$$\text{Sports} = \text{SPO} * y_2$$

$$\text{Business trip} = \text{BUS} * y_3$$

$$\text{TT} = \frac{\text{REC} * y_1 + \text{SPO} * y_2 + \text{BUS} * y_3}{\text{REC} + \text{SPO} + \text{BUS}}$$

Accommodation details can also be considered for price estimation. It consists of

$$\text{Room type} = \text{RT} * y_4$$

$$\text{Stay Length} = \text{ST} * y_5$$

$$\text{Number of persons} = \text{NOP} * y_6$$

$$\text{AD} = \frac{\text{RT} * y_4 + \text{ST} * y_5 + \text{NOP} * y_6}{\text{RT} + \text{ST} + \text{NOP}}$$

The cumulative factor considering tour type and accommodation details can be calculated as

$$F5 = \frac{j*TT + k*AD}{j + k}. \quad (3.5)$$

### 3.8 Mark up Percentage

Markup percentage is the commission amount received from adjunct services used by the customer of any service provider like, if tourist purchases gift from the gift shop of the hotel, hotel gets certain percentage of the profit made by gift shop as a markup percentage.

$$\begin{aligned} \text{Transport} &= 0.01 * \text{TRA} * y7 \\ \text{Camping Grounds} &= 0.01 * \text{CG} * y8 \\ \text{Gift Shops} &= 0.01 * \text{GS} * y9 \\ \text{Guest house operation} &= 0.01 * \text{GHO} * y10 \\ \text{Hotel Operation} &= 0.01 * \text{HO} * y11 \\ \text{Restaurant Operation} &= 0.01 * \text{RO} * y12 \\ \text{Travel Agency Service} &= 0.01 * \text{TAS} * y13 \end{aligned}$$

$$F6 = \frac{0.01*TRA * y7 + 0.01*CG * y8 + 0.01*GS * y9 + 0.01*GHO * y10 + 0.01*HO * y11 + 0.01*RO * y12 + 0.01*TAS * y13}{0.01*TRA + 0.01*CG + 0.01*GS + 0.01*GHO + 0.01*HO + 0.01*RO + 0.01*TAS} \quad (3.6)$$

### Commission

Commission is paid to travel agent, distributors and inbound tour operators for the business brought by them.

$$\begin{aligned} \text{Travel Agents} &= 0.01 * \text{TA} * y14 \\ \text{Travel Wholesales} &= 0.01 * \text{TW} * y15 \\ \text{Inbound Tour Operator} &= 0.01 * \text{ITO} * y16 \end{aligned}$$

$$F7 = \frac{0.01 * \text{TA} * y14 + 0.01 * \text{TW} * y15 + 0.01 * \text{ITO} * y16}{0.01 * \text{TA} + 0.01 * \text{TW} + 0.01 * \text{ITO}} \quad (3.7)$$

The process of estimation can prove to be too heavy for the conventional data handling techniques to cope with as the data sets are really formidable. The problem can be however solved using big data analytics. Map Reduce programming has been used by the authors to quickly and efficiently calculate their estimates. Hadoop Cluster Mode: Pseudo-Distributed Hadoop cluster mode is used that is Hadoop daemons run on the local machine.

The pseudo code for the same is as follows:

### 3.9 Algorithm of Proposed Model

#### Mapper Algorithm:

N = number of hotel

A[N] = Pricing Index of hotels

x[i][ ] = factors of ith hotel

y[i][ ] = factors of ith hotel

A [i] = Pricing index of ith hotel

fori = 1 to n {

$$N = \frac{T * x_1 + HOS * x_2 + L\&A * x_3 + C * x_4 + SD * x_5}{T + HOS + L\&A + C + SD}$$

$$I = \frac{SH * x_6 + RH * x_7 + CE * x_8 + BS * x_9}{SH + RH + CE + BS}$$

$$F_1 = \frac{a * N + b * I}{a + b}$$

$$FCI = \frac{S * x[i][10] + OL * x[i][11] + I\&R * x[i][12] + TAM * x[i][13] + BS * x[i][14] + PII * x[i][15] + WH * x[i][16]}{S + OL + I\&R + TAM + BS + PII + WH}$$

$$VCI = \frac{SM * x[i][17] + MC * x[i][18] + COS * x[i][19] + G * x[i][20] + E * x[i][21] + CMR * x[i][22]}{SM + MC + COS + G + E + CMR}$$

$$F_2 = \frac{c * FCI + d * VCI}{c + d}$$

$$ME = \frac{NE * x[i][23] + P * x[i][24]}{NE + P}$$

$$PC = \frac{CL * x[i][25] + SAF * x[i][26] + REP * x[i][27] + ACC * x[i][28] + PR * x[i][29] + VFM * x[i][30] + AA * x[i][31]}{CL + SAF + REP + ACC + PR + VFM + AA}$$

$$F_3 = \frac{e * ME + f * PC + g * DOR}{e + f + g}$$

$$DEM = \frac{IND * x_{32} + ECO * x_{33} + GEO * x_{34} + DES * x_{35} + POL * x_{36}}{IND + ECO + GEO + DES + POL}$$

$$SUP = \frac{INF * x_{37} + SUP * x_{38} + ATT * x_{39}}{INF + SUP + ATT}$$

$$F_4 = \frac{h * DEM + i * SUP}{h + i}$$

$$TT = \frac{REC * y[i][1] + SPO * y[i][2] + BUS * y[i][3]}{REC + SPO + BUS}$$

$$AD = \frac{RT * y[i][4] + ST * y[i][5] + NOP * y[i][6]}{RT + ST + NOP}$$

$$F_5 = \frac{j * TT + k * AD}{j + k}$$

$$F_6 = \frac{0.01 * TRA * y[i][7] + 0.01 * CG * y[i][8] + 0.01 * GS * y[i][9] + 0.01 * GHO * y[i][10] + 0.01 * HO * y[i][11] + 0.01 * RO * y[i][11] + 0.01 * TAS * y[i][12]}{0.01 * TRA + 0.01 * CG + 0.01 * GS + 0.01 * GHO + 0.01 * HO + 0.01 * RO + 0.01 * TAS}$$

$$F_7 = \frac{0.01 * TA * y[i][14] + 0.01 * TW * y[i][15] + 0.01 * ITO * y[i][16]}{0.01 * TA + 0.01 * TW + 0.01 * ITO}$$

### Reducer Algorithm

```
{
Net Rate = F2 + F3 + F5 + F6
Retail Rate = Net Rate + F7
return (Net Rate, Retail Rate)
}
```

### 3.10 Results and Discussions

In (Sinha et al. [12]) MapReduce program is implemented on 150000 tweets extracted from twitter, after cleaning tweets are categorized into different labels of issues raised by the tourism (Table 3.1).

(Sinha et al. [12]) used tweets to identify trending top 25 tourist destination, this information can help service providers, government and tour operators for prior planning. Deciding the optimal price for the services the proposed mathematical model was implemented on data of hotels, Net Rate and Retail Rate of each hotel was calculated. Figure 3.6 shows the format of the data considered for the result calculation:



**Table 3.1** The four major groups and the significant words in each group (Sinha et al. [12])

Group	Significant words
Political	Government management, Corruption free environment, political stability, safety, security
Social	Urbanization, Technological progress, human development index, tourist taxis, local language, health issues, global standardization, heavy rush, sanitary condition
Tourist attraction	Hotel, catering, leisure, sports, level of comfort, architecture, culture, transport connectivity, natural and cultural value, art, literature, music, theater
Infrastructure	Road, lightening, parking, gardens



**Fig. 3.6** Format of the data used [Data Source: Akamai Technologies, Bangalore]

The data was implemented on the proposed model and net rate and retail rate of hotels were calculated. Figure 3.7 shows the graphical representation of net rate

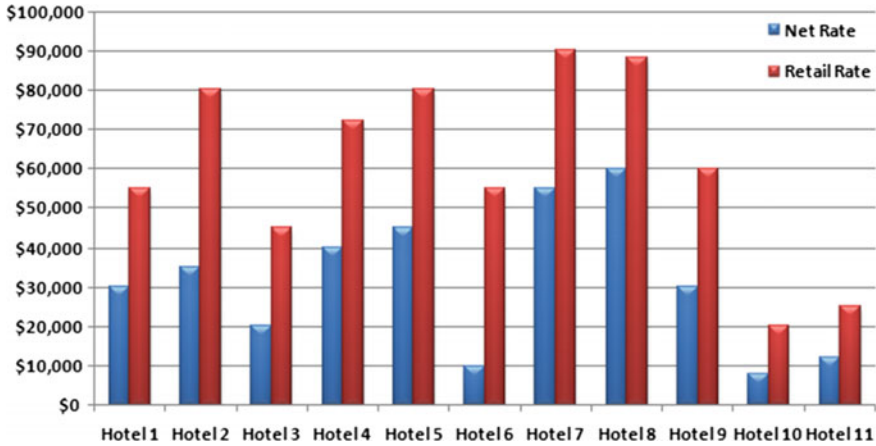


Fig. 3.7 Graphical presentation of net rate and retail rate of each hotel

Table 3.2 Numerical presentation of net rate and retail rate of each hotel

Hotels	Net rate	Retail rate
1	\$30,000	\$55,000
2	\$35,000	\$80,000
3	\$20,000	\$45,000
4	\$40,000	\$72,000
5	\$45,000	\$80,000
6	\$10,000	\$55,000
7	\$55,000	\$90,000
8	\$50,000	\$88,000
9	\$30,000	\$60,000
10	\$8,000	\$20,000
11	\$12,000	\$25,000

and retail rate of the 11 hotels. These calculated rate changes when the parameters considered changes (Table 3.2).

The value of the different factors are assumed while calculating Net Rate and Retail Rate, only the actual value of the factors can help to compare the actual and calculated rates. The main challenge is the frequent change in the value of the factors can lead to inconsistent rate schedule. It is also suggested not to keep too many schedules, best is to keep quarterly rate schedule decided well in advance.

### 3.11 Conclusion and Future Work

In this chapter, authors have proposed a dynamic pricing model pricing model for merchandising tourism and hospitality that can be used by stake holders to set price of the tourism product. The aim of any business is to gain revenue, which is directly related to the price set for the product. The revenue is directly related price and volume tradeoff. If the price set is too high, customers will not purchase that product but it also reflects the desirability of customer for the particular product. Setting appropriate price maximizes the profit earned, where price relies on market demand, cost and competitions. The results demonstrate the estimation of net rate and retail rate of 11 hotels which can be used to take strategic decision to maximize the profit earned.

If any of the factor changes, new retail and net rate can be calculated depending on season, demand/supply, tour type, accommodation, purchases, services availed.

There is some interesting work left for the future and can include:

- This analysis can be further carried out on Fully Distributed Cluster mode that is Hadoop daemons run on a cluster of machines.
- Inclusion of new parameters that will add new dimension to the work which can be continued for further enhancement in the already existing algorithm
- Setting standard value for the factors will help in authenticating results.

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