Data Warehouse Design Project

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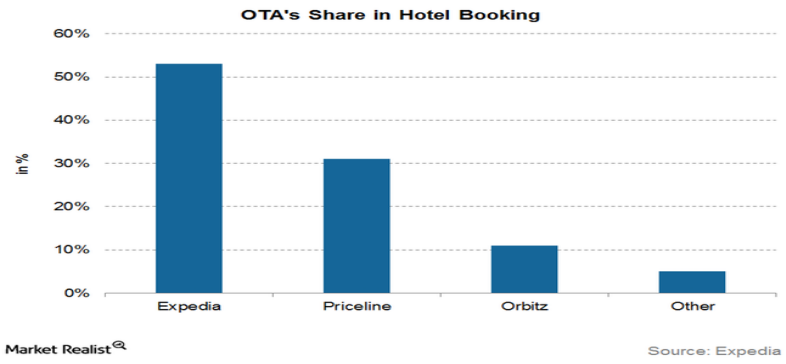
Introduction

Oyo room is hotel room aggregator which has a vast network of rooms which are standardised. It operates on the concept of a marketplace for branded budget hotels and guesthouse. It makes inventory discoverable and can be booked online. It is a virtual hospitality brand. While traveling, a cheap and good quality hotel is a requirement of all individual. Ideally a standard good quality hotel room is only expected from a star hotel. Hence, Ritesh Agarwal, the founder & CEO of the company decided to start a company of his own which caters to the need of frequent travellers who are looking for good quality budget options. By doing so It has collaborated with thousands of hotels, Motels, and Guesthouses in different parts of India. Now Oyo wants to expand its operations in-USA market. USA has total of 5 million rooms as per the recent hotel census done in the year 2015. This leads to the huge demands for standardised cheap alternative to expensive star rated hotels. The business model can be explained as Oyo brand will reserve a part of the inventory beforehand it then goes on to organize the hotel rooms under its own brand name called "Oyo Rooms". The partner hotel must provide a standardized service to the customer as decided in a contract with Oyo. Bookings shall be made via the website and mobile application. It has categorised the hotel rooms into Budget, Premium and flagship. The Oyo rooms also provides option for long stays. The revenue model of the business is simple. The expenses include booking or leasing a part of the property, matching the standards of free Wi-Fi, clean toilets, cost of running and maintaining. The users buy the Oyo rooms at a predetermined price. As Oyo is in its introductory stage of its business it must provide heavy discounts to the customers or the first-time users. These discounts also result in an expense for Oyo. Despite there being more expenditure than revenue Oyo room has been growing and expanding.

Competitive Analysis of the company

Hospitality has become a huge business with many players trying to enter the space and gain the competitive edge. The only differentiator can be the quality of the service and the brand name. Since Oyo is a new entrant to the already busy hotel aggregator business model. It already is and will be facing a stiff competition with Hotels.com, booking.com, Travelocity.com, and Airbnb. Let's discuss the business model followed by OTA industries

The OTA agencies have historically changed the way it has functioned. It depends on the market the agency is operating and on the negotiation between the hotel and the OTA.



Source: Market Realist

The two popular business models followed by almost all industries in OTA are merchant model and agency model.

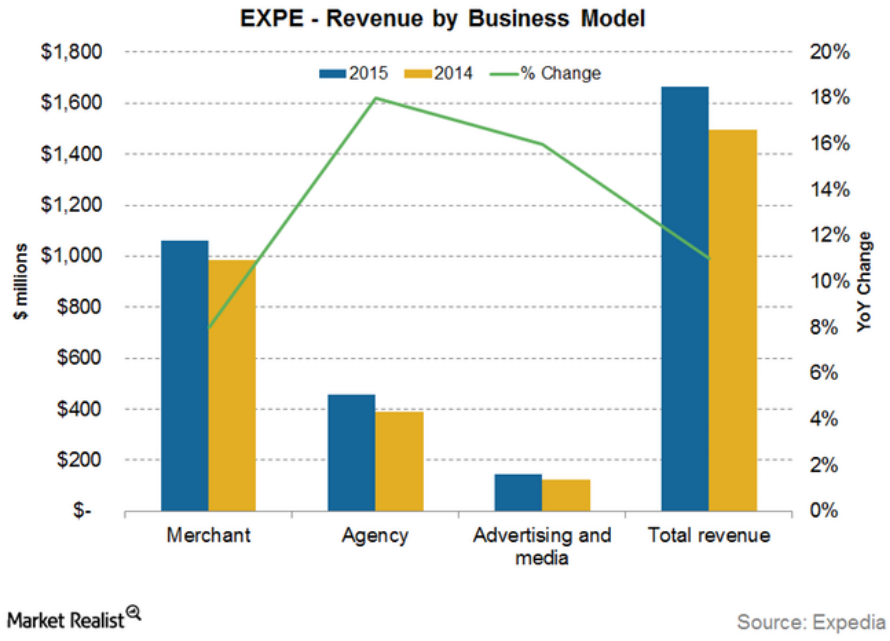
Merchant Model: In this model the hotel sells rooms to OTA in bulk at a discounted or wholesale rate. The OTA then sells then rebrands the rooms and sells the room under their name to the customer and charge a listed this. Usually this the both parties

Agency Model: This model is commission based, the hotel give OTA commission based on the business which are sold. the OTA doesn't invest anything up front.

Let's discuss the case of Expedia Inc. This is one of the largest online travel company

Expedia provides many travel products and services for leisure and corporate travellers, offline retail travel agents, and travel service providers. It has a strong global presence, with more than 150 booking sites in over 70 countries garnering about 45% of its total revenue.

Let's see the revenue by business model of Expedia to see where it is sourcing most of its profits from



Source: Marketrealist

We can notice that major source of the income can be attributed to the Merchant model which is also the model followed by the Oyo rooms.

Advantages to Expedia:

1) A big corporation with lot of funds
2) Has reach to travellers from all over the world. A trusted brand name

Disadvantages: -

1) Very diversified. Also, deals in hotels, car, cruise & others, advertisement & media, and Air. Being diversified can lead to a situation where a firm is not able to perfect it's each segment

The second model which is under the traditional price-disclosed model or via the opaque pricing model. In the traditional price-disclosed model, the company earns a commission on every transaction made on its website. In the opaque pricing model, Priceline earns the difference between the price a customer is willing to pay which is expressed by bidding and the price charged by the travel service provider. The company was the first to introduce the "name-your-price" model for making online bookings.

Advantage:

1) Customer can expect much lower prices

Disadvantages:

1) Difficult for the common user to understand opaque pricing model

Airbnb is another major player which doesn't follow the traditional model but opts for peer to peer community based online platform for listing and renting local homes. It allows travellers to connect with local homes without owning any property on its own. This is becoming popular as people can options of cheap accommodation very easily. For every booking, Airbnb charges the guest 6-12% of the booking fee. Airbnb charges the host 3% for every successful transaction.

Disadvantages

1) Security risk is a big concern also standardizing the service becomes difficult

Data Warehouse Strategy for the company

Kimball methodology is more suitable to the needs of this firm. The business users want to see the results quickly, therefore, it seems logical to follow the bottom-up approach of designing the data mart before the data warehouse. Firstly, the data marts will be designed and then various data marts will be joined together to form the data warehouse. This can be done using the Kimball's methodology where there is no requirement to have a master plan at the beginning of designing the database. Also as this is a start-up company it needs to run a lean business therefore Kimball is more suitable as it requires less number of developers and architects to run efficiently. It is easy to understand by the business owners and makes the reporting task easier. It has a relatively lesser footprint and requires less space for storage. It works well to keep the department wise metrics and KPI tracking which will be useful for a firm like Oyo rooms. Hence it can be seen that Kimball fits the requirement and I recommend the firm to use the Kimball approach of designing warehouse.

Business Problems and Its Resolution using Data Warehouse

General Problems and its resolution using data warehouse

The operational system of the company is not able to hold the data from the disparate sources all at the same time. The solution of this can be in Building a data warehouse will prove to be helpful for the firm as it can hold data from disparate sources all at the same time. It can integrate current data along with the historical data in the near real time. It has been seen that over the years the company has gathered tons of data over the years and now it wants to store it in a proper system here the Data warehouse is specifically designed to take care of the data storage problems and it also ensures that the system is scalable over the coming year. The business has developed different solution over the years but it is not able to connect all of them to answer simple business problem. The data warehouse also proves to be useful for security and safety purposes. The other most seen advantages to owning and designing a data warehouse for a firm is ROI. There is huge return of investment for every penny of money spent on designing a data warehouse. Based on 62 organizations, IDC found an average ROI of 401 percent over a three-year time (IDC Report, 1996). This average return excluded failed projects as well as exceptional performers (both good and bad).

The customer feedback is the core functioning of the company it wants. It decides all its future course based on the customer feedback. The basic questions that arises when one considers the customer feedback is What is the quality of the customer service provided? The company wants to know how, any people gave an average feedback. What kind of feedback was given if it was a positive and negative feedback. the second set of questions concentrate on the second sub set question is how many customers

have given a feedback of excellent, how many averages and how many bad? Then there is another column on comments which will be required for the next question; this will be the comments or improvement areas highlighted by customers. It can be identified as to why these questions are asked. All these three questions combined give a picture of the customer service and what improvements are needed.

He will hit the data warehouse every time to get the results and will consolidate this and arrive at solutions. Another important factor is that data warehouse provides trends. It has the history of data from a series of months and whether the product has been selling in the span of those months. If that trend is spotted, it can be analysed and a decision can be taken. An operational trend on the other hand is the transactional system. (https://www.edureka.co/, 2014)

Supply chain improvements and data warehouse

How is the procurement affected based on the feedback of the customer?

The company places the customer feedback as an indicator for procurement of rooms form various hotels and guesthouse. Every time the customer receives a guest it encourages people to give feedback. It stores these feedbacks in the warehouse for analytical purposes. It queries the feedback and makes report out of it to be presented during audit. These audit reports are used by the higher officials for making pivotal decisions.

How can the data warehouse be helpful for making financial decisions for the company?

Solution: data warehouse stores information about the cheques and payments about the industry. It has the option of deferring the payment to a later time. The data warehouse keeps track of all the payments made by all customers. It also keeps record of the time period around which the payment was made. This is done specially to understand which customer is taking how much of the time to complete the payment. This payment trend is stored overtime and then business decisions are made based on this. The group of directors sit among themselves and decide if they will allow a further deferred payment from a certain group of customers in the coming days. The data warehouse also has a role in making the financial decisions easier for the customer

In general data warehouse are helpful for business inventory management

Targeted Assortment: Analysing the historical data helps the Oyo industry to target the demography better. It identifies the pattern in which the customer buys the stuffs and services over the period which is based on their geography demographics, size, or volume ranking.

Refine their Assortments: BI helps in pre- season analysis which determines purchase quantities by size, allocation quantities by store. It analyses data from past seasons to determine the optimal mixture of sizes and styles for the product assortment.

Receive accurate information about profitability: the BI can help the business in analysing and getting the complete picture of the business. they do this by sign and analyse financial costs by product and combine that information with sales to get a truer picture of product profitability.

Improved replenishment: many retailers carry products which get replenished from the central warehouse over the period. This replenishment is made from the central warehouse. They can find out the best replenishment by optimizing the distribution channel.

Improve the accuracy of operational forecasts: data warehouse can bring together model and safety stock data together along with inventory and sales data on the same page. This helps in analysing the potential out of stock condition. We can use these data to issue alerts when the stocks become low and then generate alerts over the period

Determine over-stock situations: here we can combine sales data, forecast data and replenishment data we can determine the excess supply in advance of weeks of data over the period.

Identify slow-turning locations and products: industry can take help of data warehouse to identify products which have a sluggish turnover or products which are in stock but going without a sale.

Ensure the accuracy of inventory data in replenishment ordering systems. Inventory verification can be generated using physical counting of inventory but using a data warehouse we can select a specific set of product which have a set of attributes. We can then see the historical trend of the product over the period and understand if the historical data can be used for the purpose of predicating replenishment statues and prior count discrepancy. This will lead to significantly improve the inventory status of the company

Supply chain efficiencies

Business retails want to improve the efficiency of their enterprise wide supply chain. The efforts can improve the efficiency by reducing lead times, carrying costs, and operating costs across the enterprise.

Scrutinizing detailed waypoint logs: - long order picking will lead to problems with suboptimal routing. Large error in picked up order by the vendor is pointing to the fact that the vendor doesn't have sufficient training and this is leading to high error rate. This insufficient training could be pointing to the fact that the vendors have not been well trained in handling defective product or products which do not have long shelf life. Operating time can be reduced by reducing the time spent on Lessing the time on locating the item in order to fill the order.

Analysing vendor and distribution time: the need for safety stock can be reduced if the vendors can identify the bottlenecks in their systems. This will lead to safer and better delivery systems

Forecast accuracies: because of data warehouse the vendors can easily determine which of their product can have situation of out of stock. This will reduce a situation of out of stock or overstock situation. (Rafael Algara, 2008)

Human resource and Data warehouse

- The HR department which already utilises data warehouses in these areas
- It utilises the data warehouse to store the hire forms
- Resumes of the candidate is stored here
- The recruitment notes and feedback is stored here as well
- Year-end performance document is stored here for analysing purposes
- The time logs of the employee, entering and leaving the facility is also recorded for time sheet purposes
- All the payroll information, tax information, incentive information is stored in data warehouse for analysing purposes

The function of data warehouse can be expanded to include loads of other items in the future these include

- Integrated document management systems in the firm

- A natural algorithm analysis can be included to help analyse and review all the reviews, survey texts and sentimental analysis.
- A wearable gadget that stores all the information about the employee. This information can give the detail about the employee's health and wellness.
- This can also be used for geolocation tracking if the customer safety is one of the priority for the company.

Reporting will become more specialised over the period using a specialised tool of software and then bringing more personalised data into the system for deeper analysis. (Eubanks, n.d.)

Sales and data warehousing

Data warehouses can affect the sales as we know that 75% of the company's revenue come from the standard product and the rest of the decision made does a very little to improve the sales. Here the companies can look at the historical data and make sense of the purchasing trend. Analysis of these data sometimes goes on to show opportunities for differentiated pricing at a customer-product level, based on the willingness to pay

Data warehouse can also transform how to achieve greater response from the customer by application of warehousing techniques.

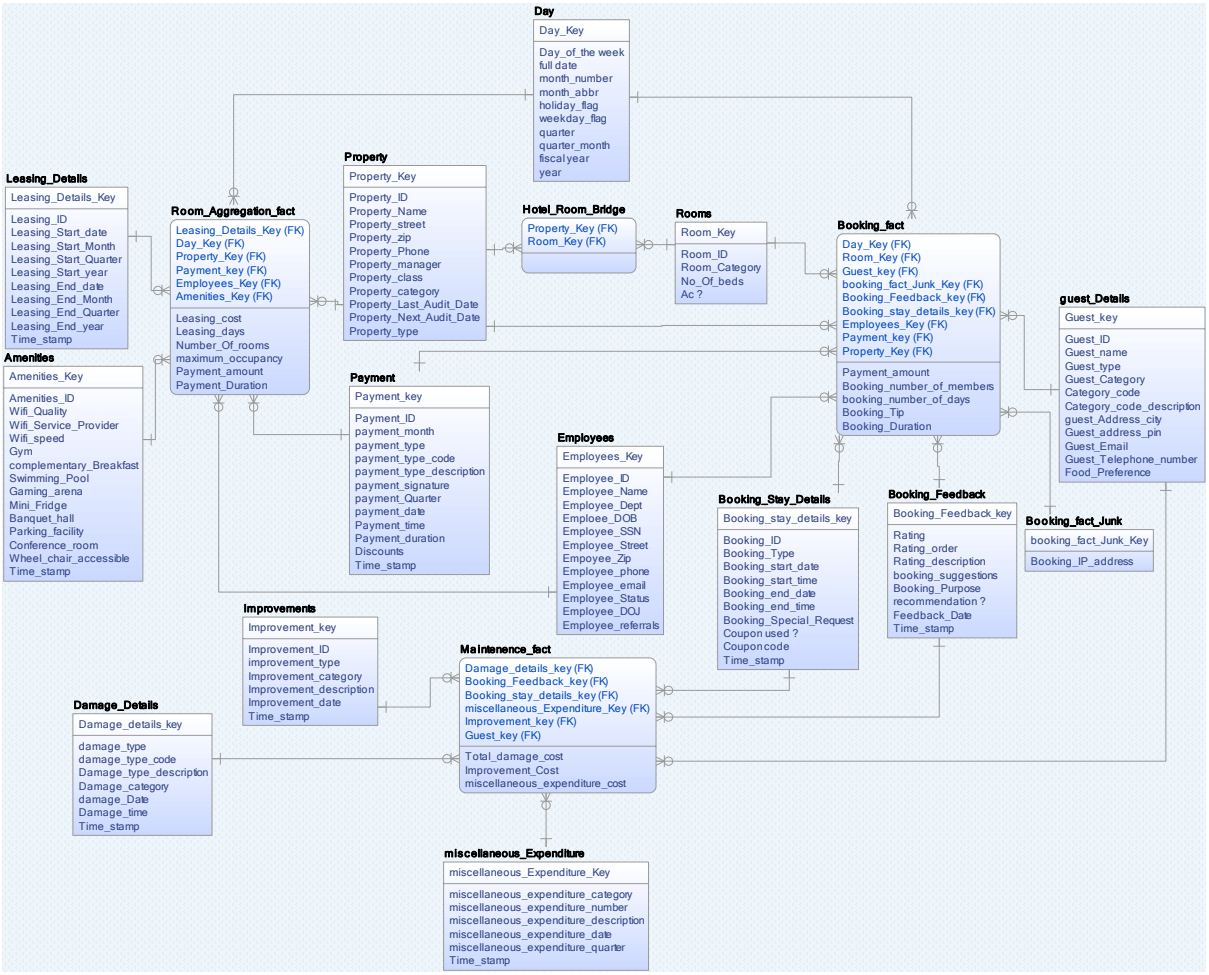
Location and data warehouse

The location decision can also be made using the concepts of data warehouse. The company can procure more rooms or products in the warehouse where they notice that the sale is increasing or has chances to grow based on the previous data over the years. Data warehouse has a huge role in procurement and sales when it comes to hotel aggregation business. It is general trend that cities which have more urban population and more accumulation of business see more visitors or a place which has a lot of leisure value also sees more number of visitors so based on customer's preference for a certain place, they can aggregate more number of hotel rooms of various categories and of various types

Business Analytic Questions

1) The company wants to know which month and in specifically during which days there is large number of bookings so that it can aggregate more number of rooms for that duration
2) Since, the business has introduced book now and pay later scheme, it wants to record and blacklist the individuals who have defaulted on the payments or who took lot of time to make the payments
3) It wants to introduce Royalty programs for the Customers who have regularly used the service
4) It wants to keep track of the feedbacks made by the guest and decide whether it wants to extend lease agreements with the Hotels
5) It also wants to understand if improving the room conditions and ambience improves the occupancy rate

Data warehouse Design



Fact Table Description

There are total of three fact table used in this dimensional modelling

Room_aggregation_fact: - Room aggregation facts contain the numerical data about the rooms that Oyo room is going to lease for number of days from the property owner (hotel or guesthouse). These rooms are then going to be rebranded as Oyo rooms and put it out for rent. Oyo aggregates the rooms on daily basis. The number of days the room is going to be leased is pre-decided also the cost is decided on per day cost. Payment duration is the amount of days for which payment is made

Leasing_cost: Additive

Leasing_days: Non-additive

Number_Of_rooms: Additive

maximum_occupancy: Additive

Payment_amount: Additive

Payment_Duration: Non-additive

Booking_fact: The details of the actual booking of the rooms are stored in the booking_fact table. It has all the information of the room booked and the guest information as well

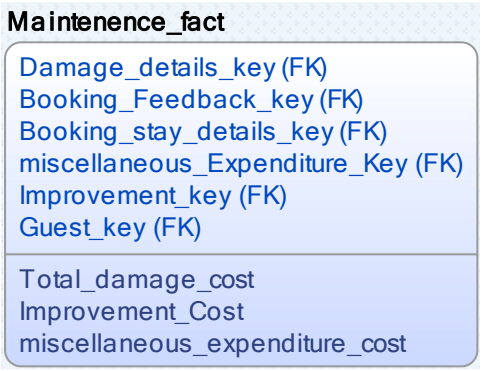
Payment_amount: Additive

Booking_number_of_members: Non-additive

booking_number_of_days: Additive

Booking_Tip: Additive Additive

Booking_Duration: Additive



Maintenence_fact: Oyo bears the cost of the damages or general maintenances of the room. It also invests in improving the room look and feel which is included in the improvement cost. There is miscellaneous cost which included in the table for better expense estimation

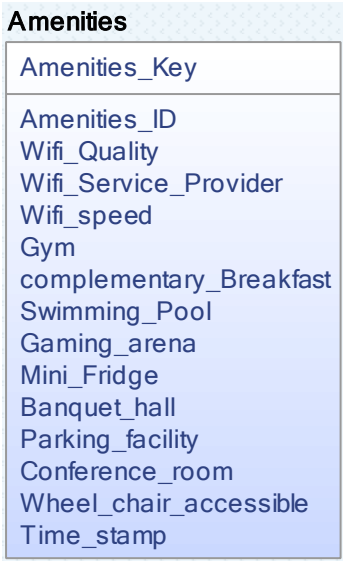
Total_damage_cost: Additive

Improvement_Cost: Additive

miscellaneous_expenditure_cost: Additive

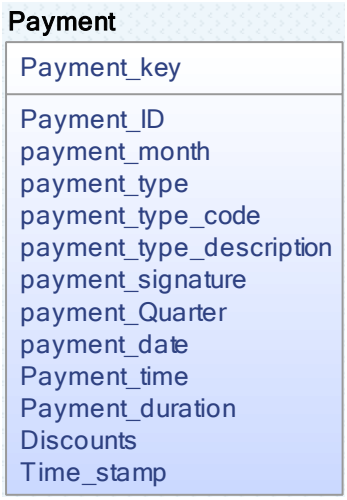
Dimension Table Description

Leasing_Details: As the name suggest Leasing details contains the details of the leasing the rooms from the hotel. It has a leasing duration and all the other accompanying details. It is an affinity dimension and is also time stamped. Leasing_start_month, Leasing_start_year, Leasing_start_quarter are all derived from Leasing_start_date similarly Leasing_End_month, Leasing_End_quarter and Leasing_End_year are all derived from Leasing_End_date. They are all part of rich dimension.

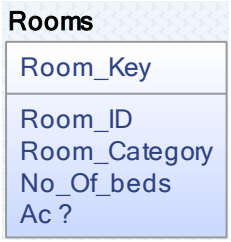


Amenities: This dimension talks about the features and functions of the booked hotels. The aggregated hotel is not necessary to have these features as a part of their service except the basics like complimentary breakfast, Wi-fi and cleanliness. It is an affinity dimension of time stamped variety There are no rich dimensions here

Property: This is the detail of the property. This property could be either a hotel or a guesthouse. The guesthouse is also audited frequently therefore we have “audit date”. It is an affinity dimension of type 1 category

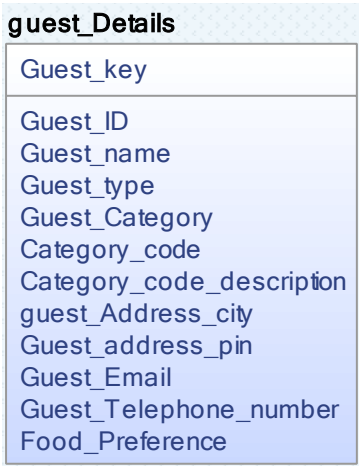


Payment: The payment is a conformed dimension between the fact tables *Room_Aggregation_fact* and *Booking_fact.* It has a rich dimension of payment_type and its derivatives are payment_type_code, payment_type_description. It is affinity dimension and is also time stamped. Oyo room allows to make deferred payments to its partner hotels and to its customer as well. Payment_duration measures that length of time in which the payment is made



Rooms: Every hotel or guesthouse can have many rooms. The combination of guesthouse and room identifies one room. A room can be categorised into basics and premium. It is joined to the hotel using a bridge. It is an affinity dimension of type 1.

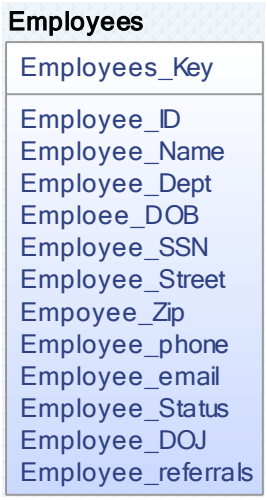
Day: This dimension has the major role in combining the room aggregation and the booking details. This is time stamped and is a rich dimension. Month_number, month_abbr, quarter, quarter_month is all derived from full date



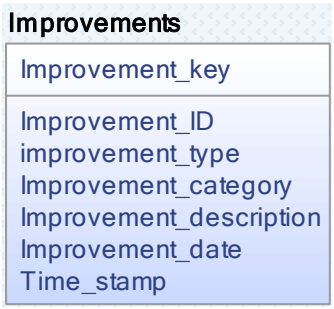
Guest_Details: This dimension stores the detail about the guest and it also has rich dimension about the *guest_category*. A Guest can fall in various category such as Regular, Promising, and exclusive member. It is an affinity dimension and a rich dimension category_code, category_code_description. It is a type 1 change dimension

Booking_Feedback: the company prioritises the feedback of customer. Hence this dimension stores all about the customer feedback, their recommendation in the table. It's an affinity, time stamped dimension

Booking_Stay_Details: This dimension stores all about the stay of the customer. It is a time stamped and affinity dimension. This detail is then used by the Maintenence_fact table for making changes. There is also a section for Booking_Special_Request where the customer can make special request

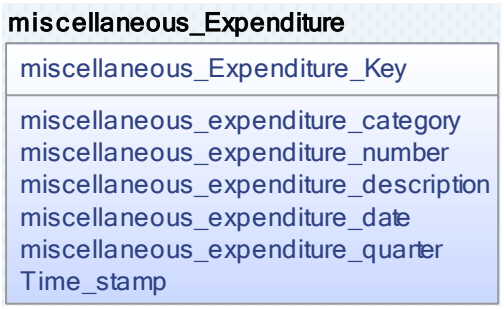


Employees: this dimension stores the data of the employee attached to the specific aggregation and booking deals. Every employee attached in these fields will be later utilised for yearend appraisal and incentives



Improvements: This dimension is useful for keeping track for all the changes and the investment made in the leased room to make it more appealing to the customer. It is time stamped based affinity dimension. Rich dimension is utilised here for improvement_category, improvement_description and improvement_type

Damage_Details: after every booking and stay, Oyo accesses the damages and replacement requirements. If it feels there is need for a replacement. It is an affinity, time stamped dimension. It has a rich dimension damage_type_code, Damage_type_description and Damage_category



miscellaneous_Expenditure: Apart from damages and improvement Oyo also spends regularly on sanitation kits, soaps etc. this is a regular expenditure, but needs to be tracked. It is an affinity and time stamped dimension

Highly Browsable Dimension

A highly Browsable dimension is one where a Dimension Table that we can get a lot of analytical value from a Dimension Browse. In the design of Oyo room Booking_feedback dimension table can be a highly Browsable Dimension. We can judge how the ratings and suggestions have changed with time. We can also know that how the purpose of

visit changed over time. This will also understand guest's preferences and based on their preference we can improve and customize the services.

Junk Dimension

The attributes that do not belong together logically are placed in a single table called a Junk Dimension for convenience. The attributes are kept in a separate dimension on right side of the fact table.

In the data warehouse design for Oyo there is one junk attribute called Booking_IP_address which is put in the table Booking_fact_Junk.

Bridges

A bridge is used between Property and Room as Room is a multivalued attribute and a single property can have many room so a bridge will keep the Property_Key and Room_Key together in one table as both of then uniquely identify a single room in a property

Solution of the 5 Business Problem and Its Solution

1. **The company wants to know which month and in specifically during which days there is large number of bookings so that it can aggregate more number of rooms for that duration**

   Solution: Using the day dimension between the two fact tables room_aggregation_fact and booking_fact, Oyo can keep track of the number of booking made during certain months or during a period. It can then see that when the room aggregation must be higher than the usual as the supply should match the demand. This will always help Oyo to keep track of aggregation between the two and avoid having surplus of room

2. **Since, the business has introduced book now and pay later scheme, it wants to record and blacklist the individuals who have defaulted on the payments or who took lot of time to make the payments**

   Solution: Since Oyo has the Business process that it can allow customers to make payment for an extended time without penalising them. Using the booking_stay_Details, Payment, and Guest_Details it can understand which guest are taking most times to make a payment. It can therefore take the decision of not giving rooms to those customers or removing the option of extended payment. Since small amount of money over extended time reduces profitability

3. **It wants to introduce Loyalty programs for the Customers who have regularly used the service**

   Solution: Oyo wants to introduce a loyalty program for the customers who have regularly used its services. It will take Booking_Stay_Details and guest_Details

and it will match up with the property details. By doing this it will understand which customer used which property for how many times over the period. It can then add those customers in the loyalty program and encourage these customers to use their other property

4. **It wants to keep track of the feedbacks made by the guest and decide whether it wants to extend lease agreements with the Hotels**

   Solution: Oyo wants to keep track of the feedback made by the customers for a specific property. We can get lot of information by joining Guest_details, booking_feedback, Property and rooms. This will be very helpful for understanding the pulse of the customer. Oyo can utilise this to make judgements if it wants to extend the lease with the existing partner or move to the next partner. This feedback will also be useful for making improvements as well.

5. **It also wants to understand if improving the room conditions and ambience improves the occupancy rate**

   Solution: Oyo can connect Booking feedback, improvements, guest_details with property. Doing this will give them specific details about the feedback and the direct improvements that they should make on a specific property's room. They can make these changes and then observe if the response and feedback has improved

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