MIS350 Project

2022 - 2023 (2nd semester)

"Insightful Analysis of Hotel Booking Patterns:
Opportunities and Challenges."

Section: 52769 (Group2)

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| Student's Name | Student's ID | Task |
|---|---|---|
| | | Conclusion and data description & visualization |
| | | Data description & visualization |
| Sara Alshathri | | Problem\opportunity formulation & visualization |
| | | Problem\opportunity formulation & visualization |
| | | Introduction to Power-BI & visualization |
| | | Proposed solution & visualization |

**Table of Contents**

**Introduction to Power BI:**

Power BI is a collection of software services, applications, and connectors that combine to transform unrelated data sources, such as an Excel spreadsheet or cloud-based data warehouse, into consistent and interactive insights. This makes it easier to share your data with anyone clearly and visually. Power BI is mostly used by business intelligence professionals and data analysts who create data models. It is designed to be user-friendly and easy to use, so it can be used by people with a wide range of technical skills, including business analysts, data scientists, and data analysts.

Their work allows Power BI users, who could be both management and department employees, to examine what-if scenarios, creating reports that help forecast, predict, and tell scenarios based on data visualizations and charts.

Some of the key benefits of why we use Power BI:

**1-Access to a wide range of data sources:** Power BI can connect to a variety of data sources, including Excel spreadsheets, databases, and cloud-based services such as Salesforce and Google Analytics.

**2-Easy data visualization:** Power BI includes a range of built-in visualization types, such as bar charts, line graphs, and maps, which make it easy to create professional-looking dashboards and reports.

**3-Collaboration and sharing:** Power BI allows users to share their dashboards and reports with others in their organization, enabling them to collaborate and work together more efficiently.

**4-Mobile access:** Power Bl has a mobile app for iOS and Android devices, which allows users to access their dashboards and reports on the go.

Overall, Power BI is a powerful tool that can help organizations of all sizes to gain insights from their data and make more informed business decisions.

**Data Description:**

This dataset contains hotel bookings between July 2015 and August 2017. Published on Kaggle, this dataset shows two types of hotels: resort hotels and city hotels. It includes information about the booking, the customer, and the hotel. It can help us understand the different demands between these two types of hotels. This dataset contains 119,391 rows and 32 columns. Data types vary between nominal, ordinal, binary, date, and numeric. The focus will be on cancellation, booking changes, arrival dates in months/years, distribution channels, reserved room types, and country.

Data can play a big role in the process of decision-making; data can provide businesses with the ability to generate real-time insights and predictions to enhance their performance. Having precise and cleansed data is critical for decision-making. Analyzing and understanding the data can reduce risk, lead to new opportunities, and help solve problems. The following points are examples of how data can improve the decision-making process in this dataset:

**1-Identify trends:** By analyzing the data, hotel managers will be able to identify peak seasons, and will have the ability to make decisions regarding hotel capacity and staff numbers.

**2-Understand customer needs:** when a room is booked, each customer provides the hotel with information about their preferences, if the information given is understood, this can identify customer needs and work on fulfilling them, such as assigning the customer to the desired room type.

**3-Improve quality:** if the data presented by hotel guests are saved over time, and later analyzed and understood, this could improve the quality of services offered to guests in the future.

**4-Maximize revenues:** through analyzing the data, managers will have the opportunity to understand the relationship between price and demand, and they will be able to make decisions concerning room prices based on customer demand.

| Column name | Data Type | Data Description |
|---|---|---|
| Hotel | Binary | Resort hotel or city hotel. |
| Is_canceled | Binary | 0 and 1 represent whether the booking was canceled or not. (1) if canceled, (0) if not. |
| Lead_time | Discrete | Days between the date of booking and the date of arrival. |
| Arrival_date_year | Date | Year of arrival date. |
| Arrival_date_month | Ordinal | The month of arrival date. |
| Arrival_date_week_number | Discrete | The week number of the year for the arrival date. |
| Arrival_date_day_of_month | Discrete | Day of arrival date. |

| | | |
|---|---|---|
| Stay_in_weekend_night | Discrete | On weekend nights (Saturday or Sunday) the guest stayed at the hotel. |
| Stayed_in_week_nights | Discrete | The number of weeks (from Monday to Friday) the guest has stayed at the hotel. |
| Adults | Discrete | The number of adults. |
| Children | Discrete | The number of children. |
| Babies | Discrete | The number of babies. |
| Meal | Nominal | **BB, FB, HB, SC, Undefined** each choice of these represents the type of meal the guest chose. **SC/Undefined:** No meal. **BB:** Bed & Breakfast. **HB:** Half board (breakfast and no other meal – usually dinner). **FB:** Full board (breakfast, lunch, and dinner). |
| Country | Nominal | County, represented in ISO 3155-3:2013 format. |
| Market_segment | Binary | Determination of market segment based on "TA" means travel agents and "TO" means tour operators. |
| Distribution_channel | Binary | Booking distribution channel. "TA" means travel agents and "TO" means tour operators. |
| Is_repeated_guest | Binary | Indicates whether the booking name was from a repeat guest (1) or not (0). |
| Previous_cancellation | Discrete | The number of the Previous cancellation by the customer. |
| Previous_bookings_not_cancelled | Discrete | The number of previous not canceled bookings by the customer. |
| Reserved_room_type | Nominal | Code of the room type reserved. |
| Assigned_room_type | Nominal | Code of the room assigned to the booking. |

| | | |
|---|---|---|
| Booking_changes | Discrete | The number of changes on the booking from the moment the booking is entered into the system until the check-in or cancellation. |
| Deposit_type | Nominal | Show if the customer made a deposit to guarantee the booking and there are 3 categories:<br>**No deposit:** no deposit was made.<br>**Non-refund:** deposit for the total cost.<br>**Refundable:** deposit for part of the total cost. |
| Agent | Discrete | The ID of the travel agency where the booking was made. |
| Company | Discrete | The ID of the company that made the booking or is responsible for paying. |
| Days_in_waiting_list | Discrete | Number of days before the booking gets confirmed. |
| Customer_type | Nominal | Type of customer. There are 4 categories.<br>**Contract:** when the booking has any type of contract.<br>**Group:** when the booking is associated with a group.<br>**Transient:** if the booking is not part of a group nor has a contract and is not associated with other transient bookings.<br>**Transient party:** when the booking is transient but is associated with at least other transient bookings. |
| Adr | Continuous | Average daily rate, dividing the sum of all lodging transactions by |

| | | the number of staying nights. |
|---|---|---|
| Required_car_parking_spaces | Integer | The number of parking spaces the guest needs. |
| Total_special_requests | Integer | The number of special requests from the guest. For example, a twin bed, a room with a view, etc… |
| Reservations_status | Nominal | Reservation's last status is among this category. **Canceled:** the guest canceled the reservation. **Check-out**: the guest has checked in but already departed. **No-show:** guest did not show up but did inform the hotel of the reason. |
| Reservation_status_date | Date | The date of the guest's last status. |

**Dataset screenshot:**

**Problem or opportunity formulation along with visualizations:**

**"Cancellation by distribution channel for City and Resort hotels":**
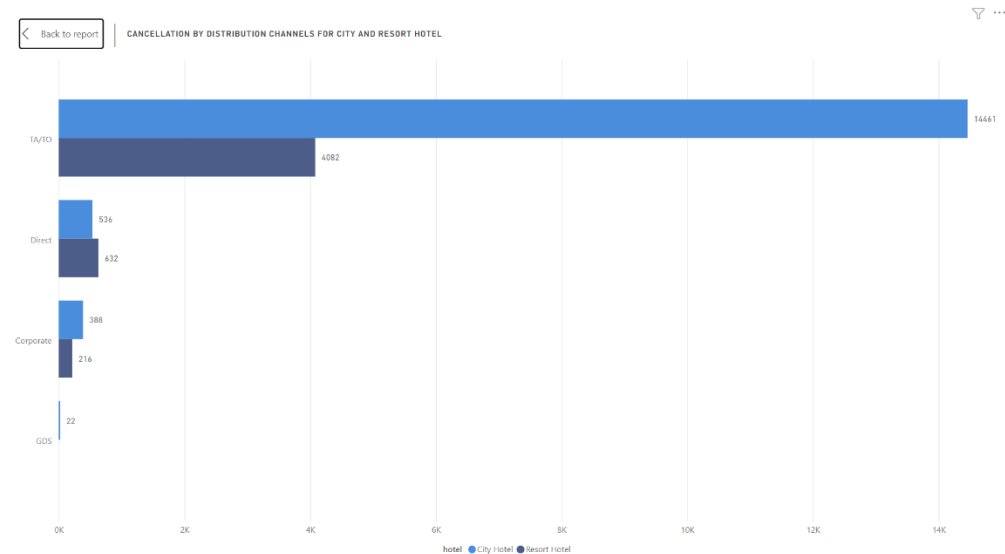


As it appears in the chart, the TA/TO (Travel Agent/Tour Operator) channel and Direct channel have a higher number of cancellations -which indicates a big problem- for several reasons:

TA/TO channel: When booking through a travel agent or tour operator, guests may be more likely to cancel their reservations because they are not directly making the booking and may not have a strong emotional connection to the hotel. Additionally, travel agents and tour operators may have more lenient cancellation policies, making it easier for guests to cancel their reservations.

Direct channel: When booking directly, guests may be more likely to cancel their reservations because they have greater control over the booking process and may have changed their minds about their travel plans. Additionally, direct bookings may be subject to stricter cancellation policies, which could result in higher cancellation rates.

**"Reserved room type for hotel":**
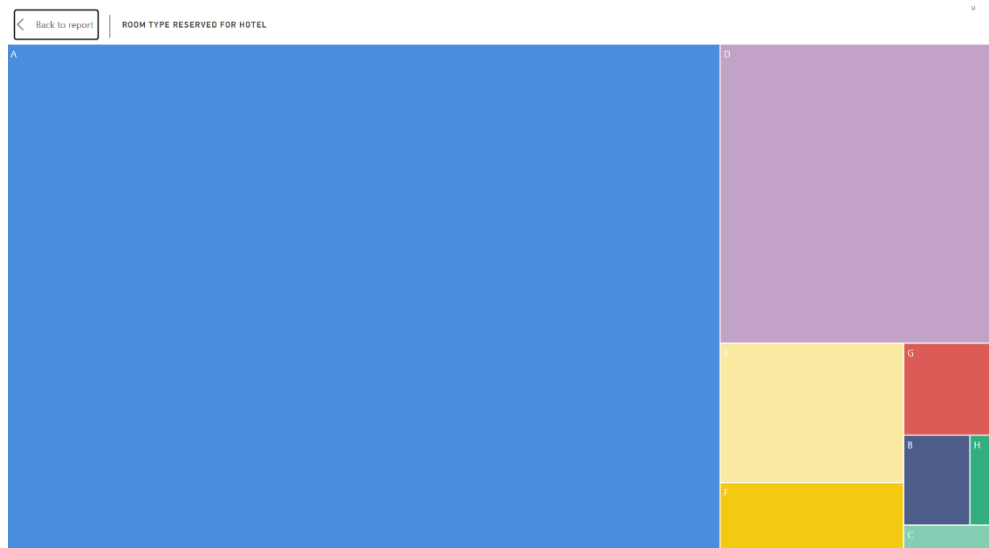
This chart demonstrates the count of reservations for each room type. It is obvious the most preferable reserved room was type A, this might be because room A is a suite. The suite always has the capacity, multiple beds, a living area, and an office, which makes it easier for businesspeople to conduct their work while having a business trip. This indicates an opportunity. The lowest of the preferable room types are types C and H, which are individual rooms, most of our guests are families and businesspeople, and these typically do not suit their demand, which reflects a problem that could be solved in many ways.

**"Booking changes for hotels based on reservation status throughout months":**
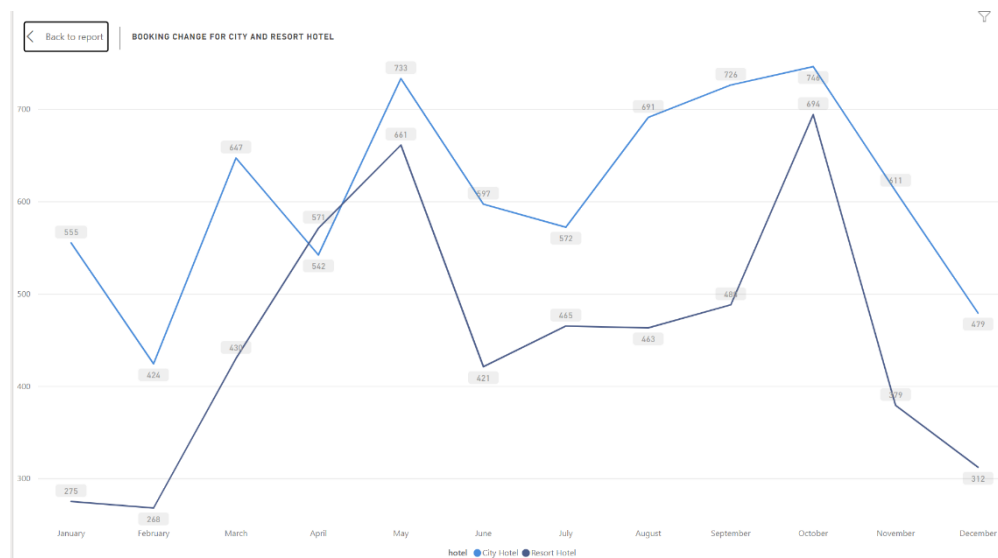


We observed a correlation between those variables, with the number of changes being relatively low in the months with few reservations, this is a chance for hotels to seize over a few months when changes are minimal, allowing other customers to book and stay. However, when reservations are large and the number of modifications is also high, this points to a problem that must be fixed to prevent losing clients and management issues, particularly in City Hotel.

10

**"Distribution channels by hotels":**

distribution_channel ● TA/TO ● Direct ● Corporate ● GDS
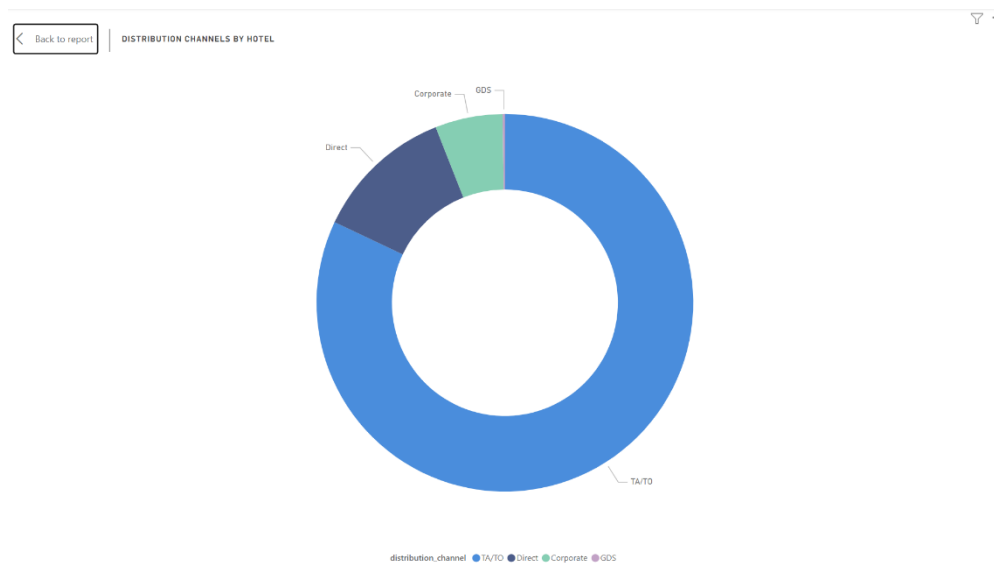
After extensive study, we discovered that TA/TO is the distribution channel most frequently used to serve clients. This may be because TA/TA are travel agencies and operators, and generally, they offer a variety of services for customers to enjoy traveling, but given that it is the highest, it suggests a concern that could be resolved to take opportunities from other channels and solve problems. While the lowest is GDS, this requires both types of hotels to solve the problem as soon as possible and take advantage of working with them.

**"The repeated guests by countries for City and Resort hotel":**

hotel ● City Hotel ● Resort Hotel
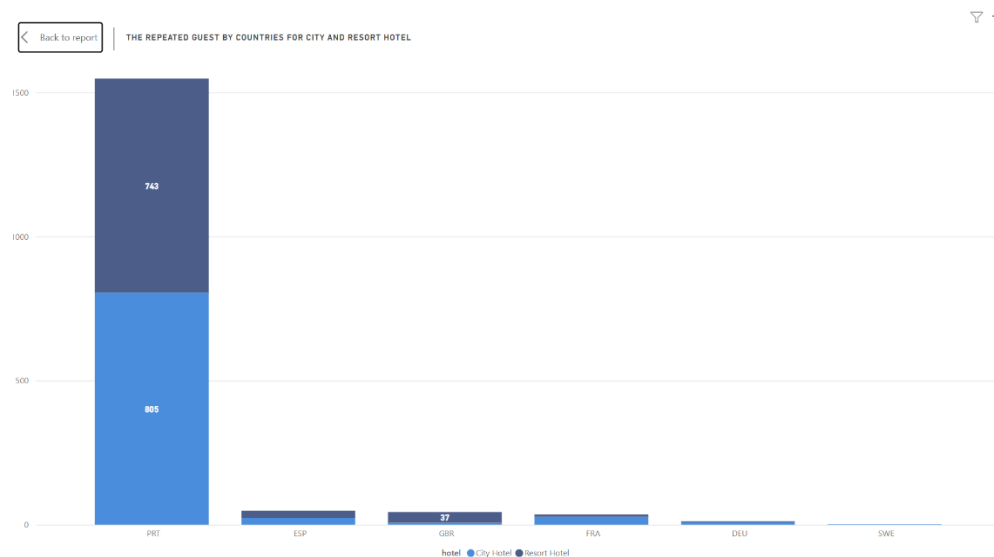
This graph shows where our repeat guests come from. The ranking of PRT (Portugal), ESP (Spain), and GBR (United Kingdom) in terms of the highest number of repeated guests could be due to the GDP per capita, the three countries are rich and because of their financial ability to travel, they are repeated guests. It is worth mentioning that City hotel may have a higher number of repeat guests for several reasons one of the reasons is convenience: City hotel is often located in central areas with easy access to

11

transportation, dining, shopping, and other amenities. This can make it a convenient option for guests who are traveling for business or leisure, thus reflecting an opportunity for both hotels.

**"Cancellation by month for City and Resort hotel":**
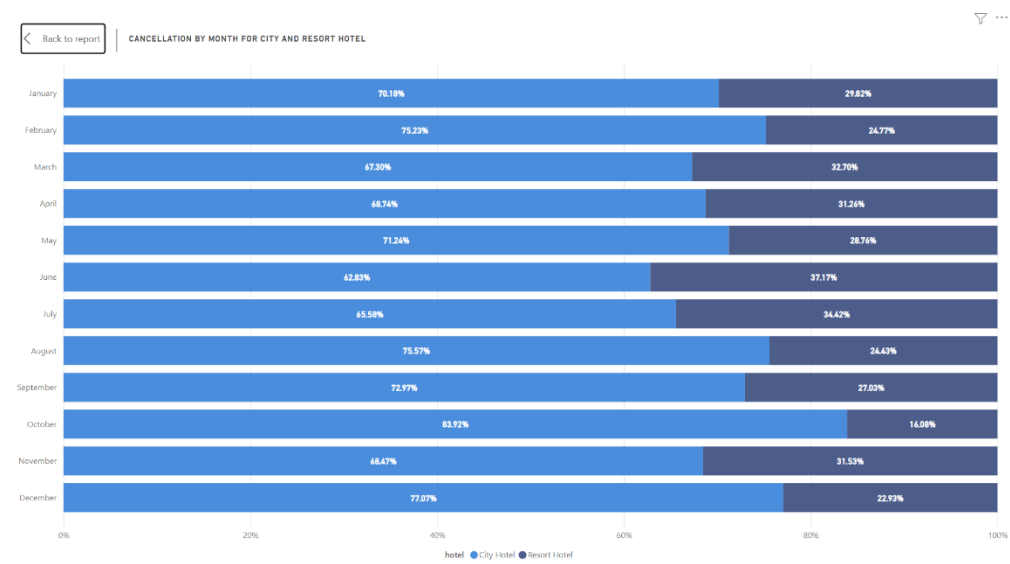


In this chart, we demonstrated the percentages of canceled reservations for each hotel. As shown, City hotel in general has higher percentages than Resort hotel, which may be caused by location. The City Hotel is typically located in densely populated areas and may attract more business travelers or travelers with more flexible plans, leading to a higher likelihood of cancellations.

The highest percentage of cancellations for City Hotel in October, which is 83.92%, could be due to several reasons:

Holiday travel: October is a peak holiday season, and travelers may have more flexible plans, leading to higher cancellations for city hotels.

Family commitments: During the holidays, travelers may have other family commitments or events that could lead to cancellations.

These aspects indicate a problem that must be solved.

## Dashboard:



**Cancellation by distribution channels for City and Resort hotel**

TA/TO: 14461, 4082
Direct: 536, 632
Corporate: 388, 216
GDS: 22
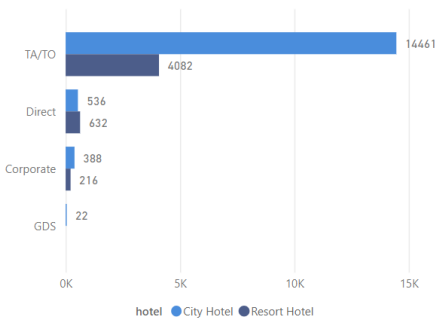
hotel ● City Hotel ● Resort Hotel

**Room type reserved for hotel**

A, D, E, F, G, B
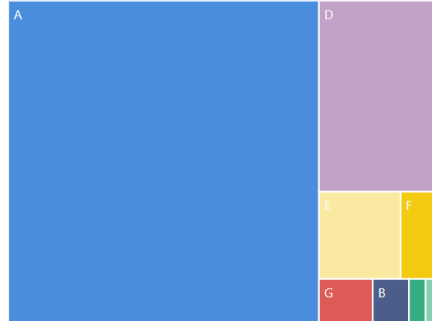
**Booking change for City and Resort hotel**

City Hotel: 555, 424, 647, 571, 733, 597, 572, 463, 691, 726, 611, 479
Resort Hotel: 275, 268, 430, 542, 661, 421, 465, 48?, 69?, 746, 379, 312

hotel ● City Hotel ● Resort Hotel

**Distribution channels by hotel**

Corporate, GDS, Direct, TA/TO

distribution_channel ● TA/TO ● Direct ● Corporate ● GDS
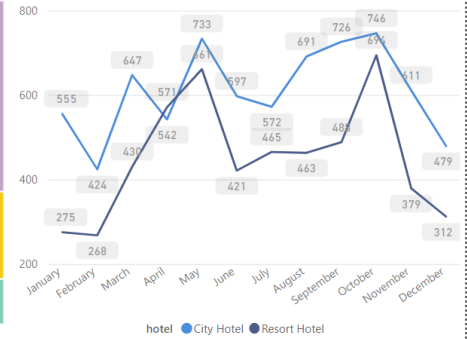
**The repeated guest by countries for City and Resort hotel**

PRT: 805, 743
ESP, GBR, FRA, DEU, SWE

hotel ● City Hotel ● Resort Hotel

**Cancellation by month for City and Resort hotel**

| Month | City Hotel | Resort Hotel |
|---|---|---|
| January | 70.18% | 29.82% |
| February | 75.23% | 24.77% |
| March | 67.30% | 32.70% |
| April | 68.74% | 31.26% |
| May | 71.24% | 28.76% |
| June | 62.83% | 37.17% |
| July | 65.58% | 34.42% |
| August | 75.57% | 24.43% |
| September | 72.97% | 27.03% |
| October | 83.92% | 16.08% |
| November | 68.47% | 31.53% |
| December | 77.07% | 22.93% |

hotel ● City Hotel ● Resort Hotel

13
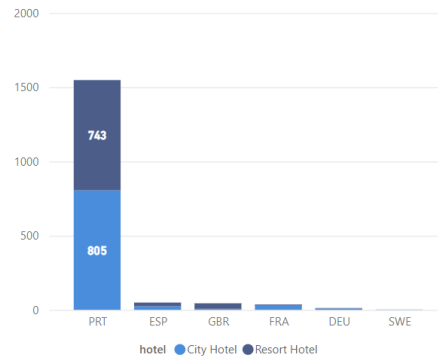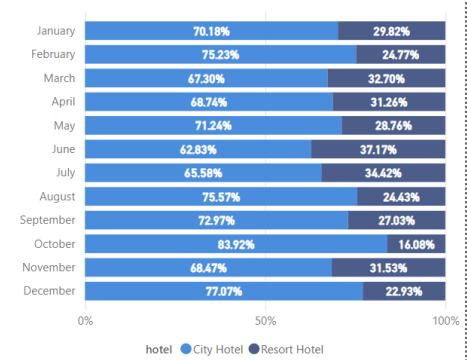
### How Did You Approach Your Problem?

We identified key areas on such crucial columns as country, year of reservation, month of reservation, distribution channels, cancellation levels, room types, booking changes, and repeated guests based on our observations and analysis of the hotel's booking demand data set. Our studies then illustrated the reasons behind such concerns. Furthermore, for an analysis team to succeed, it is essential to dig into the data set and find areas of interest. This is the only way to find opportunities and problems, which motivates us to solve problems and seize opportunities, as well as to examine and visually represent our findings to bring all our efforts together.

### Why did you formulate your problem in such a way? Why do you think it's important to consider this problem?

Our analytical team discovered such problems and missing opportunities which leads to lower customer satisfaction. Since there is a clear correlation between our chosen columns, there are many opportunities as well as challenges, the relationships between those columns were great considerations that helped us to know how to achieve our objectives of maximizing profit and improving the hotel's reputation.

It is crucial to consider such issues, to enhance the hotel's overall operations, support its systems, make decisions about customer management, identify essential components and trends, and solve triggers discovered after an in-depth analytical search.

### Who will be affected by such a problem, and what is the impact?

The affected sides are hotels and consumers.

Those problems and missed opportunities impact how well the hotels perform, which causes minimal comfort, low client loyalty, low profitability, and little consumer retention, which affects revenue.

Then, the effects on consumers are reflected in several aspects, losing the opportunity of enjoying the hotels due to such problems, as well as a high number of canceled reservations over several months took the opportunity of reservation from other consumers.

The level of loyalty and repeated customers by country also affects both sides, and other concerns regarding room types, channels, and changes. All indicate uncomfortable consumers and slim odds of returning, or missing opportunities for hotels to take. These features must be resolved to lessen such consequences.

### What benefits can be found if the problem is solved?

The hotels will gain by resolving these issues or embracing the possibilities in several ways, including an increase in profit, acquiring new clients, keeping current ones, and evaluating and recognizing key results that lead to significant accomplishments. Benefits are reflected in the hotel's financial or customer relationship management operations, which will raise customer satisfaction as well.

**Proposed Solution:**

After analyzing the dataset and identifying the possible problems and opportunities, we have reached several solutions and recommendations:

Firstly, one of the possible ways to increase bookings through the GDS distribution channel is for the hotel to offer special deals and promotions for this channel. The hotel can also improve its visibility and presentation on these channels to attract more bookings. Furthermore, as shown in the figures, reservations made through the TA/TO (Travel Agent/Tour Operator) and Direct channels had a high cancellation rate. To solve this problem, the hotel can allocate a new department to make trip plans as an additional option when booking at lower prices than other distribution channels, which will result in a lower cancellation rate, and raise our guests' satisfaction. Also, they might add a cancellation fee for cancellations made two weeks before the check-in date to make it harder to cancel the reservation. Also, to reduce the high level of cancellations through the TA\TO distribution channel, the hotel can improve its communication with these distribution partners to ensure an accurate representation of the property. The hotel can also offer incentives or commissions to these partners to encourage them to promote the property more effectively.

Secondly, since the least preferable room types are types C and H, which represent individual rooms, and most of our guests come in groups, the hotel may make some modifications, such as combining every two individual rooms into one bigger room. Also, to increase bookings for rooms C and H, the hotel can offer discounts or promotions to encourage bookings, or it might re-evaluate the amenities and services provided in these rooms to make them more attractive to guests.

Thirdly, to manage the high number of booking changes, hotels may develop a system that is responsible for handling them. Through the system, guests can change several things in their reservations without having to deal directly with the hotel management, which will save management time and effort, especially in busy months. In months with fewer reservations and booking changes, hotels may benefit from the system by knowing which rooms have not been reserved, making an offer or discount to their repeat guests, and sending it to them via email.

Fourthly, because most of our repeat guests are from rich countries, they will spend more to enjoy their vacation, and both city and resort hotels may add more activities. For example, they may allocate a special place for ice skating with a coach for children, so families who come with their children can go shopping near the hotel while their children enjoy their time. Furthermore, they can do a different activity every month to encourage the repeat guests from Portugal to come even more during their free time.

Lastly, to boost the number of reservations during months with high cancellation rates, the company could offer a variety of activities for city hotels. They might do activities for Halloween, Thanksgiving, and Christmas. Because October has the highest cancellation rate, one thing they can do during this month is host Halloween parties. The hotels may throw a big party every day for Halloween week or specify special places for group parties, so guests could come with their families or friends. They can also offer a month-long activity for visitors to carve pumpkins for a small fee. Both adults and children can do that. The activity includes going to a nearby farm to collect some pumpkins and then returning to the hotel to start craving and coloring the pumpkins.

**Conclusion:**

The dataset covers hotel reservations from 2015 to 2017, detailing city and resort hotel bookings, cancellations, lead times, stay durations, guest demographics, and booking channels. Our analysis identified key issues and opportunities:

-High cancellation rates in TA/TO and direct channels; GDS channel had the fewest bookings.

-Low demand for room types H and C.

-TA/TO was the most used booking channel; repeat guests were mainly from Portugal, Spain, and the UK.

-High cancellations in city hotels, especially in October.

To address these, we suggested:

-Creating new departments for TA/TO and direct channels to offer special deals.

-Promoting GDS channel bookings with special offers.

-Re-evaluating room types H and C features.

-Developing a system for handling booking modifications.

-Implementing a marketing strategy with activities for Halloween, Thanksgiving, and Christmas to attract and retain guests.

Challenges included finding a suitable dataset, learning Power BI, and managing time across different schedules and commitments.

**References:**

"Data Visualization: Microsoft power bi," *Data Visualization | Microsoft Power BI*. [Online]. Available: https://powerbi.microsoft.com/en-us/. [Accessed: 10-Jan-2023].

N. Antonio, A. DeAlmeida, and L. Nunes, Hotel booking demand datasets, 29-Nov-2018. [Online]. Available: https://www.sciencedirect.com/science/article/pii/S2352340918315191 [Accessed: 30-Jan-2023].