Business Analytics Case Study Mantra on Northbourne

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Image source: Accor Hotels.

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1. Synopsis/Executive Summary

The primary objective of this case study is to tackle the revenue-related challenges faced by Mantra on Northbourne, a prominent hotel establishment in Canberra. The study focuses on leveraging cutting-edge Business Analytics techniques, including Data Warehousing, visualizations, and dashboards, to address key subproblems encountered by the hotel. These subproblems encompass inconsistent room occupancy rates, inaccurate demand forecasting, ineffective pricing strategies, low online ratings, and inadequate consideration of seasonal variations and events in the vicinity of Canberra.

To overcome these challenges, the case study employs an array of advanced analytics tools and decision support systems. Predictive analytics will be utilized to enhance the accuracy of demand forecasting, while the implementation of a Revenue Management System will optimize pricing decisions. Additionally, social media analytics and sentiment analysis techniques will be employed to improve online ratings and customer satisfaction. To address issues related to seasonal variations and events, a novel approach of geo-spatial analysis will be explored.

Additionally, the case study will also draw insights from similar successful implementations in the industry, shedding light on effective solutions. Furthermore, the report will delve into the practical implementation aspects of these solutions, providing valuable guidance for Mantra on Northbourne.

1.1 Overview of the organization:

Mantra on Northbourne is a distinguished provider of accommodation in Canberra, catering to the diverse needs of both business and leisure travelers. Situated just one block away from the city's bustling Central Business District (CBD), the hotel enjoys a prime location with convenient access to renowned attractions including Parliament House, the War Memorial, and the National Gallery. Moreover, its proximity to the vibrant retail district, trendy bars, and charming cafés adds to the allure of the hotel.

The establishment offers an array of elegant lodging options, ensuring a delightful experience for every guest. From affordable hotel rooms designed for business visits to spacious self-contained rooms in different varieties like Basic, Standard, Family, Deluxe and Executive suits ideal for group or family vacations, Mantra on Northbourne caters to a wide range of traveler preferences. In addition, the hotel boasts contemporary resort amenities, such as an indoor heated pool for invigorating swims, a well-equipped gym for fitness enthusiasts, and a rejuvenating sauna for ultimate relaxation. For added convenience and peace

of mind, secure underground parking facilities are available to guests, subject to availability and applicable fees.

An exceptional dining experience awaits guests at the Stock Kitchen and Bar, where a diverse selection of culinary delights is complemented by an impressive assortment of wines. Whether indulging in a wholesome breakfast, enjoying a memorable family dinner, or savoring drinks with friends, the hotel provides the perfect ambiance and setting for every occasion.

1.2 Summary of issues and findings with Mantra:

Mantra is currently grappling with a significant challenge related to inconsistent room occupancy rates, negatively impacting on their revenue. This issue has multiple underlying sub-problems that need to be addressed. Firstly, the hotel faces difficulties in accurately forecasting demand, resulting in instances of overbooking during high-demand periods and low occupancy during off-peak seasons. Secondly, the pricing strategy employed by Mantra is not effectively optimized to align with fluctuating demand patterns. This is leading to missed opportunities for maximizing revenue Additionally, Mantra's marketing efforts are falling short in effectively reaching their target audience, while the presence of low online ratings on platforms like Google Reviews further hampers customer decision-making processes.

1.3 Underlying Business Analytics theories employed:

In order to comprehensively assess the challenges faced by Mantra, a range of business analytical techniques have been employed. Initially, data from Mantra's website was gathered and meticulously analyzed to generate various visualizations and dashboards. These insights were instrumental in gaining a deeper understanding of the underlying subproblems that Mantra is currently encountering. Moreover, considering the existing system at Mantra, a strategic blend of business analytics techniques was employed, including Predictive Analytics, Decision Support Systems, Social Media Analytics, Sentiment Analysis, and Geo-Spatial Analysis. These methodologies, augmented with the implementation of Data Warehousing, have been recommended as viable solutions to address Mantra's concerns effectively.

1.4 Assumptions:
The following assumptions have been made with regards to Mantra. These assumptions are foundational in analyzing and developing strategies to address the challenges faced by Manta.
- Revenue distribution of different services is assumed to be as below:
    - Revenue from room bookings – 50%

- Revenue from food and drinks – 35%
- Revenue from other facilities like parking fees, event space bookings etc. – 15%

- Mantra has 177 rooms with a sufficient staff-to-room ratio of 2:10 amounting to 35 staff members. This includes various roles such as front desk staff, housekeeping, restaurant bar staff and others.
- The average length of stay is assumed to be 2 nights per guest with a average occupancy rate of 60%.

2. Findings

Major problem: Inconsistent Room Occupancy Rates Affecting Revenue

Mantra is facing significant challenges with maintaining consistent room occupancy rates, which in turn adversely impacts their revenue stream, as a substantial portion of their earnings is derived from room bookings. This fluctuation in occupancy rates poses operational planning difficulties for Mantra, making it challenging to accurately predict and manage their bookings, resulting in financial and operational complexities.
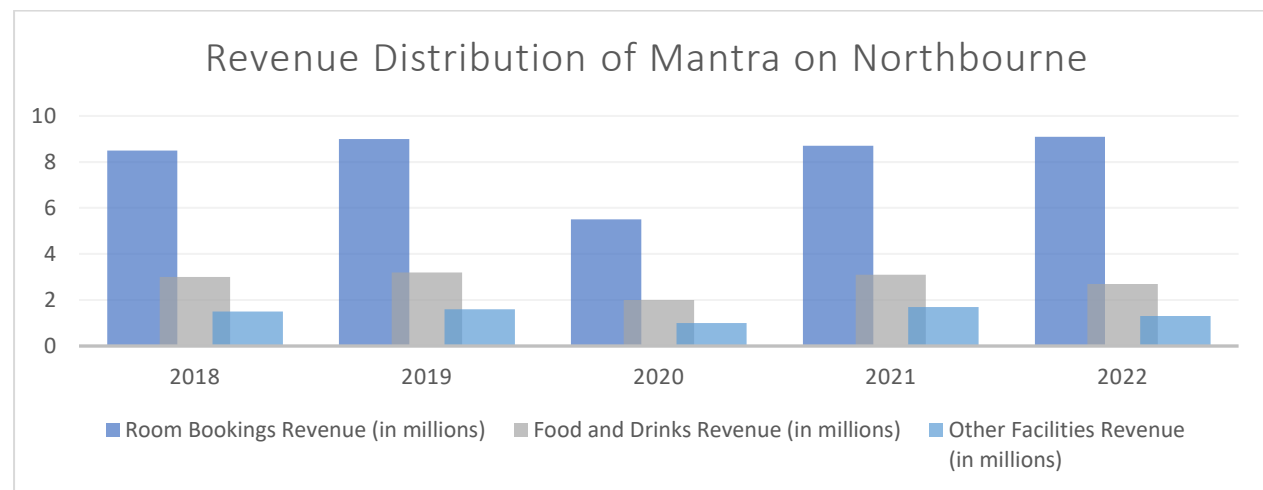
Fig 1: Revenue Distribution of Mantra on Northbourne (appendix Table 1)

The fluctuating room occupancy rate can be attributed to several sub-problems:

Subproblem 1: Inaccurate Demand forecasting: The inconsistent room occupancy rate can be attributed to several sub-problems that Mantra is facing. Firstly, the issue of inaccurate demand forecasting arises, as Mantra lacks the capability to precisely predict the demand for their rooms. This leads to instances of

overbooking during peak times and low occupancy during off-peak periods, ultimately impacting their revenue generation.

Subproblem 2: Ineffective Pricing: Mantra has not optimized their room prices to align with the current demand variations, leading to missed opportunities for maximizing their occupancy and revenue potential.

Subproblem 3: Insufficient Marketing and Low Online Ratings: The Hotel's insufficient marketing efforts and low online ratings on platforms like Google Reviews further compound the challenges. Mantra's current marketing initiatives are not effectively reaching their intended audience, and the negative ratings influence potential customers' decision-making processes, deterring them from choosing Mantra as their accommodation provider.

Subproblem 4: Inadequate consideration of seasonal variations and events in and around the city: Mantra lacks the necessary insights and strategies to appropriately price their rooms during events like SummerNats or Floriade, missing opportunities to optimize their room occupancy rates.

3. Discussion
3.1 Identifying solutions to problems faced by Mantra:
Major problem: Inconsistent Room Occupancy Rates Affecting Revenue

Given Mantra's challenge with inconsistent room occupancy rates and inefficient booking management, it is imperative to explore potential solutions to address this issue effectively.
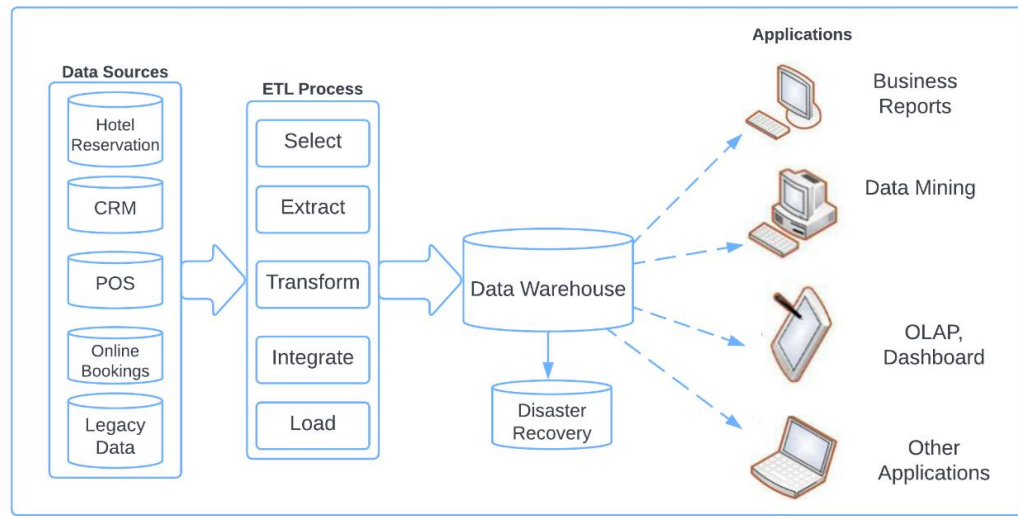
3.2 Data Warehousing solution:

Fig 2: Data Warehousing solution for Mantra (Richardson, 2022)

Data warehousing can play a crucial role in addressing the problem of inconsistent room occupancy rates. Mantra can collect, integrate, and analyze data from various sources to gain valuable insights across different applications it uses in its premises to understand their room occupancy patterns.

Data collection from various sources:

The data collection process will involve gathering information from multiple sources, including Mantra's internal reservation system, online booking platforms, historical occupancy data, and past customer feedback. By consolidating these diverse data sets into a centralized data warehouse, Mantra ensures that all relevant information is captured and readily available for analysis.

ETL process:

One of the primary advantages of implementing a data warehousing solution is the ability to consolidate and integrate data from various sources into a centralized repository. Mantra can leverage the ETL (Extract, Transform, Load) process to extract data from disparate sources, transform it into a consistent format, and load it into the data warehouse. This integration enables Mantra to gain a comprehensive view of room occupancy rates across different dimensions such as time, customer segments, and events. Thus, Mantra can develop a holistic understanding of their occupancy patterns and make informed decisions to address the challenges related to inconsistent room occupancy rates.

Historical Analysis:

With data warehousing solution in place, Mantra can examine historical data and understand the impact of different factors on occupancy, such as seasonal variations, events in the city, seasonal pricing strategy and customer satisfaction levels.

Demand Forecasting and Data Driven Decision Making:

Using the data collected from various sources and analyzing past occupancy patterns, Mantra can develop predictive models that consider factors such as seasonality, events, market trends and customer preference. These forecasts can drive marketing campaigns, strategic decision on pricing, availability to optimize room occupancy.

This warehousing solution empowers Mantra to make informed data-driven decisions around their product offerings and marketing campaigns using which it can take pro-active measures to address the room occupancy rate, thereby optimizing revenue generation.

3.3 Visualizations:

Using the data hosted in the data warehouse Mantra can leverage visualizations to address its existing problems. Below are some of the way visualizations can be used to address Mantra's revenue problem.

1. Identifying Revenue Trends: Visualizations allows Mantra to analyze revenue trends over time by presenting data in visually intuitive manner. Visualizations such as bar graphs, area plots, pie charts can be used to showcase real-time revenue fluctuations, highlighting periods of high and low revenue.
2. Occupancy Rates Analysis: By plotting occupancy rates against revenue Mantra can identify the co-relations between these two variables. Heatmaps or stacked area charts can provide a visual representation of occupancy rates across different parameters like room types, customer segments, time periods, helping in identifying areas of high and low revenue.
3. Pricing Optimization: By visualizing the relationship between room rates and revenue, they can identify pricing sweet spots and optimize based on the observations made. Visualizations such as scatter plots or box plots can be used to showcase the distribution of revenue at different price points, allowing Mantra to focus on pricing adjustments wherever necessary.
4. Demand forecasting: Time series plots, trend lines and forecasting models can provide insights into demand patterns. Mantra can compare historical occupancy rates with forecasted values to assess the accuracy of these predictions and make revenue projections.

5. Operational Efficiency Analysis: By visualizing metrics such as average check-in time, service response time, and customer satisfaction ratings, Mantra can delve into its staff's operational performance. Using Heatmaps or bullet charts they can compare performance metrics across different departments. This will allow Mantra to better manage its staff across departments.

6. Performance Dashboards: Combining several visualizations, performance dashboards can be created that provide a comprehensive view of different metrics and key performance indicators like occupancy rate, revenue per available room (RevPAR).
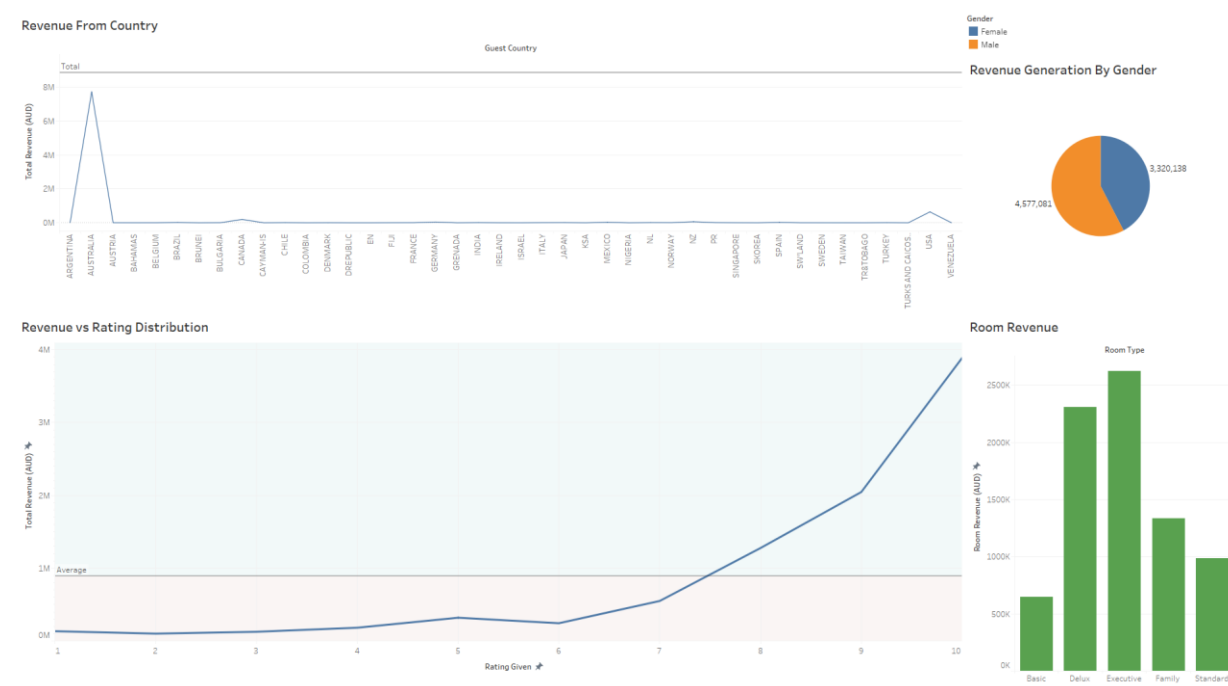

Fig 3: Dashboard depicting different revenue related distributions. (Appendix Table 2)

3.4 Case Study for Applying Data Warehousing in hospitality context:

The case study by Martins et al (2015) addresses the need for a state-of-the-art online information system for the hoteliers. The study highlights the importance of having a data warehouse with updated information in order to access information about the competitive landscape, customer data and the entire hospitality activity. This case study also acknowledges the challenges in building one and the benefits of leveraging data warehousing solutions for business intelligence purposes for their hotels.

3.5 Solution to Subproblem 1: Inaccurate Demand forecasting using Predictive Analytics.

Using predictive analytics to address the issue of demand forecasting involves collecting data such as historical booking data, room reservation patterns, customer profiles, historical pricing information.

Additionally, data on holidays and local events. This comprehensive set of data will enable Mantra to create robust predictions. After this data is collected relevant variables or features from the collected data. This includes seasonality indicators such as month on month holiday or event indicators. Variables to indicate whether it is a weekday or a weekend. This activity is termed feature engineering which involves transforming raw data into meaningful attributes (Heaton, 2020).

Using these created attributes Mantra can leverage ensemble modelling techniques such as regression, decision trees or develop a demand forecasting model using neural networks (Fig 4). By training these models using historical data patterns can emerge which lead to accurate predictions.
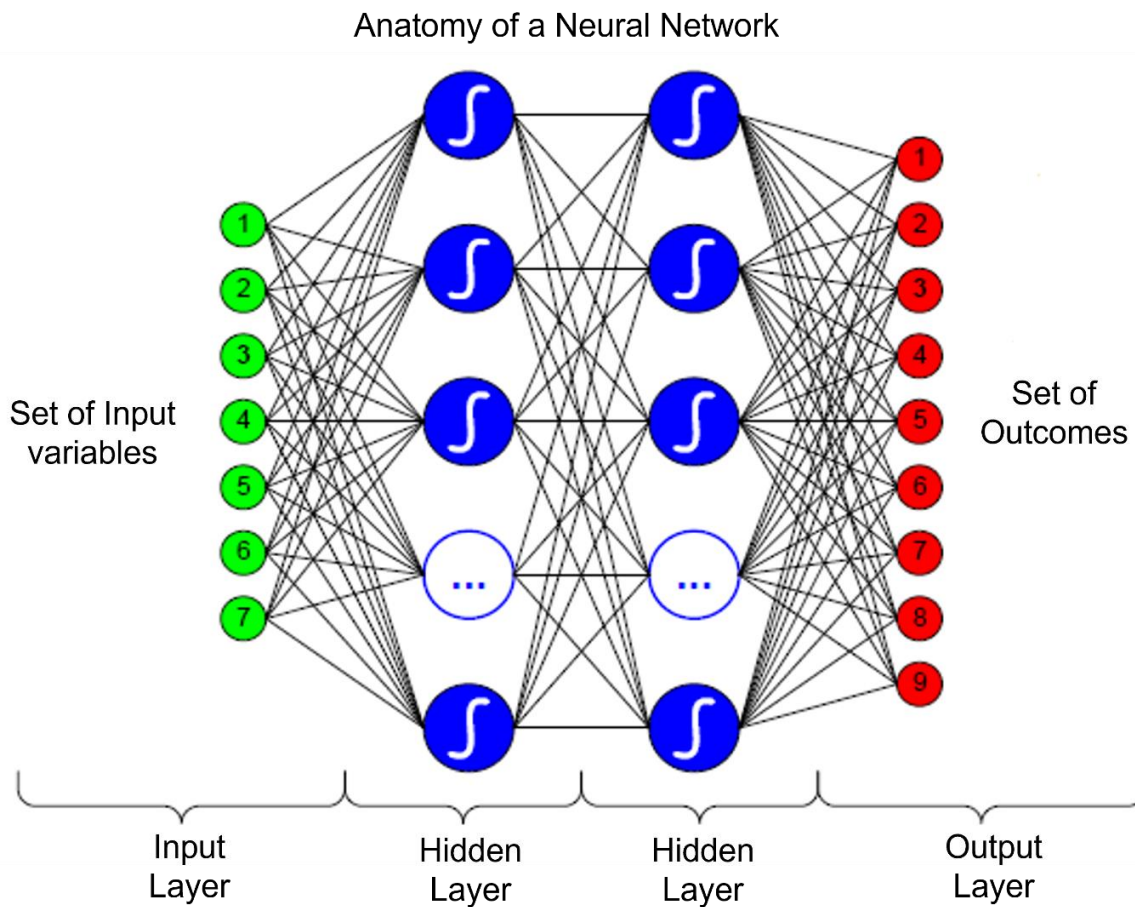
Anatomy of a Neural Network

Fig 4: Anatomy of a neural network. (Richardson, 2022)

Once these models are formulated the variables generated in the previous step can be utilized to generate accurate forecasts for room occupancy rates. These forecasts provide insights into expected demand levels, allowing Mantra to adjust staffing, inventory, and pricing.

Predictive analytics also enables Mantra to perform scenario analysis where the impact of different factors on demand and revenue can be visualized. For example, evaluating the pricing of the rooms based on a specific event in the city and applying scenario analysis, Mantra can optimize room occupancy.

By integrating live feeds into predictive models Mantra can extend the functions of predictive analytics to continuously update their forecasts. This way real-time monitoring allows them to adapt to the changing conditions.
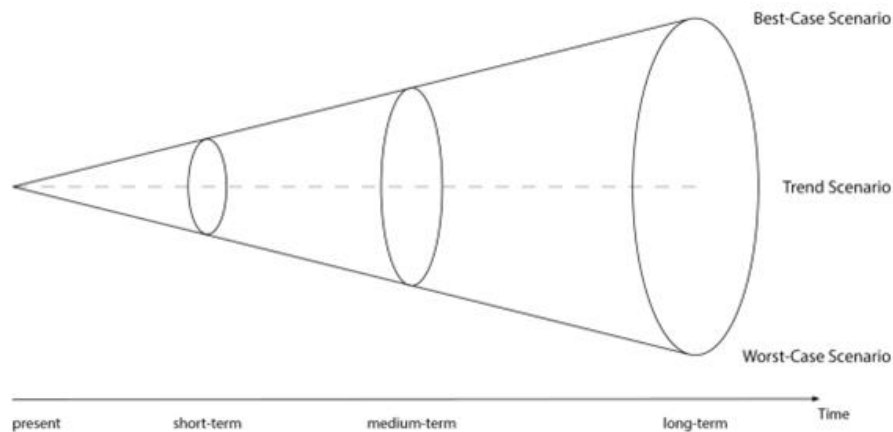

Fig. 5: Scenario Analysis. (Hablowetz, 2022)

3.6 Case Study for Demand forecasting using Scenario Analysis:

The case study titled "Forecasting hotel room demand amid COVID-19" by Zhang and Lu (2021) explores the application of scenario analysis techniques to forecast hotel room demand during the COVID-19 pandemic. The study focuses on understanding the impact of the pandemic on the hotel industry and provides valuable insights and strategies for hotel businesses to effectively manage their demand forecasting in this challenging environment. With scenario analysis, the study offers a comprehensive approach to forecasting hotel room demand, enabling hoteliers to make informed decisions and adapt their operations accordingly.

3.7 Solution to Subproblem 2: Ineffective Pricing.

Under the umbrella of classification techniques used in Business Intelligence Mantra can make use of a robust Revenue Management System which make use of Statistical Models (Analysis) like Price Elasticity Modeling that analyses the responsiveness of the customer demand to changes in room rates. By quantifying this price elasticity as a metric Mantra can identify optimal price points to maximize revenue. Mantra can

also collect data from its nearest competitors via various online hotel booking websites to perform a competitive pricing analysis, by this they can ensure that prices are competitive and aligned with the market.
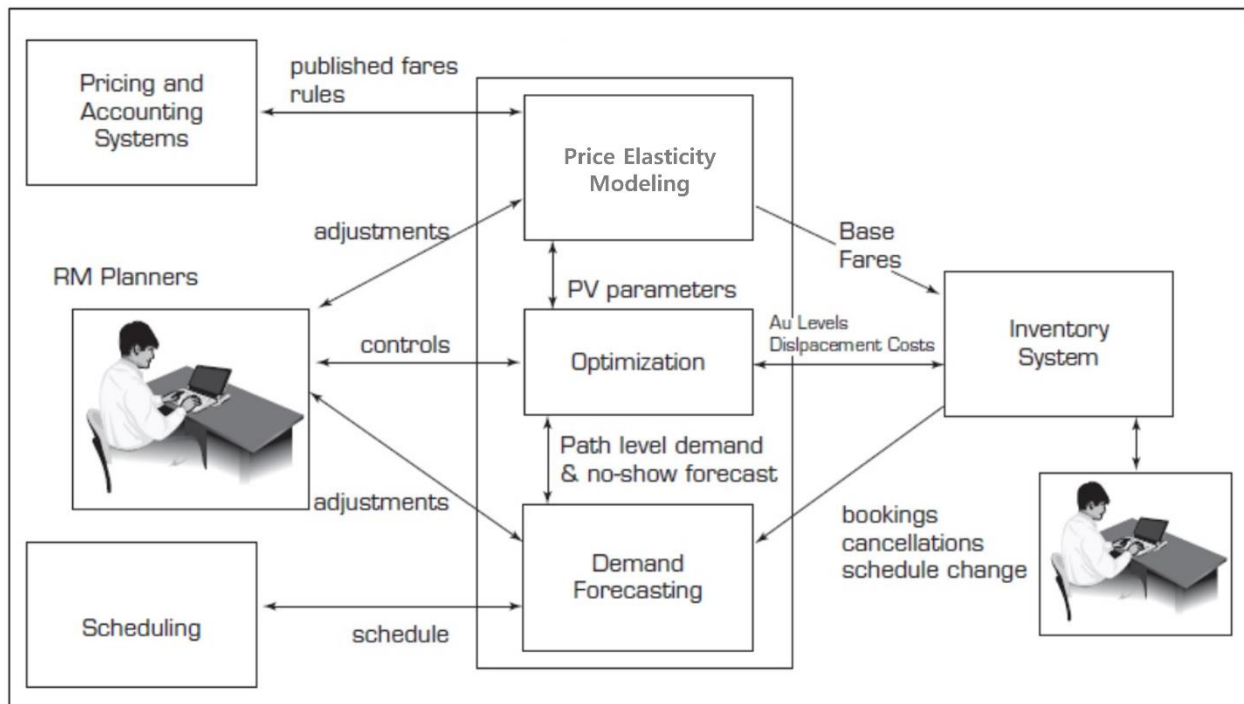

Fig 6: Revenue Management System for Mantra (Richardson, 2022)

The RMS integrates data from various sources such as pricing and accounting systems, scheduling systems and inventory systems. These systems include data of historical bookings, pricing, and market data. RMS also utilizes this data to power its demand forecasting engine, which generates accurate forecasts for various room types and time periods. These demand forecasts offer valuable insights into expected demand levels, enabling Mantra to make informed inventory decisions and optimize their room availability accordingly.

Optimization Engine:

Revenue management systems employ sophisticated algorithms to recommend optimal pricing strategies. The algorithms consider such a demand forecasts, competitor pricing, historical pricing and booking data, customer segmentation variables and revenue objectives. The optimization engine analyses these inputs and suggests pricing adjustments to maximize revenue based on available inventory.

Using this system Mantra can effectively manage over-booking and no-show scenarios allowing for efficient allocation of rooms to different market segments. By setting the availability controls effectively and intelligently into RMS we can ensure efficient inventory for Mantra.

Some of the other metrics such as average daily rate (ADR) revenue per available room (RevPAR), occupancy rates and revenue by identified market segment can be measured. Additionally, in order to harmonize the pricing across different online booking platforms RMS integrates with various distribution channels such as direct booking engines and online travel agencies. This integration allows for pricing decisions to be communicated consistently across all channels, preventing inconsistencies and rate disparities.

3.8 Case Study for Revenue Management Systems:

According to the authors Aziz, Saleh, Rasmy, and ElShishiny (2011) in the case study "Dynamic room pricing model for hotel revenue management systems" propose a hotel revenue management system model based on dynamic pricing aiming to provide hotel managers with flexible and efficient decision-making tool for maximizing room revenue. This innovative optimization model, referred to as the dynamic room pricing model, offers a promising solution for addressing the challenges faced by hoteliers to streamline their revenue.

3.9 Subproblem 3: Insufficient Marketing and Low Online Ratings.
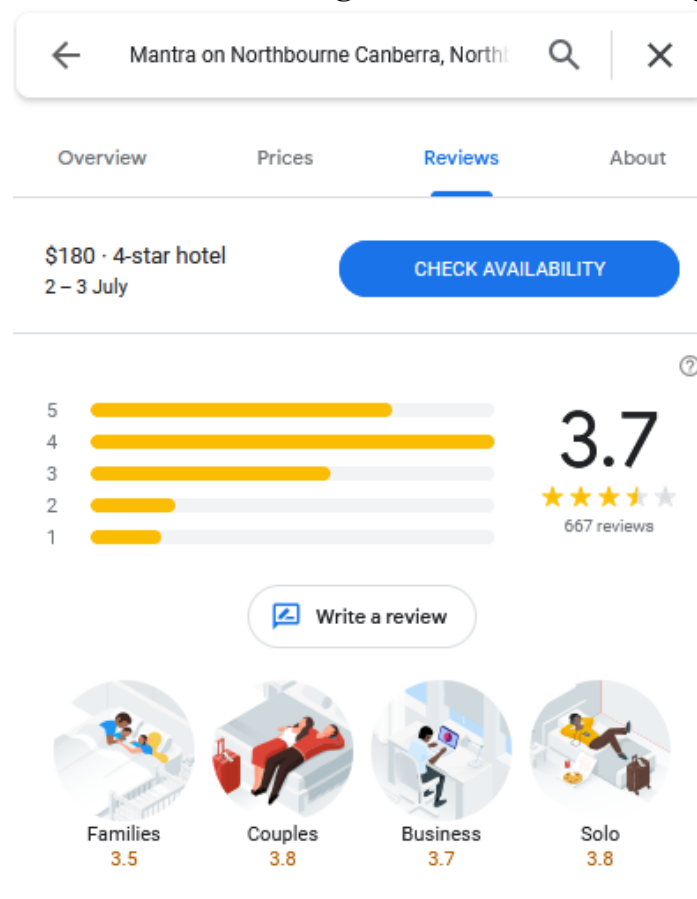

Fig 7. Current Ratings for Mantra on Google. (Google, 2023)

Mantra can leverage social media analytics to monitor and analyze online conversations, mentions and sentiments related to their hotel. By tracking social media platforms such as Facebook, Twitter, Instagram, Google Reviews they can gain insights into customer feedback, trends, and reviews. With this information Mantra can optimize marketing campaigns, engage with customers, and address any negative sentiments. In a similar approach Mantra can analyze website traffic, user behavior on those sites and the resulting conversion rates. Metrics such as number of visitors, page views, bounce rates[1] and click-through rates[2] (CTR) can determine the areas of improvement in their marketing efforts. For example, on their website they can analyze which pages or offers generate the most bookings and optimize accordingly.

Using the results of this analysis Mantra can segment the customers into distinct groups based on demographics, preferences or booking patterns. Understanding each segment and their unique preferences Mantra can tailor their marketing messages, offers and promotions to effectively reach each segment. This technique can lead to increased bookings and better customer satisfaction.

Furthermore, Mantra can use sentiment analysis which involves using Natural Language Processing (NLP) techniques to classify and analyze customer reviews. This technique is used to classify and quantify the sentiment, (whether it is positive, negative, or neutral) expressed in the online reviews, this is called Review Classification (Soofi and Awan, 2017). This helps in manta taking proactive measures to enhance online ratings. In addition to this Mantra should actively stive to maintain online reputation by proactively responding to customer reviews and feedback across various platforms by addressing customer concerns, acknowledging positive feedback Mantra can build customer trust and attract more bookings.
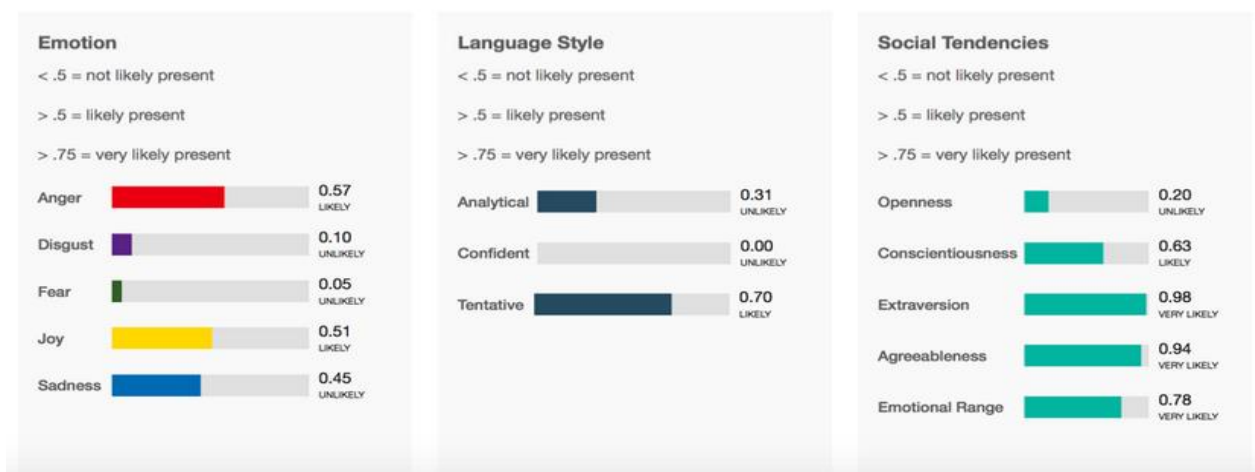

Fig 8. Sentiment Analysis on IBM Watson Tone Analyzer (Kelly-Yahner and Twilio, 2017)

[1]The percentage of visitors to a particular website who navigate away from the site after viewing only one page.

[2]A ratio showing how often people who see your ad or free product listing end up clicking it.

3.10 Case Study for Sentiment Analysis:

In the case study "Sentiment Analysis of Hotel Online Reviews Using the BERT Model and ERNIE model—Data from China" conducted by Wen, Lian and Zhu (2023) the authors explored the application of Neural networks models for sentiment analysis of hotel online reviews. This study is aimed to help hotels gain better understanding of the customer needs and utilize customer reviews to generate a sentiment analysis of those reviews for the hotels to gain from it.

3.11 Solution to Subproblem 4: Inadequate consideration of seasonal variations and events in and around the city.

By utilizing the data warehousing infrastructure Mantra needs to collect relevant geographic data to analyze the impact of location on room occupancy rates. Data such as geographical information related to local events, how do people attend these events – the demographics of those events. By obtaining guest origin data from booking systems or surveys, and event-related geographic information from event calendars or organizers, Mantra can gain insights into the preferences of people visiting Canberra for specific events. Furthermore, Mantra can leverage geospatial visualization technique to map and visualize the demand for a particular event by recognizing geographic patterns and areas with potential demand variations. This can be achieved through geographical information systems (GIS). Accessing data of locational proximity to other competitors and their offerings.
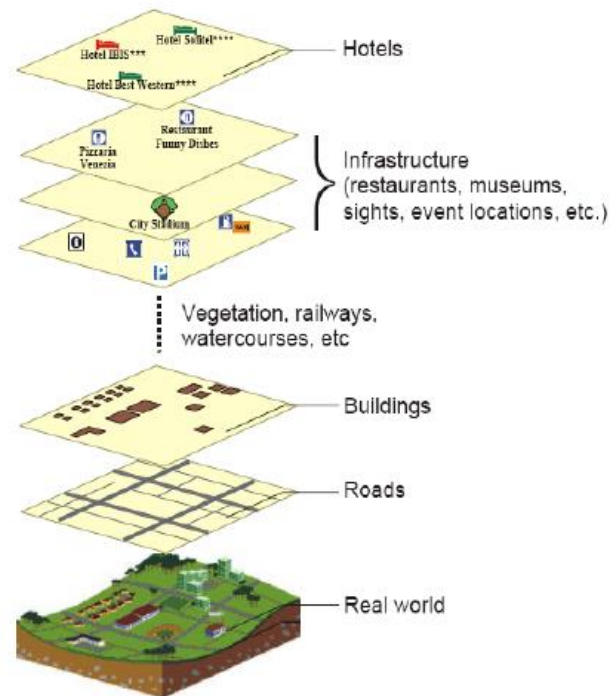
Fig 9. Geo-spatial Analysis (Jovanovic and Njegus, 2008)

Mantra can segment their guests bases on geographic criteria such as regions or countries or proximity to local events such as SummerNats and Floriade. Analyzing people from which region or country they arrive and contribute more significantly to their room occupancy during specific seasons or events. Identifying suburbs that show higher or lower demand during specific seasons or local events will allow Mantra to understand the factors that influence demand in those suburbs thus giving them opportunity to tailor their marketing and pricing strategies accordingly. Additionally, Mantra can create promotional offers tailored to guests attending specific events.
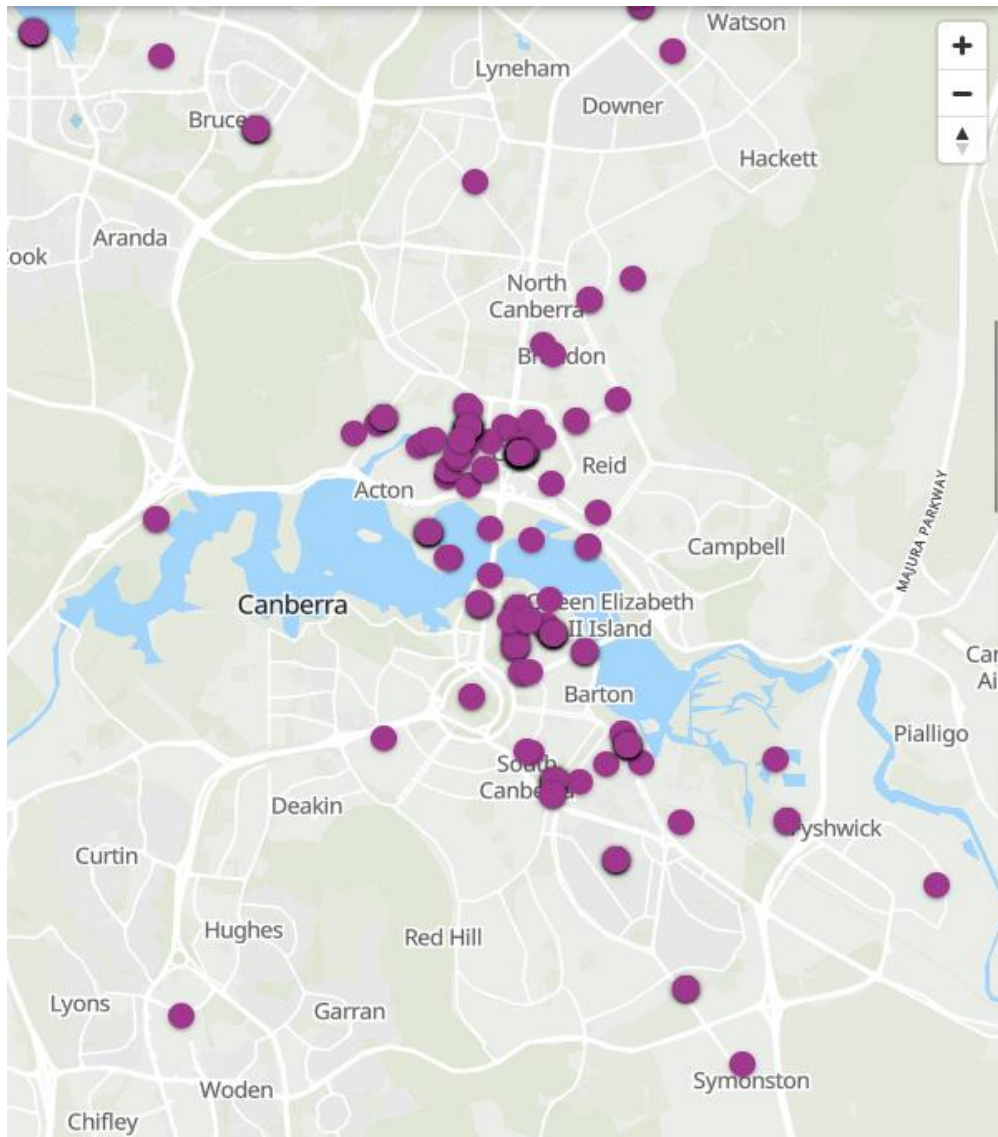
Fig 10. Event Map of Canberra - Jun 2023 (ACT Government, n.d.)

Using the event map data (Fig 10) provided by Events Canberra (*ACT Government, n.d.*) Mantra can use this data as one of the layers for geo-spatial analysis.

3.12 Case study for Geo-Spatial Analysis:

The case study titled "The application of GIS and its components in tourism" by Jovanovic and Njegus (2008), explores the application of geo-spatial analysis and Geographic Information System on the tourism industry. The authors specifically focus on the GIS and geo-spatial analysis with respect to a specific geographic location – in this case Zlatar (Serbia). The data is organized into thematic layers each representing a specific category of objects like an event layer, hotel layer and infrastructure layer. With this

approach the authors state that the tourism stakeholders can gain valuable insights into spatial aspects of their locations. This technology enables them to analyze and evaluate different factors such as events that impact the tourism industry.

4. Conclusion

By addressing Mantra's revenue problem, we saw how to address the underlying problems and addressing them with various business analytics techniques. With the implementation of a data warehousing solution Mantra can collect and integrate a wide variety of data from multiple sources which further provides the opportunity for Mantra to analyze and capitalize on them. Data warehousing forms the basis of all the business analytics techniques which are discussed in this report since it provides the data framework for further in-depth analysis.

Visualizations provide a clear and intuitive representation of key metrics enabling Mantra to proactively act on the data. By this they can identify the periods of high and low revenue and adjust their marketing and pricing, accordingly, maximizing revenue during peak periods and improvising targeted campaigns during low-revenue periods.

Integration of visualizations into performance dashboards provides a comprehensive view of key metrics such as occupancy rate or revenue per available room (RevPAR). Since these dashboards offer real-time insights, allowing Mantra to monitor performance and make data-driven decisions.

With the collection and analyzing data Analytical techniques such as predictive analytics must be utilized to develop robust predictive models. The use of demand forecasting models will help mantra to avoid overbooking or underutilization of its staffing or inventory. With accurately predicting the demand Mantra can align its resources and operations accordingly.

The RMS employs statistical models like Price Elasticity modeling to analyze customer responsiveness to changes in room rates by quantifying price elasticity as a metric Mantra will be able to identify optimal price points with the implementing a robust RMS system as a part of its BI strategy. Extending the functionality of the RMS with various distribution channels ensures consistent pricing across platforms avoiding any revenue damage from rate disparity. Mantra can effectively manage over-booking and no-show scenarios, efficiently allocating rooms to different market segments.

Using social media analytics Mantra can classify online conversations, mentions and feedback on social media to gain valuable insights into their establishment and engage with customers addressing any negative feedback. Using techniques like sentiment analysis with NLP to classify customer reviews into positive, negative, or neutral and depending on the results can enhance customer trust and attract more bookings.

Through geo-spatial analysis Mantra can map and visualize the demand with respect to specific events. By leveraging event map data from Events Canberra Mantra can integrate this information into their geo-spatial analysis enhancing their understanding of local events landscape and its impact on the occupancy rates. The integration of data warehousing and geo-spatial analysis enables Mantra to make informed decisions and maintain a competitive position in the market.

5. Recommendations

Based on the solutions proposed for the existing problems on Mantra here are some of the recommendations which will go a long way in improving business for Mantra.

1. Implement Data Warehousing Solution:
   - Consult with a cloud service provider and setup infrastructure to collect different sorts of data from various sources and by leveraging ETL processes classify those data into meaningful formats. Make sure there is enough data to support creating predictive models.
   - Conduct a historical analysis to understand the impact of factors such as seasonality, events, pricing strategies.
2. Leverage Visualizations and Dashboards:
   - Create impactful Dashboards which includes visualizations preferably with real-time data to analyze different parameters like room occupancy rates, revenue distribution, Service response time, customer satisfaction rating or other metrics that will be useful on a daily basis. This will help in optimizing operations in an efficient manner.
3. Deploy a Revenue Management System (RMS):
   - Implement a robust RMS system such as *IDeAS* or *ATOMIZE* that incorporates statistical analysis techniques using NLP to analyze customer demand and its co-relation to room rates.
   - Integrate data from other systems such as market data, accounting systems and distribution channels into RMS to ensure pricing is optimal and consistent communication of pricing decisions across all platforms.
4. Employ Social Analytics and Sentiment Analysis:

- Setup a model to perform social analytics on conversations and mentions on the reviews and feedback on various social media platforms.
- Utilize sentiment analysis and NLP techniques to classify and quantify customer reviews and gain insights from it. Additionally, analyze website traffic, user behavior, and conversion rates to optimize marketing efforts.

5. Conduct geo-spatial analysis:
- Using the recommended data warehousing solution collect data related to events, data on location proximity to competitors and their offerings utilizing data from events Canberra and others via an API call to *Open Data Portal*
- Leverage Geo-spatial visualizations to map and visualize demand from particular events.

6. Implementation.

Priority	Recommendation	Reasoning	Time Estimate	Financial Estimate	Team Responsible	Dependencies	Required Capability
High	Implement Data Warehousing Solution	Forms the foundation of collecting, organizing, and analyzing data.	2-3 months	Cloud service provider costs	Cloud vendor IT Team and Data Analysts.	Availability and access of relevant data from various teams	IT expertise in setting up, managing cloud infrastructure in similar contexts
Medium	Leverage Visualizations and Dashboards	Aids in optimizing operations with real-time insights.	1-2 months	Visualization tool licenses	Data Analysts, UI/UX Designers	Availability of timely data from the data warehouse	Personnel skilled in Data visualizations and Dashboard Design.
High	Deploy a Revenue Management System (RMS)	Directly impacts the pricing decisions and as a result affects other areas.	2-3 months	RMS system costs	Revenue Management Team and vendor IT Team.	Integration with other systems such as market data and accounting systems.	State of art Revenue Management systems implementation experience in Australian context.
Medium	Employ Social Analytics and Sentiment Analysis	Helps in understanding customer sentiments and thus providing valuable data to optimize marketing efforts.	1-2 months	Social analytics tools/licenses	Data Analysts and Marketing Team.	Availability of required amount of data from various social media platforms and scraping those data.	Personnel skilled in sentiment analysis and social media analytics.

Medium	Conduct Geo-spatial Analysis	Provides insights on geo-graphical demand patterns.	1-2 months	API integration costs	Data Analysts and Marketing team.	Timely availability of data from Events Canberra and other open-source APIs.	Personnel who have implemented geo-spatial mapping techniques prior to this implementation.

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IDeAS:
https://ideas.com/revenue-management/

Atomise:
https://atomize.com/

Open data portal

https://www.data.act.gov.au/

8. Appendices
Table 1: Estimated Revenue for Mantra 2018-22.

Year	Room Bookings Revenue (in millions)	Food and Drinks Revenue (in millions)	Other Facilities Revenue (in millions)
2018	8.5	3	1.5
2019	9	3.2	1.6
2020	5.5	2	1
2021	8.7	3.1	1.7
2022	9.1	2.7	1.3

Table 2:

Link:

https://anu365-
my.sharepoint.com/:f:/g/personal/u7355427_anu_edu_au/Ekst5hEnBRtGoQHEhr8Njk8B9MsVTg3YvHK
H0i6xst9QSA?e=T62yhX

Data for creating dashboard:

Table 3:

Mapping of Problems, Techniques used and Week from course.

Problems	Technique/Method Used to Address Problems	Week
Major Problem	Data Warehousing	1
	Visualizations and Dashboards	3
SubProblem 1	Predictive Analytics (Neural Networks)	4

	Scenario Analysis/What-if Analysis	7
SubProblem 2	Decision Support System (Revenue Management System)	9
	Statistical Analysis (Price Elasticity Modeling)	4
SubProblem 3	Social Media Analytics	6
	Sentiment Analysis	5
SubProblem 4	Geo-spatial Analysis	12