

SVKM's NMIMS

Mukesh Patel School of Technology Management & Engineering

<u>Visualizing Insights: Leveraging SAS Studio and Tableau Dashboard based on AirBnB</u>

Subject: Business Information Visualization and Analysis

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1. Introduction:

1.1 SAS Studio Data Builder

In today's data-driven business landscape, organizations worldwide rely on robust analytical tools to derive actionable insights from their vast datasets. SAS Studio emerges as a powerful solution, offering a user-friendly interface and a comprehensive suite of analytical capabilities tailored to meet the diverse needs of modern enterprises. This introduction aims to provide a holistic understanding of SAS Studio and its application within a compelling business scenario.

SAS Studio serves as an integrated development environment (IDE) within the SAS ecosystem, empowering users to harness the full potential of SAS analytics through a web-based platform. With its intuitive interface and extensive functionality, SAS Studio enables users to manipulate, analyze, and visualize data efficiently, facilitating informed decision-making across various industries and domains.

To illustrate the practical application of SAS Studio, let us consider a hypothetical business scenario: a multinational corporation embarking on a strategic expansion initiative across diverse geographic regions. In this scenario, the organization's HR department seeks to optimize workforce management strategies by leveraging data analytics to understand employee demographics, compensation structures, and geographic distributions.

By employing SAS Studio, the HR team can conduct comprehensive analyses of employee data, segmenting the workforce based on geographic locations, job roles, and other relevant variables. Through techniques such as data segmentation, statistical analysis, and visualization, SAS Studio empowers HR professionals to gain deep insights into workforce dynamics, identify areas for improvement, and develop targeted strategies to support organizational objectives.

Furthermore, SAS Studio's versatility extends beyond HR analytics, serving as a valuable resource for decision-makers across various departments, including marketing, finance, and operations. Whether it's optimizing marketing campaigns, forecasting financial performance, or streamlining operational processes, SAS Studio offers a versatile platform for driving data-driven decision-making and achieving organizational excellence.

In summary, SAS Studio stands as a testament to the transformative power of analytics in today's digital age. From empowering organizations to unlock the full potential of their data to facilitating evidence-based decision-making across diverse business functions, SAS Studio emerges as a catalyst for innovation, efficiency, and success in the modern enterprise landscape.

1.2 Tableau Data Visualization

In today's data-centric world, organizations across industries are increasingly turning to data visualization tools to extract meaningful insights and drive informed decision-making. Tableau, a leading data visualization platform, offers businesses a powerful solution to explore and analyze their data in intuitive and impactful ways. In this introduction, we delve into the application of Tableau data visualization within the context of a specific business scenario: the analysis of Airbnb listings in various cities.

With the proliferation of short-term rental platforms like Airbnb, the hospitality industry has witnessed a paradigm shift in how accommodations are booked and managed. As such, businesses and individuals alike seek to leverage data insights to optimize their Airbnb listings, improve rental performance, and enhance the overall guest experience. Tableau data visualization serves as a valuable tool in this endeavor, providing users with the ability to visually explore Airbnb data, identify trends, and make data-driven decisions to achieve their rental objectives.

By harnessing the capabilities of Tableau, users can gain valuable insights into various aspects of Airbnb listings, including pricing dynamics, occupancy rates, geographic trends, and more. Whether it's a property management company seeking to optimize its portfolio of Airbnb listings or an individual host looking to maximize rental revenue, Tableau data visualization offers a comprehensive solution to analyze and visualize Airbnb data effectively.

In the following sections, we will explore how Tableau data visualization can be applied to analyze Airbnb listings, uncover actionable insights, and drive informed decision-making in the dynamic and competitive landscape of short-term rentals. Through real-world examples and practical demonstrations, we will showcase the power of Tableau in transforming raw data into actionable insights that drive business success in the Airbnb ecosystem.

2. Data Preparation

Scenario 1:

Orion Inc., a rapidly growing multinational corporation, is strategically expanding its operations into new countries to capitalize on emerging markets and diversify its revenue streams. As part of this expansion, the HR department is tasked with optimizing its international workforce management strategies to ensure efficient resource allocation, promote diversity and inclusion, and maintain competitive compensation structures across different regions.

Scenario: "How can Orion Inc. leverage data analytics to gain insights into their international workforce demographics, salary distributions, and gender diversity across various countries?"

```
proc univariate data = orion.sales;
var salary;
run;
proc means data=orion.sales nmiss min max sum maxdec=1 nonobs;
   var Salary;
   class Gender Country;
run;
proc means data = orion.sales;
var salary;
class gender country;
run;
proc means data = orion.sales;
run;
proc freq data=orion.sales nlevels;
   tables _all_ / noprint;
run;
proc freq data=orion.sales order = freq;
   tables job_title / nocum nopercent;
run;
proc freq data=orion.sales nlevels;
   tables Gender Country / nocum nopercent;
run;
proc sort data= orion.sales out = sorted;
by country;
run;
```

```
proc freq data = sorted;
tables gender;
by country;
run;
proc freq data = sorted;
tables gender*country / list;
run;
proc freq data = sorted;
tables gender*country / crosslist;
run;
proc freq data = orion.sales;
tables country / nocum nopercent;
run;
proc freq data = orion.sales;
tables gender country;
run;
```

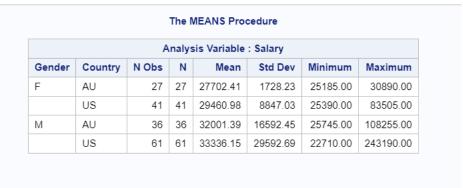
Output:

The UNIVARIATE Procedure Variable: Salary

	Мо	ments	
N	165	Sum Weights	165
Mean	31160.1212	Sum Observations	5141420
Std Deviation	20082.6671	Variance	403313519
Skewness	8.16761992	Kurtosis	78.5622611
Uncorrected SS	2.26351E11	Corrected SS	6.61434E10
Coeff Variation	64.4499006	Std Error Mean	1563.43352

The MEANS Procedure

		Analysis	Variable : Sa	alary	
Gender	Country	N Miss	Minimum	Maximum	Sum
F	AU	0	25185.0	30890.0	747965.0
	US	0	25390.0	83505.0	1207900.0
M	AU	0	25745.0	108255.0	1152050.0
	US	0	22710.0	243190.0	2033505.0



Number of Varia	ble Levels
Variable	Levels
Employee_ID	165
First_Name	154
Last_Name	165
Gender	2
Salary	152
Job_Title	7
Country	2
Birth_Date	164
Hire_Date	98



	Ta	able of Gende	r by Count	ry	
Gender	Country	Frequency	Percent	Row Percent	Column
F	AU	27	16.36	39.71	42.86
	US	41	24.85	60.29	40.20
	Total	68	41.21	100.00	
М	AU	36	21.82	37.11	57.14
	US	61	36.97	62.89	59.80
	Total	97	58.79	100.00	
Total	AU	63	38.18		100.00
	US	102	61.82		100.00
	Total	165	100.00		

Insights:

• The analysis reveals salary discrepancies across genders and countries, helping Orion Inc. to identify potential areas for pay equity adjustments.

- Understanding the distribution of job titles within the organization allows HR to assess the need for specific skill sets in different regions and plan recruitment strategies accordingly.
- Insights into gender distribution within countries can inform diversity and inclusion initiatives, helping Orion Inc. create inclusive workplaces tailored to the cultural contexts of each region.
- By conducting thorough analyses of its workforce data, Orion Inc. can make data-driven decisions to optimize its human resources management strategies and support its global expansion goals.

Scenario 2:

Orion Inc., a global company with operations in multiple countries, is aiming to optimize its HR strategies by understanding the geographic distribution of its workforce. The HR department seeks to segment employee data based on countries, allowing for targeted analysis and decision-making tailored to specific regions.

Scenario: "How can Orion Inc. effectively segment its employee data by country to gain insights into the geographic distribution of its workforce and inform location-specific HR strategies?"

```
data usa au other;
    set orion.employee addresses;
    if country="US" then
        output usa;
    else if country="AU" then
        output au;
    else
        output other;
run;
title1 "USA Employee Dataset";
proc print data=usa;
run;
title1 "AU Employee Dataset";
proc print data=work.au;
run;
title1 "Other Employee Dataset";
proc print data=other;
run;
```

Business Information Visualization and Analysis

```
data usa (drop=Street_ID Country) australia (drop=Street_ID State Country)
        other;
    set orion.employee_addresses;

if country="US" then
        output usa;
    else if country="AU" then
        output australia;
    else
        output other;
run;
```

Output:

			U	JSA Employee	Dataset				
Obs	Employee_ID	Employee_Name	Street_ID	Street_Number	Street_Name	City	State	Postal_Code	Country
1	121044	Abbott, Ray	9260116912	2267	Edwards Mill Rd	Miami-Dade	FL	33135	US
2	120761	Akinfolarin, Tameaka	9260121030	5	Donnybrook Rd	Philadelphia	PA	19145	US
3	120656	Amos, Salley	9260123736	3524	Calico Ct	San Diego	CA	92116	US
4	121107	Anger, Rose	9260120989	744	Chapwith Rd	Philadelphia	PA	19142	US
5	121038	Anstey, David	9260116991	939	Hilltop Needmore Rd	Miami-Dade	FL	33157	US
6	120273	Antonini, Doris	9260116925	681	Ferguson Rd	Miami-Dade	FL	33141	US
7	120759	Apr, Nishan	9260123711	105	Brack Penny Rd	San Diego	CA	92071	US
8	120798	Ardskin, Elizabeth	9260116954	701	Glenridge Dr	Miami-Dade	FL	33177	US
9	121030	Areu, Jeryl	9260116937	265	Fyfe Ct	Miami-Dade	FI	33133	US
10	121017	Arizmendi, Gilbert	9260123825	379	Englehardt Dr	San Diego	CA	91950	US

				AU Employe	e Dalasei				
Obs	Employee_ID	Employee_Name	Street_ID	Street_Number	Street_Name	City	State	Postal_Code	Country
1	120145	Aisbitt, Sandy	1600101803	30	Bingera Street	Melbourne		2001	AU
2	120185	Bahlman, Sharon	1600103028	24	LaTrobe Street	Sydney		2165	AU
3	120109	Baker, Gabriele	1600103074	166	Toorak Road	Sydney		2119	AU
4	120188	Baran, Shanmuganathan	1600102985	207	Canterbury Road	Sydney		1225	AU
5	120144	Barbis, Viney	1600102974	3	Alice Street	Sydney		2114	AU
6	120168	Barcoe, Selina	1600101850	435	Sherwood Rd	Melbourne		8003	AU
7	120182	Barreto, Geok-Seng	1600103062	241	Royal Perade	Sydney		1115	AU
8	120104	Billington, Kareen	1600103066	40	Smith Street	Sydney	Sydney		AU
9	120183	Blanton, Brig	1600101844	6	Palmiston Cresent	Melbourne		3150	AU
10	120198	Rody Meera	1600103038	51	Martin Place	Sydney		1121	ΔΗ

			Other Employee Dataset												
Obs	Employee_ID	Employee_Name	Street_ID	Street_Number	Street_Name	City	State	Postal_Code	Country						
1	121019	Desanctis, Scott	9260121087	765	Greenhaven Ln	Philadelphia	PA	19102	us						
2	120997	Donathan, Mary	9260121069	4923	Gateridge Dr	Philadelphia	PA	19152	us						
3	120747	Farthing, Zashia	9260123756	763	Chatterson Dr	San Diego	CA	92116	us						
4	121102	Flammia, Rocheal	9260123922	1201	Hoyle Dr	San Diego	CA	91978	us						
5	120698	Kistanna, Geoff	1600103007	28	Fonceca Street	Sydney		1171	au						
6	120695	Moffat, Trent	1600101835	8	Learmonth Road	Melbourne		3101	au						
7	120135	Platts, Alexei	1600103071	39	Station Street	Sydney		2000	au						
8	120994	Sergeant, Danelle	9260123959	734	Ladys Slipper Ct	San Diego	CA	92105	us						

Obs	Employee_ID	Employee_Name	Street_Number	Street_Name	City	State	Postal_Code
1	121044	Abbott, Ray	2267	Edwards Mill Rd	Miami-Dade	FL	33135
2	120761	Akinfolarin, Tameaka	5	Donnybrook Rd	Philadelphia	PA	19145
3	120656	Amos, Salley	3524	Calico Ct	San Diego	CA	92116
4	121107	Anger, Rose	744	Chapwith Rd	Philadelphia	PA	19142
5	121038	Anstey, David	939	Hilltop Needmore Rd	Miami-Dade	FL	33157

Insights:

- By segmenting employee data by country, Orion Inc. can gain a clearer understanding of its global workforce distribution, facilitating strategic decision-making tailored to specific regions.
- Analysis of country-specific datasets can reveal differences in workforce demographics, allowing HR to tailor recruitment, retention, and talent development strategies to each country's unique needs.
- Understanding the geographic distribution of employees can also inform decisions related to office locations, employee benefits, and cultural initiatives to foster engagement and productivity across different regions.

Scenario 3:

Orion Inc., a multinational company, operates sales teams across various countries. The company aims to analyze the bonuses given to sales representatives in Australia to ensure fair compensation practices and incentivize performance effectively. The HR department is tasked with conducting detailed analyses of sales data to gain insights into bonus distributions and identify opportunities for optimization.

Scenario: "How can Orion Inc. analyze bonuses given to sales representatives in Australia over time, ensuring fair compensation practices and identifying potential areas for improvement?"

```
data usa au other;
    set orion.sales;
    bonus=salary*.5;
    month_join=month(hire_date);

if country='AU' then
        output au;
    else if country='US' then
        output usa;
    else
        output other;

    if bonus > 2550;
run;

proc print data=work.usa;
run;
```

Output:

Obs	Employee_ID	First_Name	Last_Name	Gender	Salary	Job_Title	Country	Birth_Date	Hire_Date	bonus	month_join
1	120261	Harry	Highpoint	М	243190	Chief Sales Officer	US	4800	11535	121595.0	8
2	121018	Julienne	Magolan	F	27560	Sales Rep. II	US	-4381	6575	13780.0	1
3	121019	Scott	Desanctis	М	31320	Sales Rep. IV	US	11133	17684	15660.0	6
4	121020	Cherda	Ridley	F	31750	Sales Rep. IV	US	10280	16922	15875.0	5
5	121021	Priscilla	Farren	F	32985	Sales Rep. IV	US	6918	13939	16492.5	3
6	121022	Robert	Stevens	М	32210	Sales Rep. IV	US	8701	16833	16105.0	2
7	121023	Shawn	Fuller	М	26010	Sales Rep. I	US	2994	12174	13005.0	5
8	121024	Michael	Westlund	М	26600	Sales Rep. II	US	10491	17653	13300.0	5
9	121025	Barnaby	Cassey	М	28295	Sales Rep. II	US	-2274	7183	14147.5	9
10	121026	Terrill	Jaime	M	31515	Sales Rep. IV	US	11269	18353	15757.5	4

Insights:

- By analyzing bonuses given to sales representatives in Australia, Orion Inc. can ensure fair compensation practices and incentivize high performance effectively.
- The analysis allows HR to identify discrepancies in bonus distributions and make adjustments to ensure equitable compensation across the sales team.
- Insights gained from the analysis can inform future bonus structures and performance evaluation processes for sales representatives in Australia, ultimately contributing to the company's sales growth and success in the region.

Scenario 4:

Orion Inc. is a multinational corporation operating in various countries, including the USA and Australia. The company is focused on refining its compensation strategies to attract and retain top talent while ensuring cost-

effectiveness and fairness across different regions. The HR department aims to analyze employee salaries and bonuses in the USA and Australia to optimize compensation structures accordingly.

Scenario: "How can Orion Inc. analyze and optimize compensation strategies for employees in the USA and Australia to ensure competitiveness and fairness while managing costs effectively?"

```
data work.subset1;
    set orion.sales;
    where country='AU' and Job_Title contains 'Rep';
run;
title1 "Output1";
proc print data=work.subset1;
run;
data work.subset1;
    set orion.sales;
    where country='AU' and Job_Title contains 'Rep' and Hire_Date < '01jan2000'd;
    format hire date date9.;
run;
title1 "Output2";
proc print data=work.subset1;
run;
data work.subset1;
    set orion.sales;
    where country='AU' and Job_Title contains 'Rep' and Hire_Date < '01jan2000'd;
    drop Salary;
    Bonus=Salary*.10;
    format bonus dollar8.;
run;
title1 "Output3";
proc print data=work.subset1;
    where bonus < 5000;
run;
```

Output:

	Output1												
Obs	Employee_ID	First_Name	Last_Name	Gender	Salary	Job_Title	Country	Birth_Date	Hire_Date				
1	120121	Irenie	Elvish	F	26600	Sales Rep. II	AU	-4169	6575				
2	120122	Christina	Ngan	F	27475	Sales Rep. II	AU	-523	8217				
3	120123	Kimiko	Hotstone	F	26190	Sales Rep. I	AU	3193	10866				
4	120124	Lucian	Daymond	M	26480	Sales Rep. I	AU	1228	8460				
5	120125	Fong	Hofmeister	M	32040	Sales Rep. IV	AU	-391	8460				

	Output2												
Obs	Employee_ID	First_Name	Last_Name	Gender	Salary	Job_Title	Country	Birth_Date	Hire_Date				
1	120121	Irenie	Elvish	F	26600	Sales Rep. II	AU	-4169	01JAN1978				
2	120122	Christina	Ngan	F	27475	Sales Rep. II	AU	-523	01JUL1982				
3	120123	Kimiko	Hotstone	F	26190	Sales Rep. I	AU	3193	01OCT1989				
4	120124	Lucian	Daymond	M	26480	Sales Rep. I	AU	1228	01MAR1983				
5	120125	Fong	Hofmeister	M	32040	Sales Rep. IV	AU	-391	01MAR1983				

Output3									
Obs	Employee_ID	First_Name	Last_Name	Gender	Job_Title	Country	Birth_Date	Hire_Date	Bonus
1	120121	Irenie	Elvish	F	Sales Rep. II	AU	-4169	6575	\$2,660
2	120122	Christina	Ngan	F	Sales Rep. II	AU	-523	8217	\$2,748
3	120123	Kimiko	Hotstone	F	Sales Rep. I	AU	3193	10866	\$2,619
4	120124	Lucian	Daymond	M	Sales Rep. I	AU	1228	8460	\$2,648
5	120125	Fong	Hofmeister	М	Sales Rep. IV	AU	-391	8460	\$3,204

- By analyzing salary and bonus data for employees in the USA and Australia, Orion Inc. can identify opportunities to optimize compensation structures while ensuring competitiveness and fairness.
- The analysis allows HR to assess the effectiveness of current bonus policies and make adjustments to better align with company objectives and market standards.
- Insights gained from the statistical analysis of salaries can inform decisions related to salary adjustments, promotions, and recruitment strategies, ultimately contributing to employee satisfaction and organizational success.

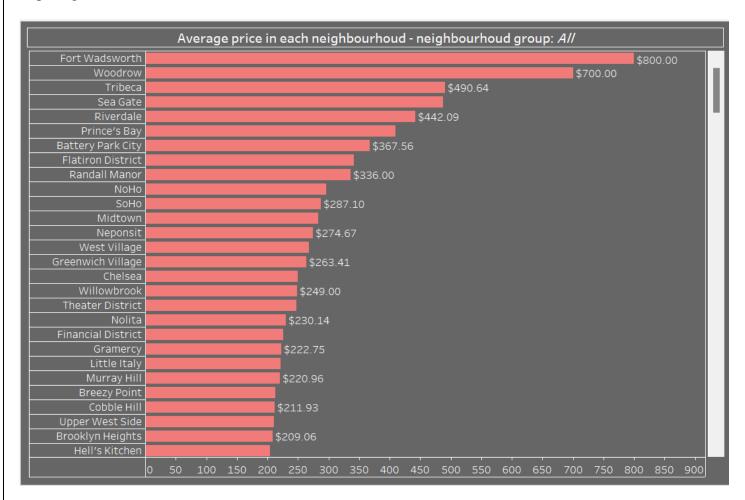
3. Dashboard Design

Scenario 1: Imagine you're a property manager for a company that rents out rooms across New York City. You need a quick way to understand the average rental prices by neighborhood. This information is crucial to set competitive rates and maximize revenue.



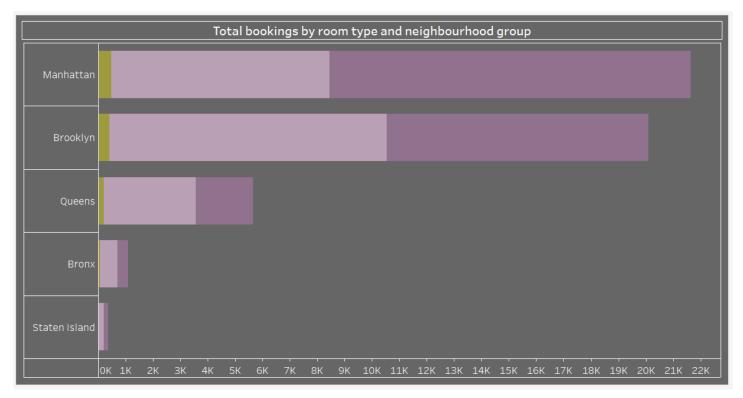
- The average price of rooms in Manhattan is more than double the average price of rooms in the Bronx. This suggests that there is a significant difference in the demand for rooms in these two neighborhoods.
- The average price of rooms in Brooklyn is higher than the average price of rooms in Queens or Staten Island. This suggests that Brooklyn may be a more popular place to live than Queens or Staten Island.

Scenario 2: Imagine you're a real estate agent tasked with selling nightclubs in New York City. You need a way to quickly visualize the average sale price of nightclubs across different neighborhoods. This information would help determine the fair market value of nightclubs you have listed and those you might be considering acquiring.



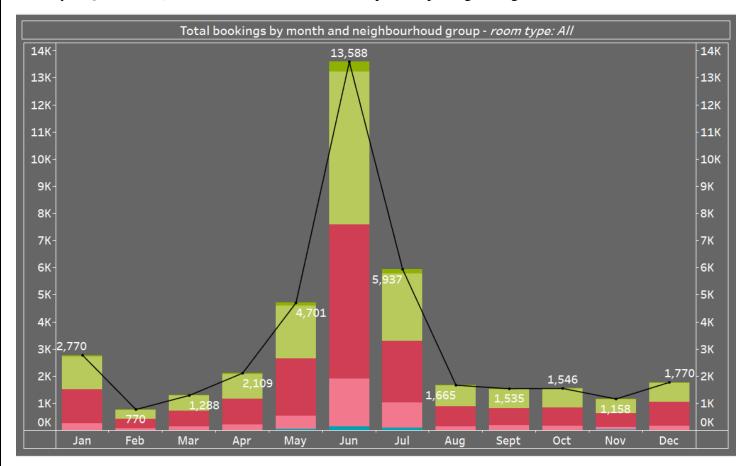
- The average price of a neighborhood group in Manhattan is higher than the average price of a neighborhood group in any other borough. This suggests that Manhattan is the most expensive borough to live in New York City.
- There is a significant variation in price between the most expensive and least expensive neighborhood groups. This suggests that there is a wide range of housing options available in New York City, to suit a variety of budgets.

Scenario 3: Imagine you're a manager for a hotel chain looking to expand into New York City. You need a way to quickly visualize the number of rooms available for booking by room type (e.g., single king, double queen) across different neighborhoods (Manhattan, Brooklyn, Queens, etc.). This information would help determine which neighborhoods have the most in-demand room types and would be the most profitable for your new hotel.



- **Manhattan** has the most bookings across all room types. This suggests that Manhattan is a popular destination for tourists and business travelers alike.
- **Studio rooms** are the most popular room type across all neighborhoods. This could be because studio rooms are typically the most affordable option, or they may be preferred by solo travelers.
- Manhattan has the most bookings for all room types except for Queens Kings. This suggests that Queens Kings may be a more budget-friendly option for travelers looking for larger rooms like double queens or family suites.

Scenario 4: Imagine you're a vacation rental manager overseeing properties across New York City. You need a way to understand how bookings fluctuate throughout the year across different neighborhoods (Manhattan, Brooklyn, Queens, etc.). This information is crucial to optimize pricing strategies and maximize revenue.



- Seasonality: Bookings are highest in the summer months (June, July, and August) and lowest in the winter months (December, January, and February). This suggests that tourism is a major driver of hotel occupancy in New York City.
- **Neighborhood trends:** There seems to be a difference in booking patterns between neighborhoods. For instance, bookings in Manhattan peak in July, whereas bookings in Brooklyn seem to peak in August. This could be due to several factors, such as the types of accommodations available in each neighborhood or the types of travelers they attract.
- **Summer surge:** Across almost all neighborhoods, there is a significant surge in bookings during the summer months. This suggests that understanding summer booking trends is crucial for hotels to optimize their pricing strategies.

Complete Dashboard:



4. Conclusion:

In conclusion, the project on "Business Information Visualization and Analysis" has provided valuable insights into the application of analytical tools such as SAS Studio Data Builder and Tableau Data Visualization in addressing real-world business scenarios. Throughout the project, we have explored the capabilities of these tools in analyzing diverse datasets, uncovering trends, and deriving actionable insights to drive informed decision-making.

The project commenced with an introduction to SAS Studio Data Builder, highlighting its significance in today's data-driven landscape and its application in a hypothetical business scenario involving workforce management strategies at a multinational corporation. Through the lens of SAS Studio, we explored how HR departments can leverage data analytics to gain insights into employee demographics, compensation structures, and geographic distributions, thereby supporting organizational objectives and global expansion initiatives.

Subsequently, the introduction to Tableau Data Visualization elucidated the platform's role in transforming raw data into compelling visualizations, with a focus on analyzing Airbnb listings in various cities. We delved into the potential of Tableau in optimizing rental strategies, improving rental performance, and enhancing the guest experience within the dynamic hospitality industry.

The project further progressed to data preparation, where four distinct business scenarios were outlined, each addressing critical challenges faced by organizations across different sectors. These scenarios encompassed a

range of analytical objectives, from optimizing workforce management strategies and analyzing sales performance to refining compensation structures and understanding market dynamics in the hospitality sector.

The dashboard design phase translated these business scenarios into actionable visualizations, offering stakeholders intuitive tools to explore data, identify trends, and make data-driven decisions. By showcasing real-world applications of analytical tools, the project provided a comprehensive understanding of how organizations can leverage data visualization to drive business success across various domains.

In conclusion, the project underscores the importance of business information visualization and analysis in today's competitive landscape, offering a roadmap for organizations to harness the power of data-driven insights for informed decision-making and strategic planning. Moving forward, the insights gleaned from this project can serve as a foundation for future initiatives aimed at maximizing operational efficiency, optimizing resource allocation, and driving sustainable growth in an increasingly data-centric world.

5. References:

- 1. https://drive.google.com/file/d/18Yp_e69YroP43Qa7HutLzQXi64XOnnIo/view?usp=drive_link
- 2. https://drive.google.com/file/d/11S7WPEff2UnymsfXuR9h1cc4TBbk8j2b/view?usp=sharing