The Case of BIRT Sample:

Which Aspects Could be Changed to Improve Classic Model Inc.?

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Introduction

According to Staniewski, the indicators of the company to improve in their industry are "(1) maintenance of liquidity, (2) level of competitiveness, (3) evaluation of chances for future business development, and (4) evaluation of the company's innovativeness." (Staniewski, 2016). To measure these, it is critical for the company to analyze their current situation such as their customer, their product, and their avenue (Hingley, 2015). Through this essay, to give insight to a company in how to improve their own business, the current status of the company would be discussed by the data visualization. Data visualization is one of the powerful tools not only to understand the present circumstance of the business by sharpening the message but also to resonate the audience with the issue and problem which can increase the chance of business issue solving (Knaflic, 2016). In the essay, the main question discussed is

"Which aspects could be changed to improve Classic Model Inc.?".

Starting with the short introduction of the company's dataset, each of the important cases which were defined using a Balanced Scorecard with KPIs would be elaborately illustrated with data visualization.

Case Description

The dataset of the BIRT Project was developed from Classic Model Inc. which is the company that buys and sells various types of model automobiles, trains, and ships. The company buys the products from the manufacturers and sells the products to merchandisers. This dataset contains 8 tables which are Offices Table, Employees Table, Customers Table, Orders Table, Order Details Table, Products Table, Payment Table, and Product Lines Tables. The Office Table shows the 7 global office's details such as the address and office code of the Classic Model Inc. The Employees Table demonstrates the name of the employee, their job title, office code, and employee number. The customers' information such as name, customer number, their phone number and address, and credit limit are deployed in Customers Table. In the Orders Table, the order date, order number, required date, shipped date, the shipment status, the customer who ordered and the detailed comments of the customer are shown. Order Details Table detailed explains the orders with the order number, product code, quantity ordered price each, and order line number. This product code is explained in the Products Table with product name, product line, scale, the product description, quality in stock, buy price, and MSRP. The customer number which appears in the Customer Table is also demonstrated in

the Payment Table and in this table, the payments detailed are well explained. The last table is the Product Line Table which describes the product line such as Classic Cars, Motorcycles, and Planes.

Balanced Scorecards and KPIs

Brown talked about the importance of choosing the key measurement by saying "... it is worse to measure too many things than it is to not measure anything at all" (Brown, 1998). Therefore, in this essay to specify the measurement, the Balance Scorecards and key performance indicators (KPIs) were used.

The balanced scorecard is one of the strategic management performance metrics to improve internal company function which could result in the external outcome (Tarver, 2020). It helps to measure the problem of the firm and provide feedback to the firm. There are four main perspectives in the balanced scorecard model which are Financial, Customer, Process, and Learn and Growth. With the Financial perspective, it is clear to define the company's financial performance and where to make investments (Kaplan & Norton, 1996). It can give the company an overview of how the company features to the shareholders. The Customer perspective can answer the question "How do our customers see us?" by viewing the company from the customers' viewpoint (Intrafocus, 2020). In this part, the company could know the needs of customers. In the Business perspective, the new and creative ideas on business could be developed by checking the best performance or biggest cost items (Kaplan & Norton, 1996). To improve and create values, the Learn and Growth part generates the business idea by checking infrastructure or technology (Intrafocus, 2020).

KPIs demonstrates the measurable value that shows the company's performance and goals (Karlson, 2019). KPIs are effective in understanding the organizational objects, planning on achieving the objects, and finding the actors who can operate with the issue (Shahin & Mahbod 2007). This process could connect the feedback from analysts to department managers and heads so that it helps the problem solving productively (Shahin & Mahbod, 2007). The specific business outcome with measurement of performance would be related to every KPI.

In investing in the BRIT dataset, the balanced scorecard measurement was used to identify the issues and the KPIs was included to demonstrate the detailed statistical information.

Explanation of KPIs

Financial Perspective

We decided to mainly focus on sales trends and product margin rates as indicators that can confirm the financial perspective from the balanced scorecard. The KPI from a financial point of view can be said to be the most important indicator of corporate performance. Ultimately, the success of the other three perspectives is aimed at enhancing the financial performance. We first looked at trends in overall sales across all regions. Time-series analysis of sales revenue is an indicator that a company must pay attention to because it is possible for a company to conceive a marketing strategy for each point if a seasonality has been seen. Additionally, as these trends may vary by region and product category, we decided to include them in our analysis as well.

Secondly, it is important to monitor if a company is setting an appropriate level of MSRP and margin rate. Therefore, we propose a Classic Model Inc. which mainly focuses on a retail industry to discover these indicators by products and product lines for a financial perspective. By analyzing sales prices and margit rates, it is expected that companies will be able to compare them with the industry average, while adjusting margin rates for products with low sales performance, leading to an increase in its sales.

Customers Perspective

We have made two KPI to check the satisfaction level of customers. Our first KPI is the number of orders by customers. As we considered that customers would like to order more frequently when they are satisfied with our product and services, the frequency of orders has been chosen. If the number of orders is rising, it means that the consumer is satisfied and vice versa, it can be assumed that the consumer is dissatisfied.

Our second KPI is the total number of customers by country. It is possible that only the number of orders might increase or decrease while the number of customers does not change. Therefore it is necessary to check the number of customers as well. If existing customers are satisfied, they are more likely to introduce others and increase the number of customers. As with the order number KPI, if the number of consumers rises, consumer satisfaction rises, and vice versa, consumer satisfaction falls.

The Consumer Satisfaction Index is an abstract concept and it is difficult to measure exactly how much has changed. However, these KPI provide an overview of the changes in the consumer satisfaction index. So if KPI in measured locations goes up, it is used to determine that the branch is doing well and that further improvement is needed if it goes down.

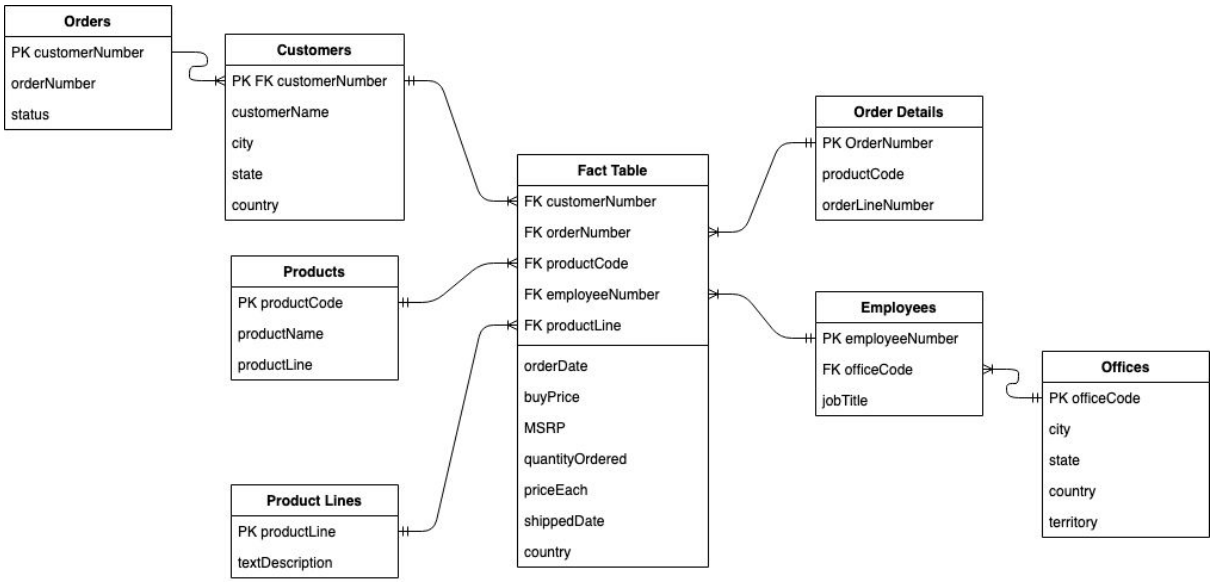
Process Perspective

From an internal business process point of view, this refers to the reliability or rapidity that appear in the business process consistent with the company's strategy. Therefore, we suggest measuring the order processing time, which can focus on checking the integrated work process at the level of the organization as a whole. This indicator is associated with customer satisfaction, and by implementing it, it is expected that it will be possible to check whether inventory supplement and business processes are being performed on time within the company. This KPI can be calculated by finding the difference between the date of a customer placing an order and the shipment date.

Learn and Growth Perspective

In the Growth and Information part, Number of orders handled by an employee per office was used as KPIs. It was calculated by dividing the (Number of Orders / Total Working Days Observed) by Number of Employees (per office). One of the factors that affects the productivity and efficiency of the employee is the number of tasks (Yu, 2018). Also the high stress work system would decrease the job satisfaction and efficiency (Arando, Gago, Jones & Kato 2015). Therefore, if this Number of orders handled by an employee per office could refer to employees' productivity. Also this KPI would give ideas to companies how they can develop the growth in their current employees.

Data Warehouse Design



Notice: Screenshots of the data inserted in the fact table and other dimension tables are attached in the appendix.

Our data warehouse design consists of seven dimension tables and one fact table. The names of the seven dimension tables are product lines, products, order details, deployees, offices, customers,

and orders. Each Dimension table contains only the data needed to describe the objects in each table. These data are used to describe and remain unchanged.

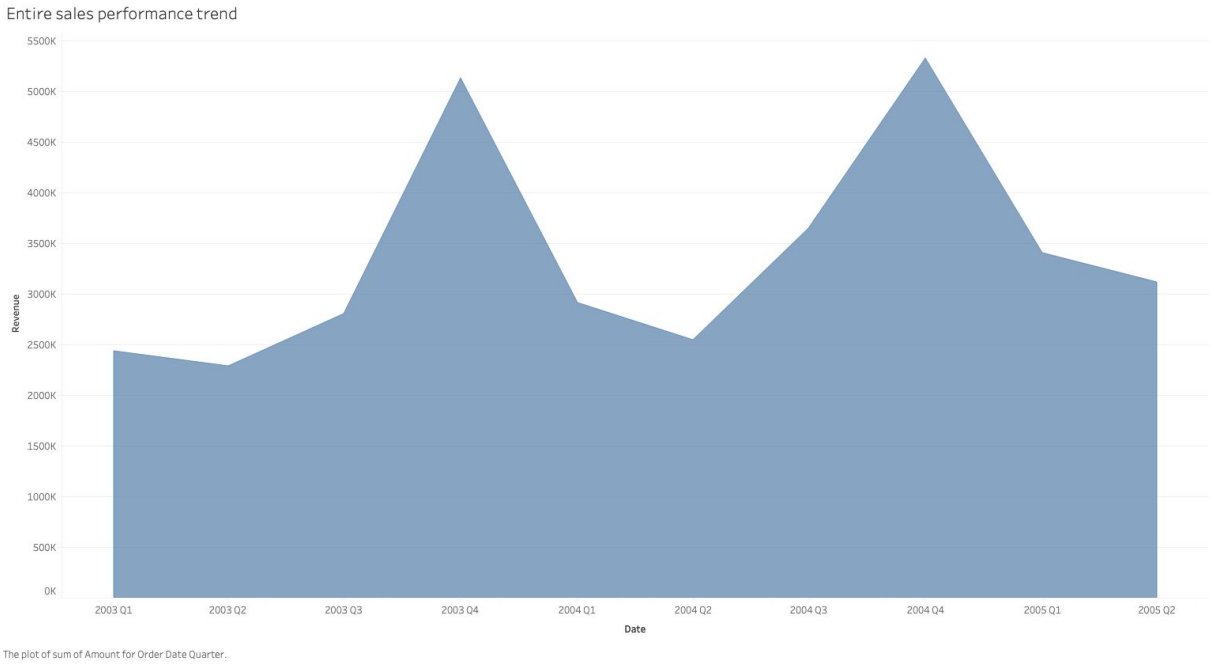
The fact table contains the foreign keys and the variables that represent the changes in the phenomenon that each dimension table needs to connect. The variables we've chosen are MSRP, BooPrice, PriceEach, Number of orders, orderDate, and ShippedDate.

This warehouse design takes the form of a snowflake because some dimension tables are deeply related. First of all, the office and the staff table are connected, and the reason is that the employees work in the office, so we decided that there is a big correlation. Secondly, there is a connection between the consumer and the order table, and the reason for this is that the customer is very involved in the order, so we connected it.

Data Analysis

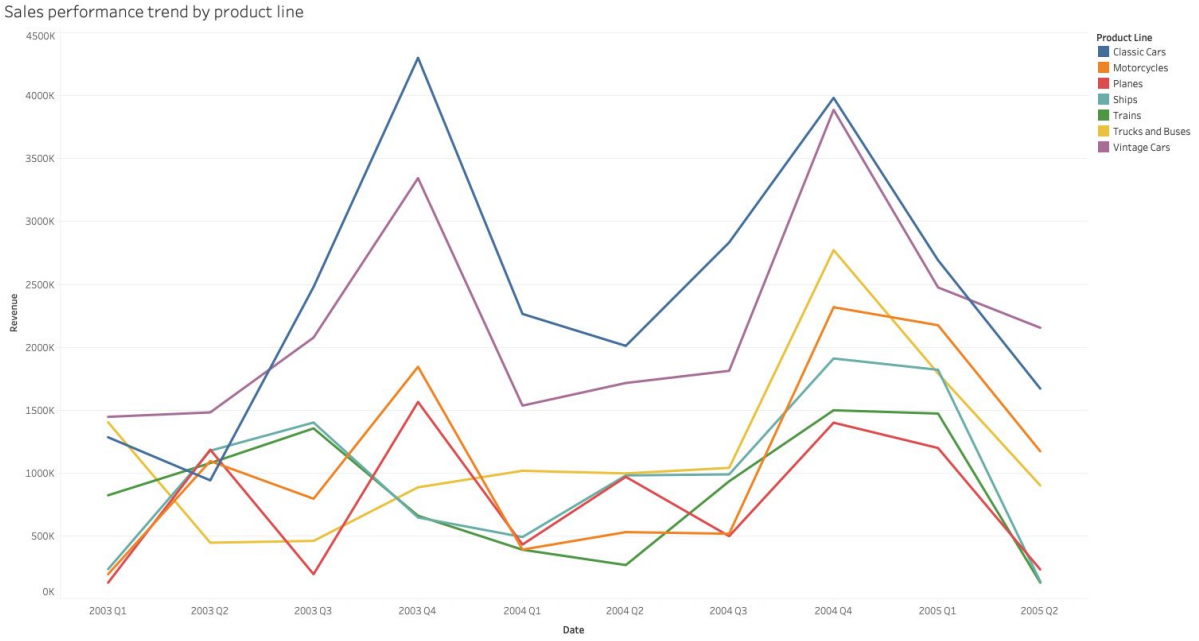
Financial Perspective

Sales Revenue Trends

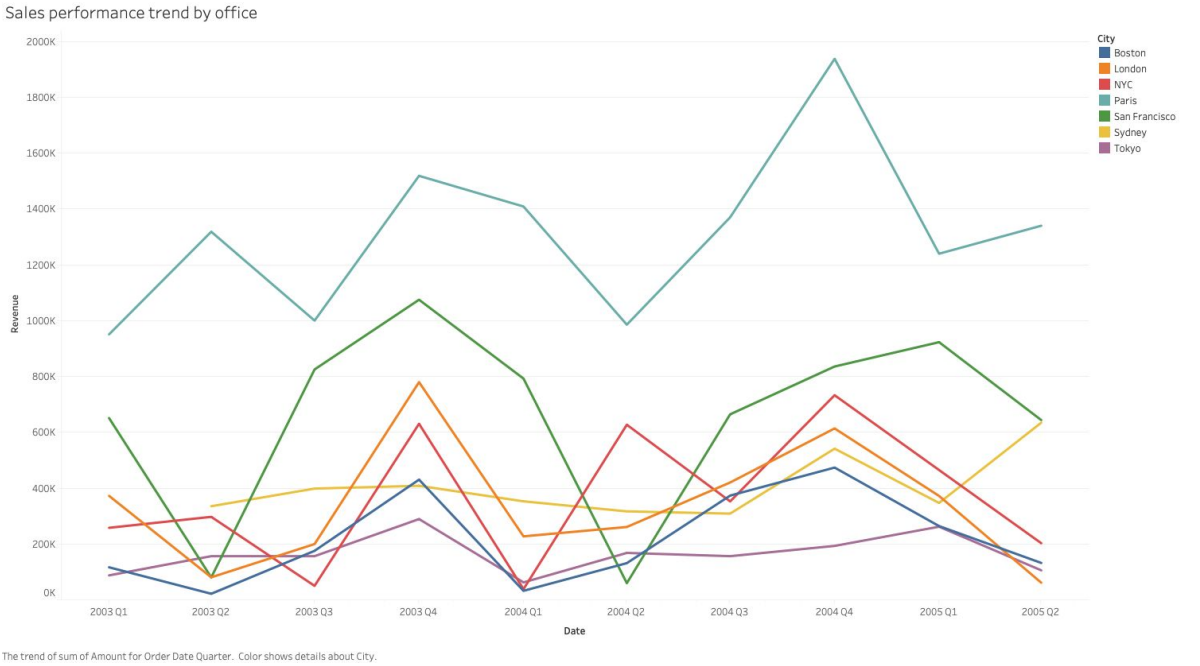


First, we looked at the trend of sales change over time. The graph over two years showed seasonality. In both 2003 and 2004, sales decreased at the beginning of the year and increased as the third and fourth quarters reached. In the first half of the years, especially in the second quarter, sales

were $2.2 million and $2.5 million, respectively. In the second half of the year, sales were up to more than $5 million, which was about twice of the first half.

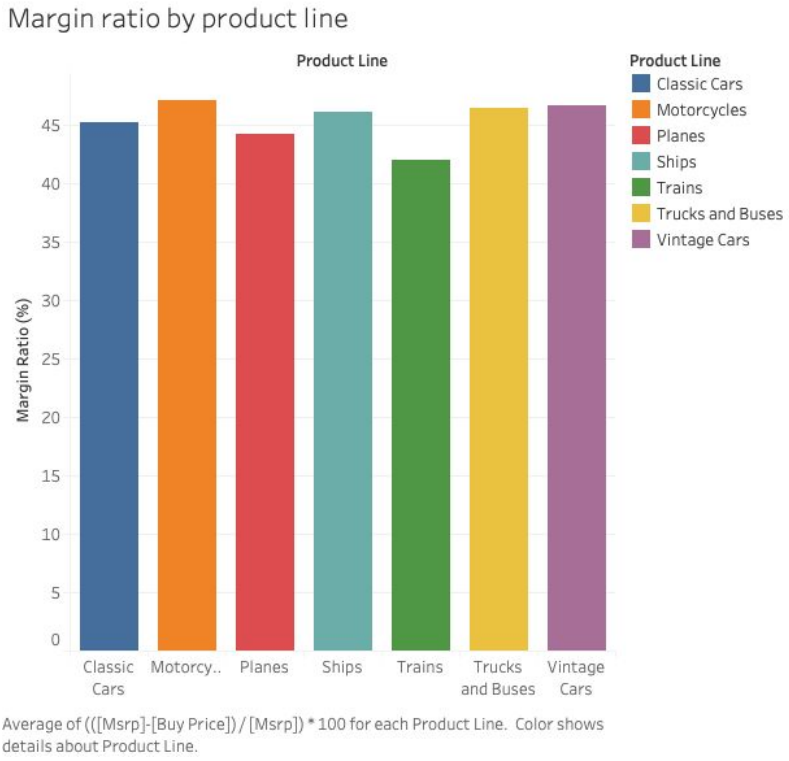


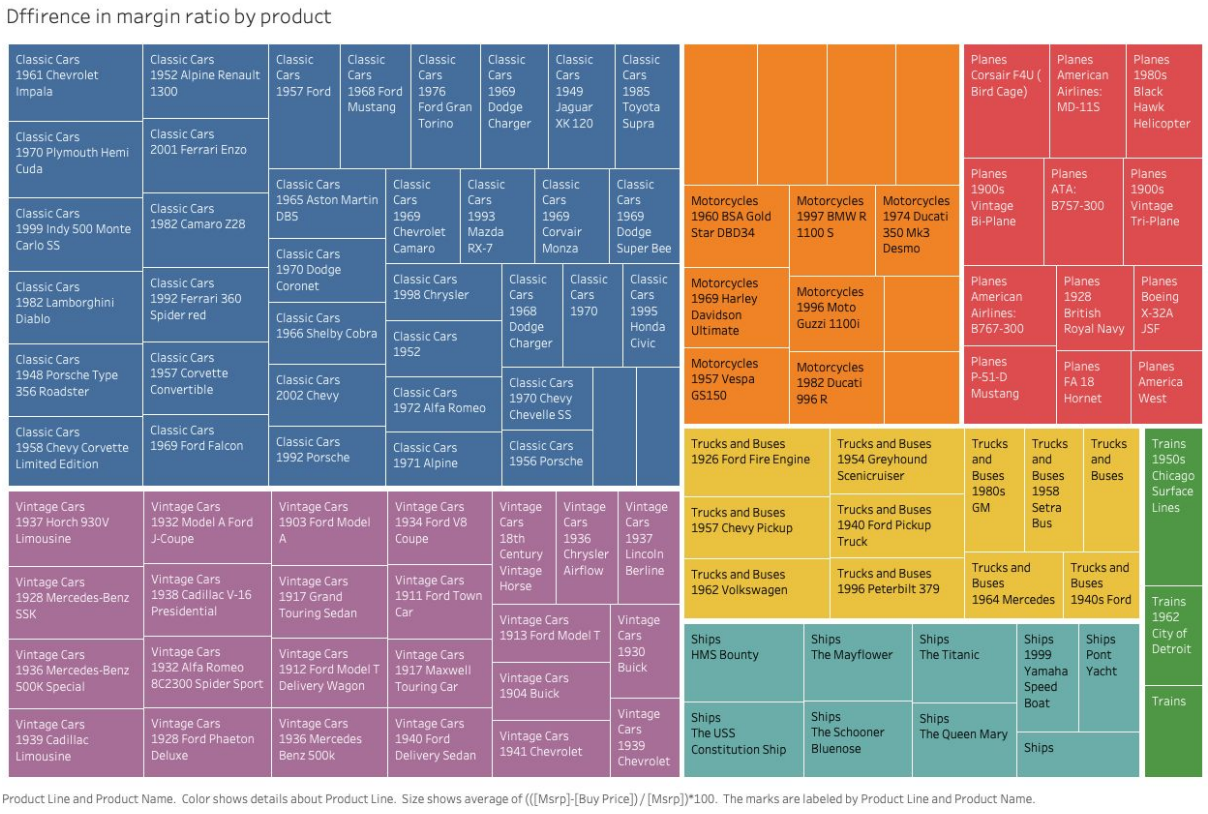
To discover further, we analyzed the sales revenue KPI by product group. Although there is a difference in the ranking of sales revenue by product group, seasonality was generally similar. Unlike other product lines, sales revenue of airplanes and motorcycles showed a steep downturn in the third quarter.



As an ultimate indicator of a company, analyzing the sales performance trend by branch can be considered as a performance indicator of each branch. Sales from the Paris office were found to be the most prominent in all quarters. In addition, the fluctuation of sales in San Francisco was the largest. As shown in the graph above, when the sales trend was analyzed by office dimension, difference has occurred from when the seasonality was checked on a company-wide basis.

Margin Ratio

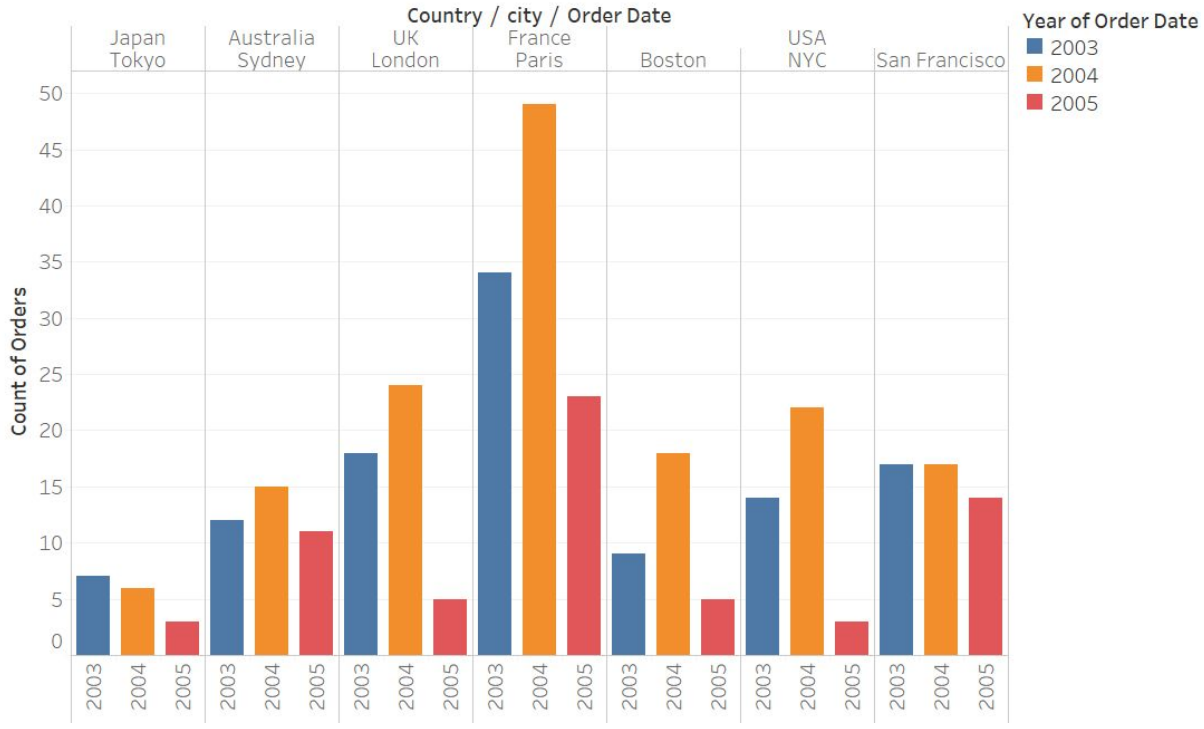




In the first graph, the average margin for each product line was calculated and visualized as a bar plot. On average, each product group showed similar margin rates, around 40-45 percent. However, there was a difference in margin ratio for each product in the same product category. The treemap below shows the margin rates of all products that Classic Model Inc. handles. Each small box represents a product, and product lines are color coded. The box size and margin ratio are proportional. The margins of each product ranged from a minimum of 30% to a maximum of 60%.

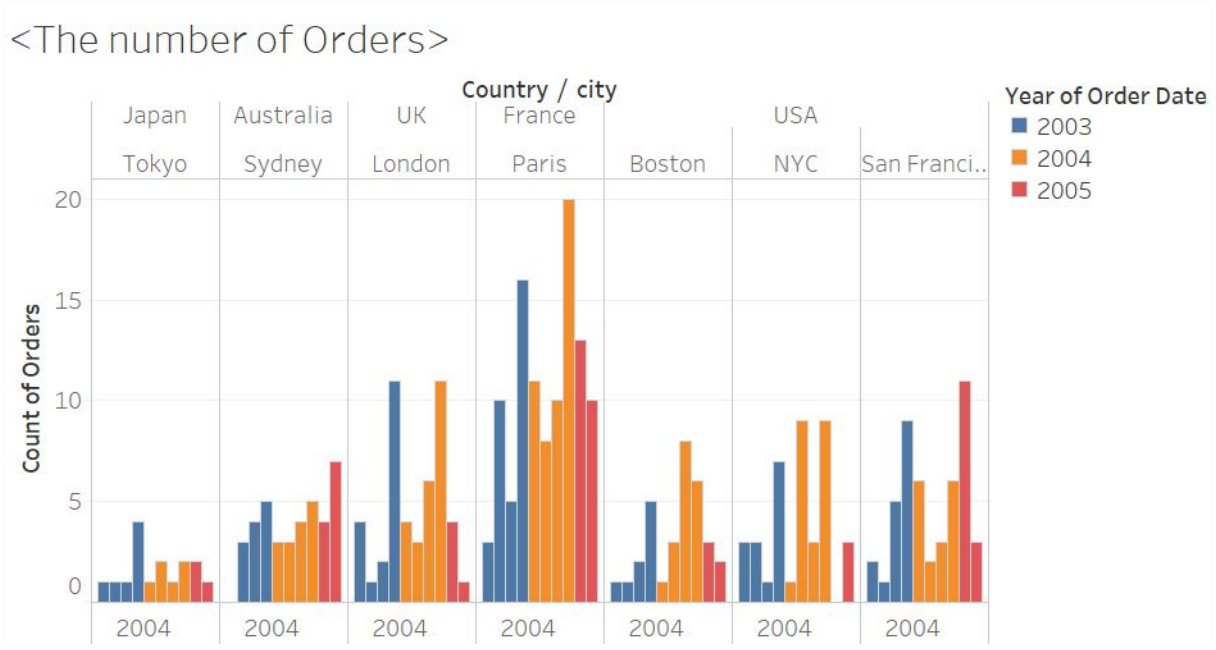
Customers Perspective

<The number of orders>

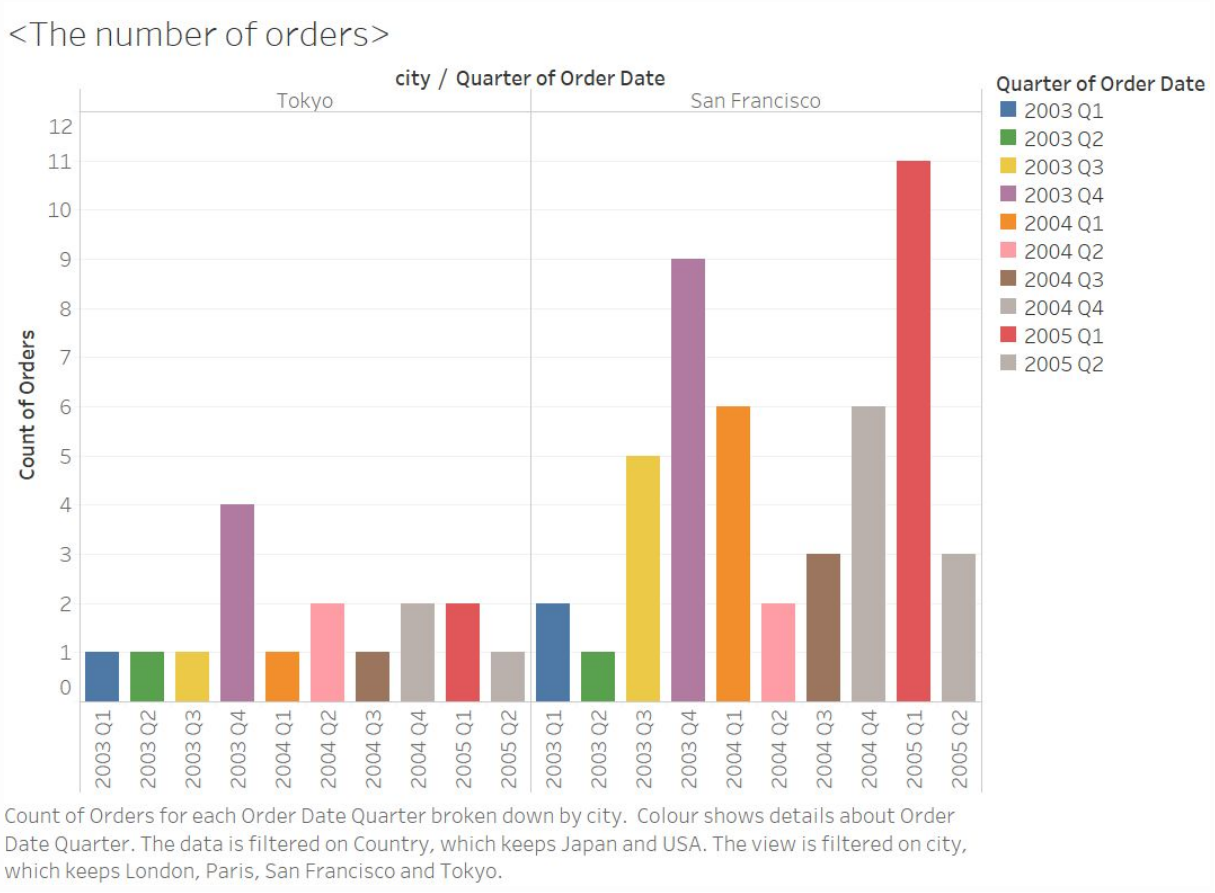


To check the consumer satisfaction index, we have visualized the number of annual orders by branch. Here the year 2005 is only up to the second quarter, and the change between 2004 and 2005 is to see how much order volume accounts for compared to the previous year. If 2005's orders are similar to 2004, it can be inferred that 2005's consumer satisfaction has been very good so far. But if the index goes down because 2005 is not over yet, judgment will be withheld.

From the graph above, it can be seen that the order number has mostly risen except at the Tokyo and SanFrancisco branches. Between 2003 and 2004, the number of orders placed in San Francisco remained the same. And the Tokyo branch shows a drop in the number of orders. In this regard, the company can judge that the San Francisco and Tokyo branches are not improving or making things worse in terms of consumer satisfaction. Further investigations were conducted to determine whether this was certain.



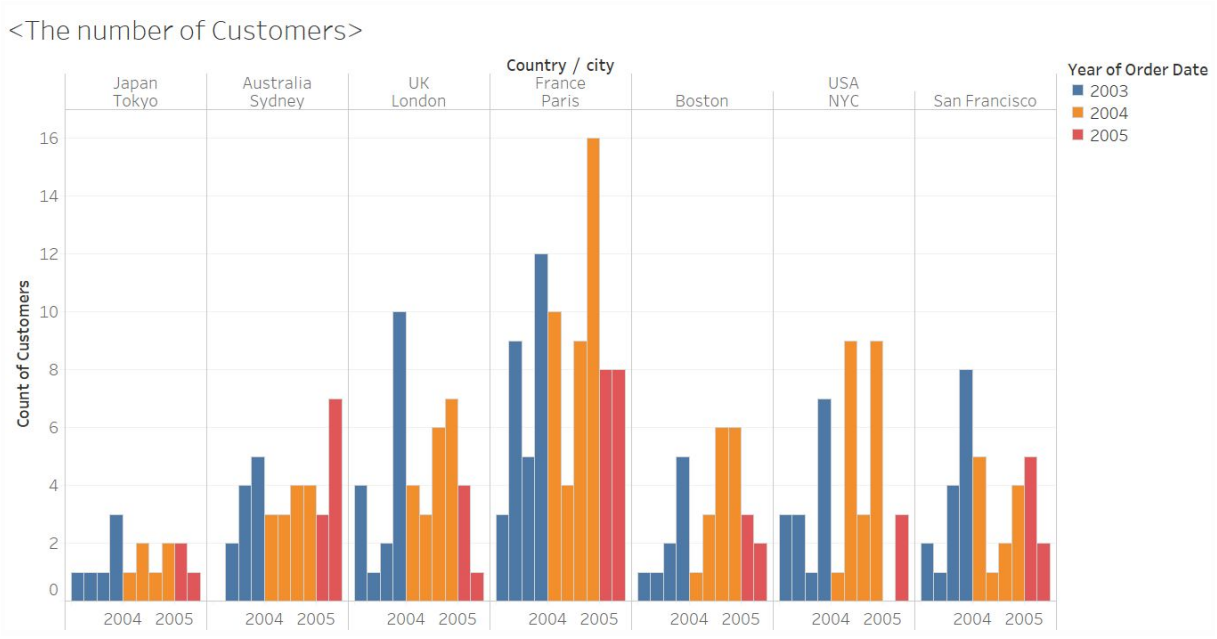
This graph is to show the seasonal changes of orders



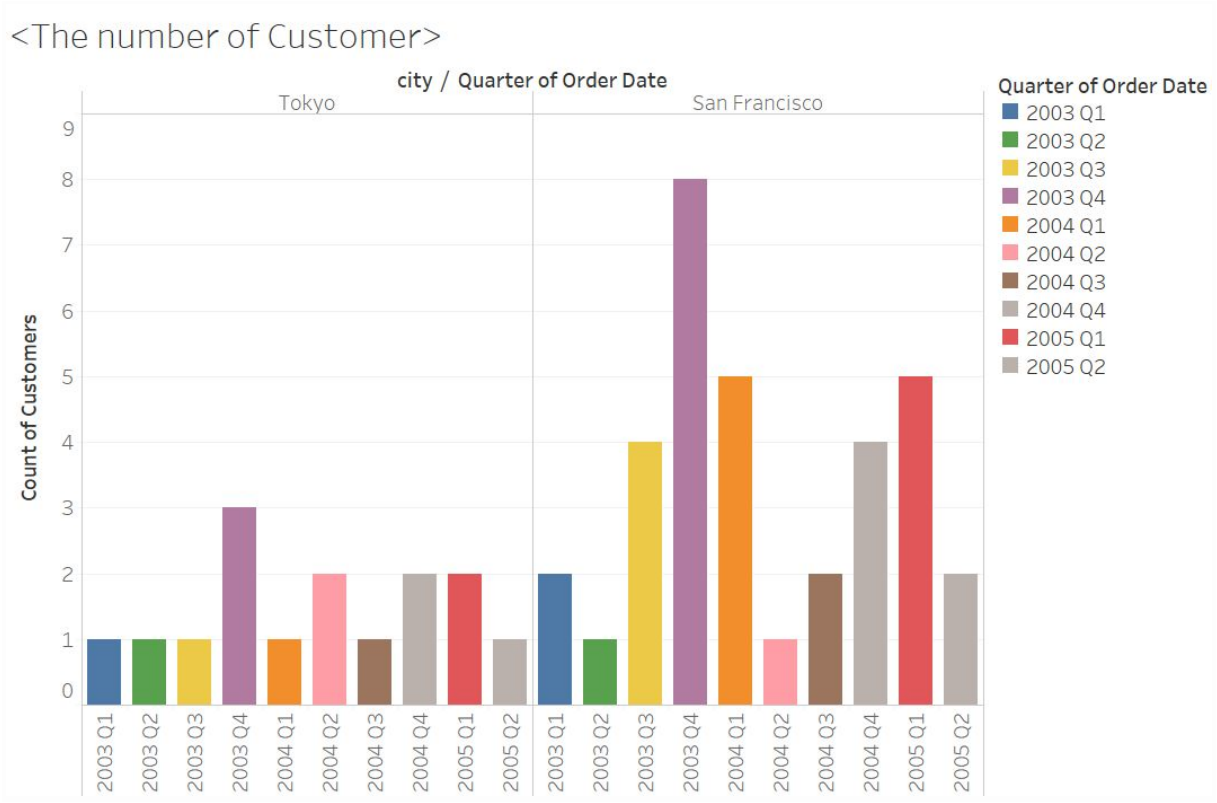
For a more solid investigation, we have visualized the change in the number of orders per quarter. First of all, one characteristic that is shown is seasonal changes in order quantity. This can be

found in all branches that the quantity of orders diminish after the 4th quarter. Taking these seasonal changes into account, we can see that only the Japanese branch has a problem with consumer satisfaction. In 2004, the number of orders placed in the third quarter and the fourth quarter should be higher than the second quarter in general, but we can see that they are smaller. Now, if we look at the San Francisco branch, the San Francisco branch saw a very large increase in orders in 2005 Q1, although its performance was not so good in 2004, so we can see that the branch is not much of a problem.

We also visualized the change in the number of consumers because identifying the consumer satisfaction index simply by the quantity of orders may not bring accurate interpretation. Similar to earlier results, all other branches showed positive changes in consumer numbers. But the San Francisco and Tokyo branches showed negative consumer numbers. For a more detailed survey, we visualized changes in the number of consumers in each of the San Francisco and Tokyo branches.



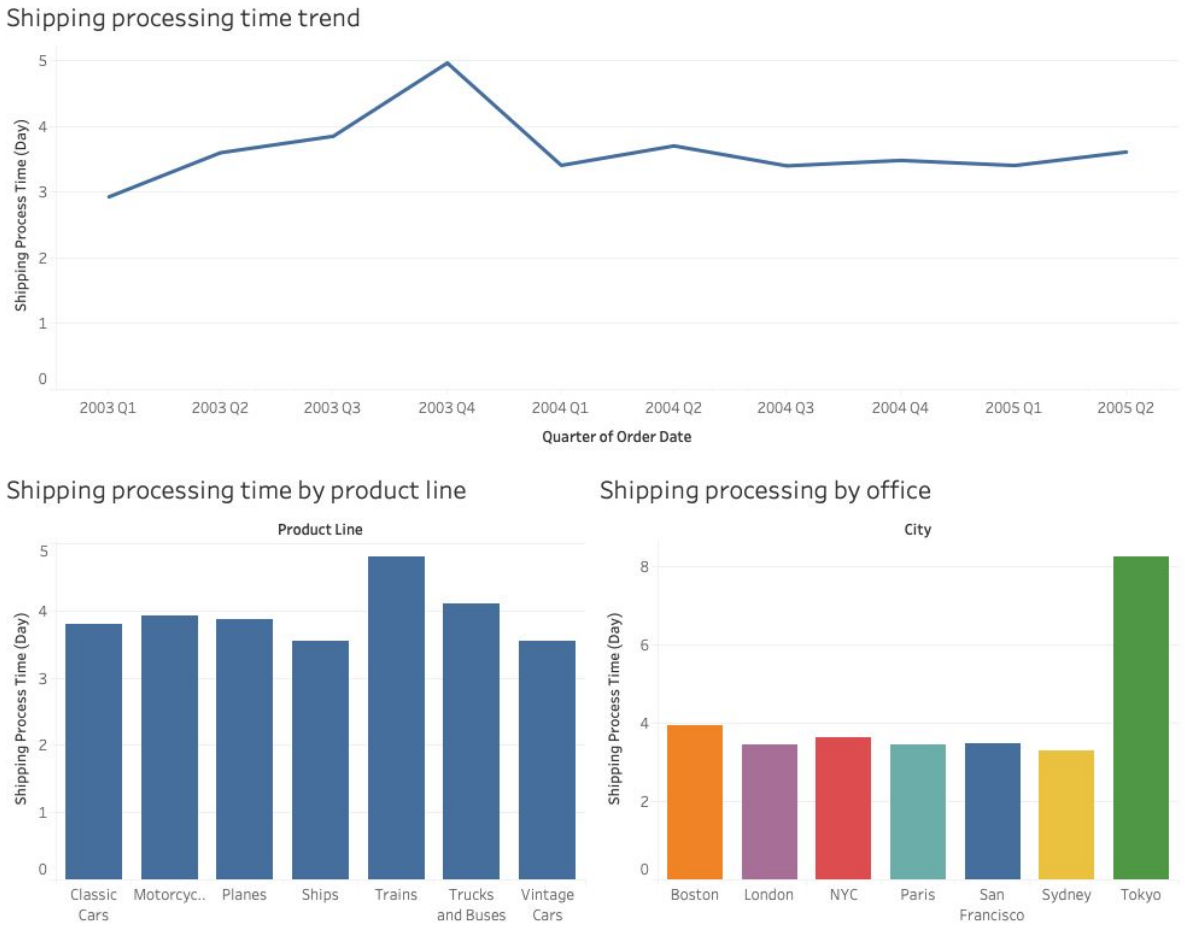
This graph is to show seasonal changes of customers



The visualized graph above shows that although the annual drop in the number of consumers is the same as the San Francisco and Tokyo branches, there is a big difference in growth rates. First of all, San Francisco shows improvement from the second quarter of 2004, although the number of consumers in 2004 has decreased compared to the second quarter of 2004. However, in Tokyo, the number of consumers is almost stagnant, and the seasonal changes in the number of consumers are

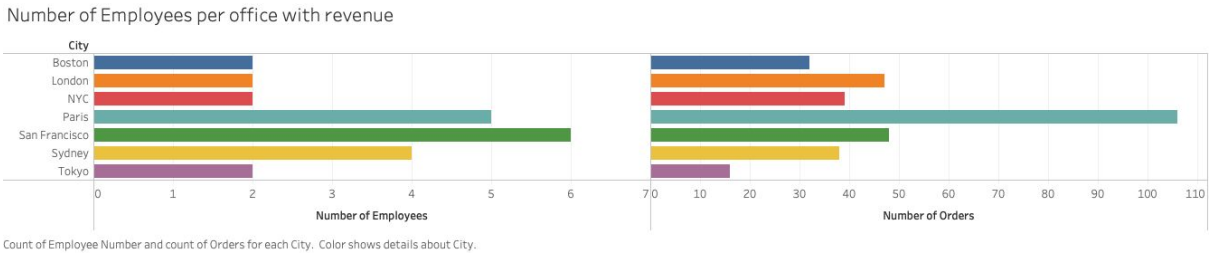
very small. Through this, we can confirm that the consumer satisfaction level in Tokyo shows a red light once again.

Process Perspective

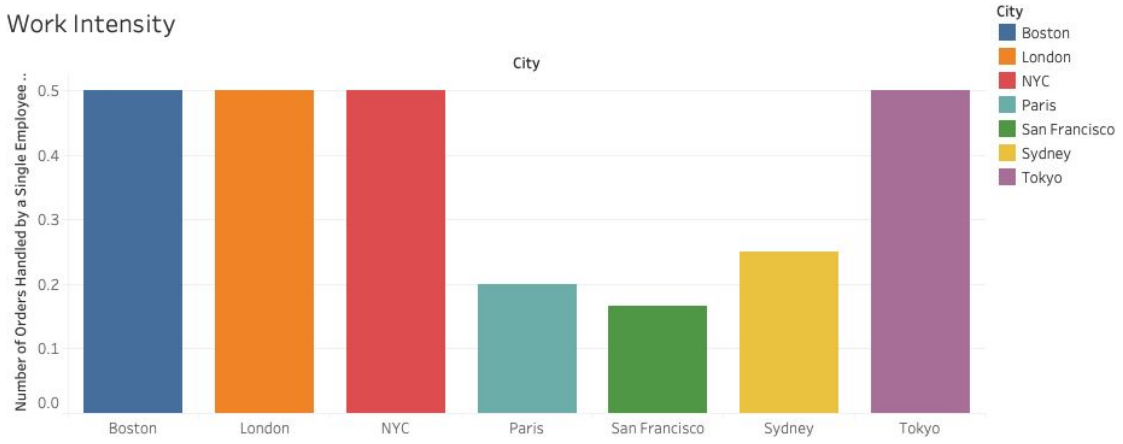


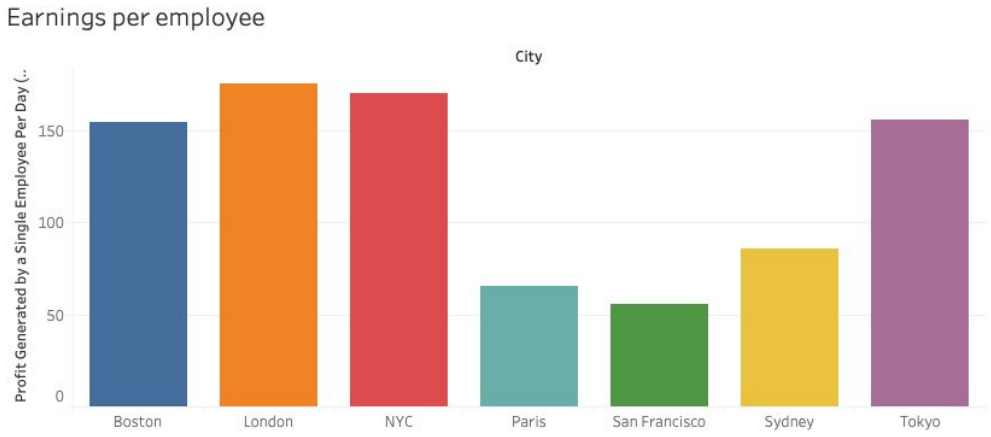
Overall, the order processing period from the time of order to shipment remained similar for 2 years, ranging from 3 to 5 days. Also, by the product line dimension, it was found that order processing time of all product lines remained similar in general. Only the delivery time of the train category required a day longer than other product lines. While comparing the processing time by offices, it was found to be particularly slow at the Tokyo branch. In the other six offices, processing order took an average of four days, while in Tokyo, it took eight days to ship which is twice as slow.

Learn & Growth Perspective



We first started a comparative analysis by visualizing the number of employees working and the number of orders per office side by side to see if the employment status was well controlled in proportion to the order volume.





The intensity of work was calculated based on how many orders were processed by an employee per day on average by dividing the number of orders per office by the total number of employees. In Paris, San Francisco and Sydney, the work intensity was lower than in the other four regions. Additionally, the revenue earned by one employee also showed a similar pattern to the work intensity. Based on the data, we proposed to reconsider the level of employment for branches with lower-work intensity. In particular, if the San Francisco office, which has a significantly larger

number of employees than the number of orders, does not have most of its employees dealing with non-order-related tasks, employment adjustment may be necessary.

Conclusion

Through this essay, the factors that could be improved in Class Model Inc. which buys and sells the model cars was discussed with the BIRT dataset. This dataset contains 8 tables that show the company's detailed customer data, order data and office data from 2003 to 2005. To find out the important aspect to improve, the balanced scorecard and key performance indicators (KPIs) were used to analyze data. Dividing the important aspects into 4 parts which were Financial, Customer, Process and Learn and Growth and using KPIs as measurement, it became more clear to know the company performance between 2003 and 2005. Also, it became apparent what the company's problem was and which aspects to focus on.

Based on our visual analysis, we recommend Classic Models Inc. to monitor the above KPIs periodically to refer them on operation. From what has been observed so far, it seems that the company has to develop different marketing strategies for the time according to its sales revenue trend. Through our treemap analysis, it was found that the company is maintaining properly the average margin rate for each product group, but adjusts the margin rate between each individual product to a similar distribution. From this, the company must be able to flexibly adjust the margin rate through analysis with sales trends by product. From the customer perspective, the number of orders and the number of customers are selected as KPI. With visualized graphs of these two KPI, the general direction of customer satisfaction level is checked. Among seven branches, only the Tokyo branch showed a general decrease in KPI. This downfall implies that customers are not satisfied with this branch. Additional action is necessary to improve the customer satisfaction level. Regarding the order processing time which represents the process perspective, it seems necessary to investigate the process of the Tokyo office, where the processing time was significantly longer from other regions. Also, in the case of offices with unnecessarily low work intensity, adjustment on employee management is required.

Reference

ARANDO, G, GAGO M., JONES D & KATO T. (2015). EFFICIENCY IN EMPLOYEE-OWNED ENTERPRISES: AN ECONOMETRIC CASE STUDY OF MONDRAGON. Industrial & Labor Relations Review, 68(2), 398–425. https://doi.org/10.1177/0019793914564966

Brown, M.G., (1998). Keeping score: using the right metrics to drive world-class performance. Quality Resources (distributed by AMACOM Books), New York, USA.

Hingley, A. (2015). The current situation and future conceptualization of power in industrial markets. Industrial Marketing Management, 48, 226–230. https://doi.org/10.1016/j.indmarman.2015.03.022

Intrafocus (2020, September 23)Balanced Scorecard - What is the Balanced Scorecard?. Retrieved December 10, 2020, from https://www.intrafocus.com/balanced-scorecard/

Kaplan, R. S., & Norton, D. P. (1996). The balanced scorecard : translating strategy into action . Boston, MA: Harvard Business School Press.

Karlson, K. (2019, November 14). 12 Business Metrics That Every Company Should Know. Retrieved December 07, 2020, from https://www.scoro.com/blog/12-business-metrics/

Knaflic, C. N. (2016). Storytelling with data : a data visualization guide for business professionals . Hoboken, New Jersey: Wiley.

Shahin, M.& Mahbod M.A. (2007). Prioritization of key performance indicators: An integration of analytical hierarchy process and goal setting. International Journal of Productivity and Performance Management, 56(3), 226–240. https://doi.org/10.1108/17410400710731437

Staniewski, J. (2016). Entrepreneurial personality dispositions and selected indicators of company functioning. Journal of Business Research, 69(5), 1939–1943. https://doi.org/10.1016/j.jbusres.2015.10.084

Tarver, E. (2020, August 29). How a Balanced Scorecard Is Used. Retrieved December 08, 2020, from https://www.investopedia.com/terms/b/balancedscorecard.asp

Yu, G. (2018). Achieving employee efficiency–flexibility ambidexterity. International Journal of Human Resource Management, 31(19), 1–36. https://doi.org/10.1080/09585192.2018.1449762

Appendix

Figure 1: A screenshot of data inserted in the fact table

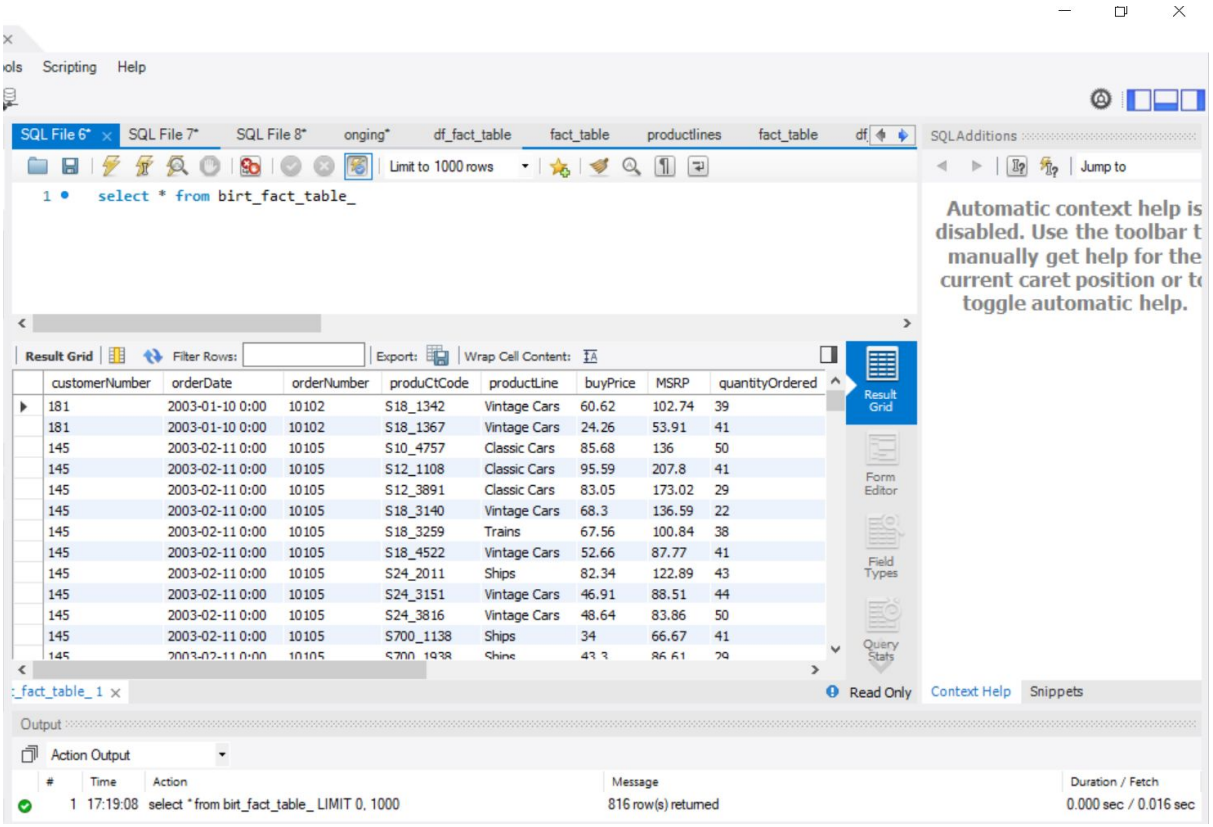


Figure 2: A screenshot of data inserted in the dimension table (Customers)

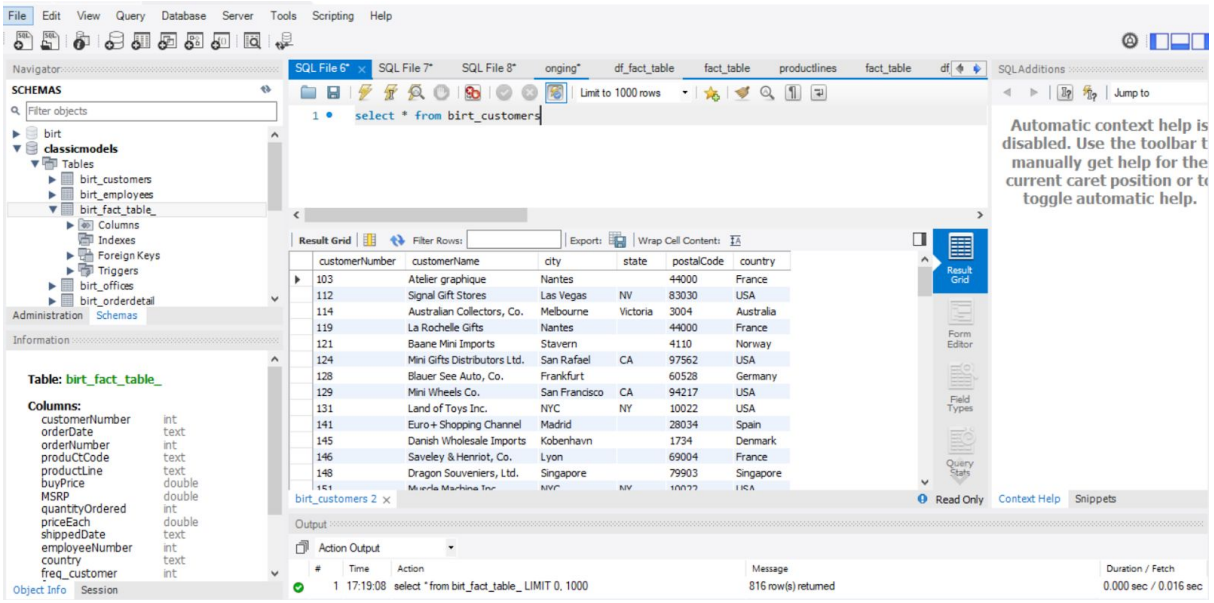


Figure 3: A screenshot of data inserted in the dimension table (Products)

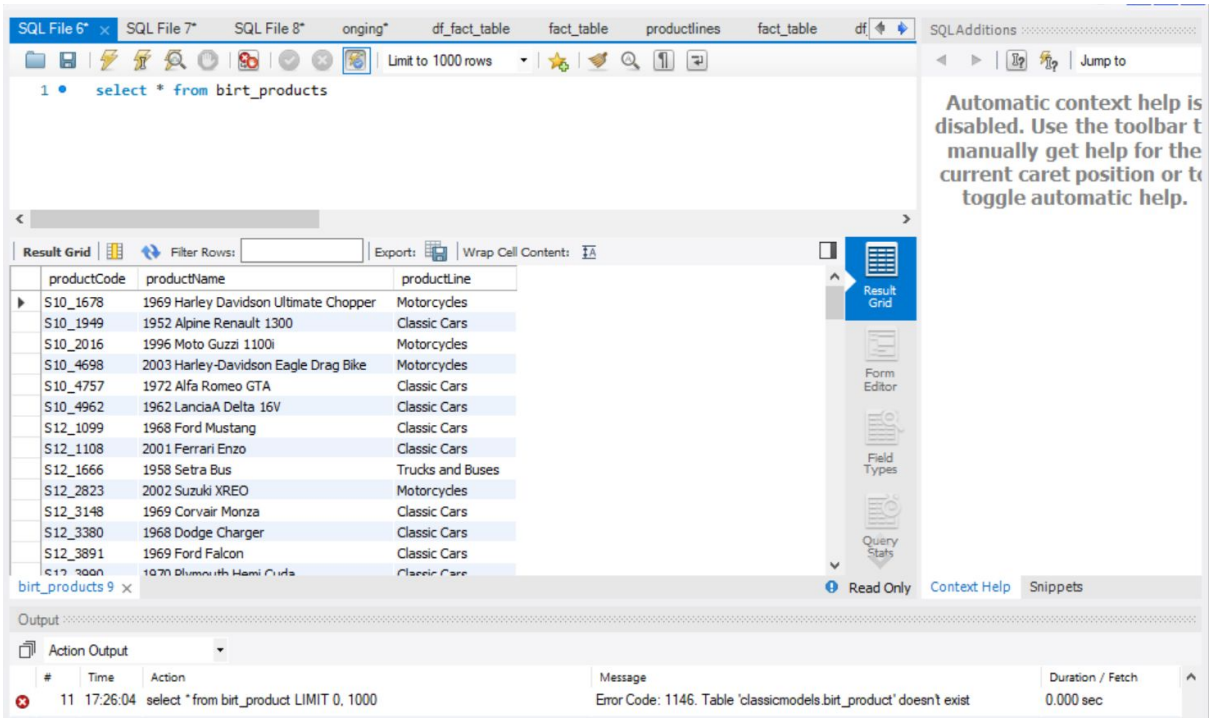


Figure 4: A screenshot of data inserted in the dimension table (Product Lines)

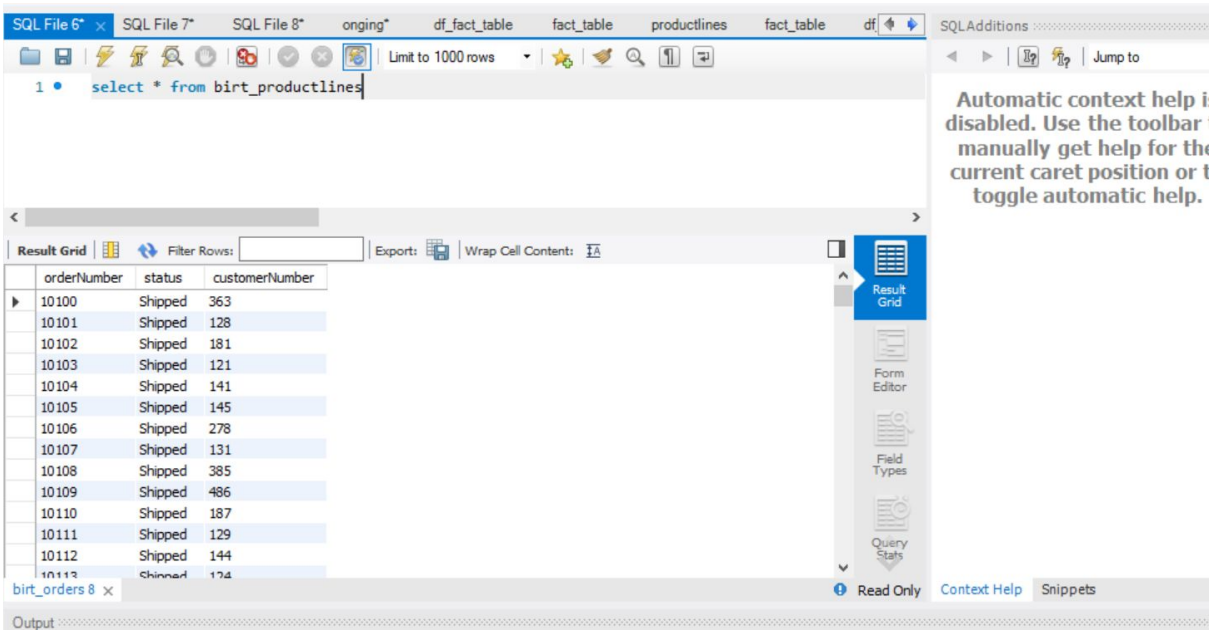


Figure 5: A screenshot of data inserted in the dimension table (Orders)

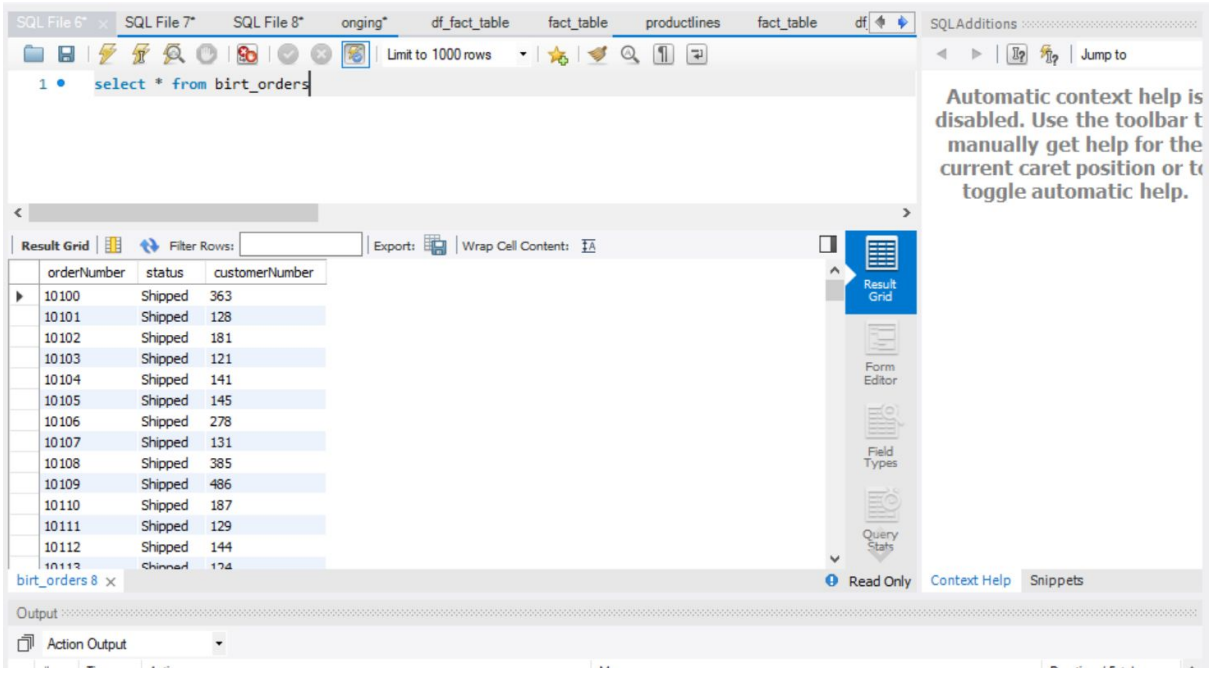


Figure 6: A screenshot of data inserted in the dimension table (Order Details)

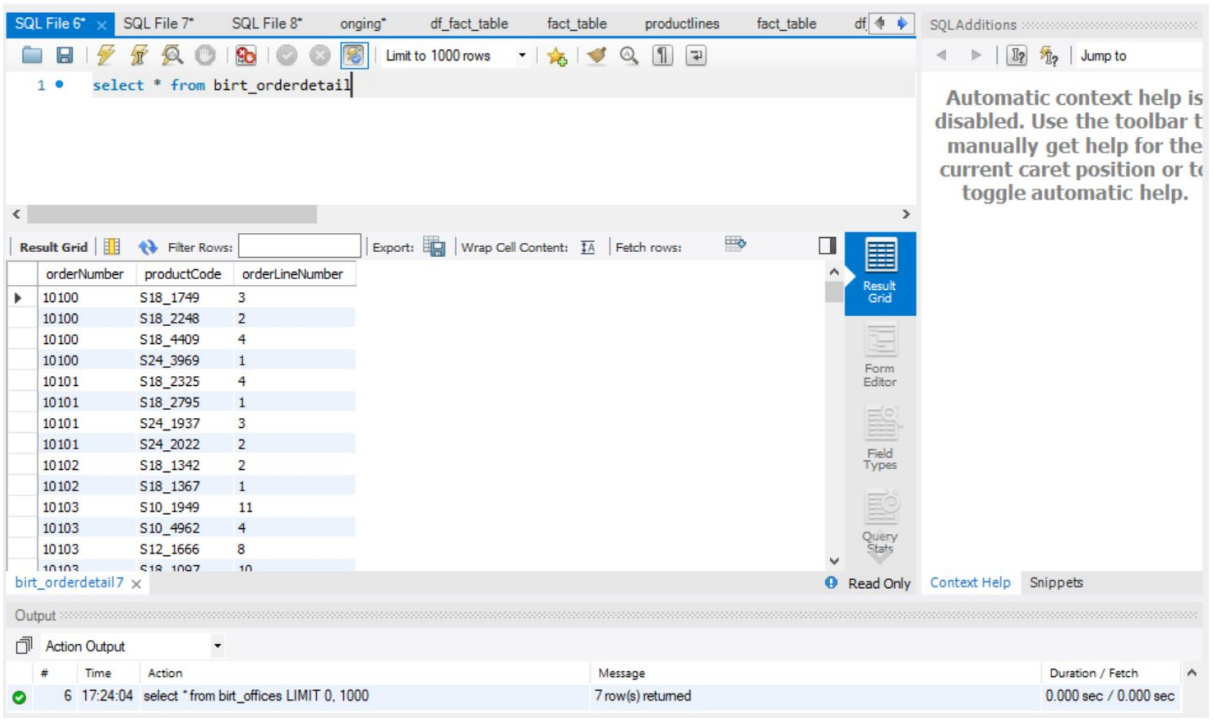


Figure 7: A screenshot of data inserted in the dimension table (Employees)

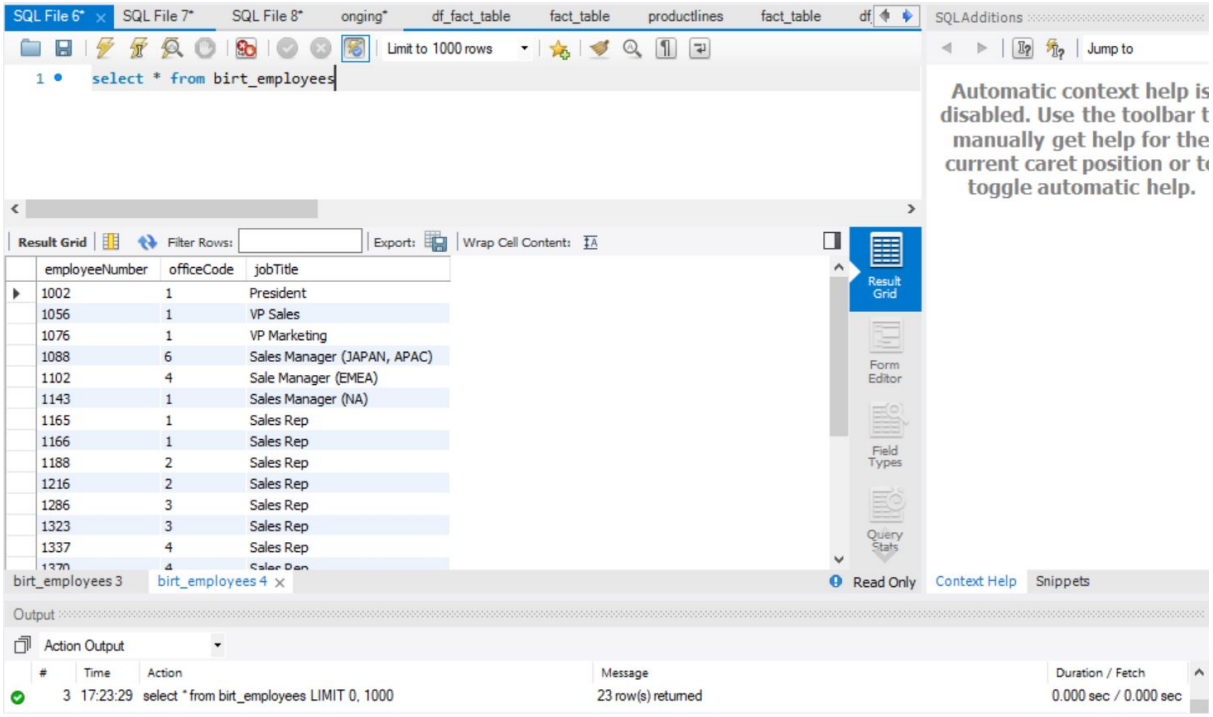
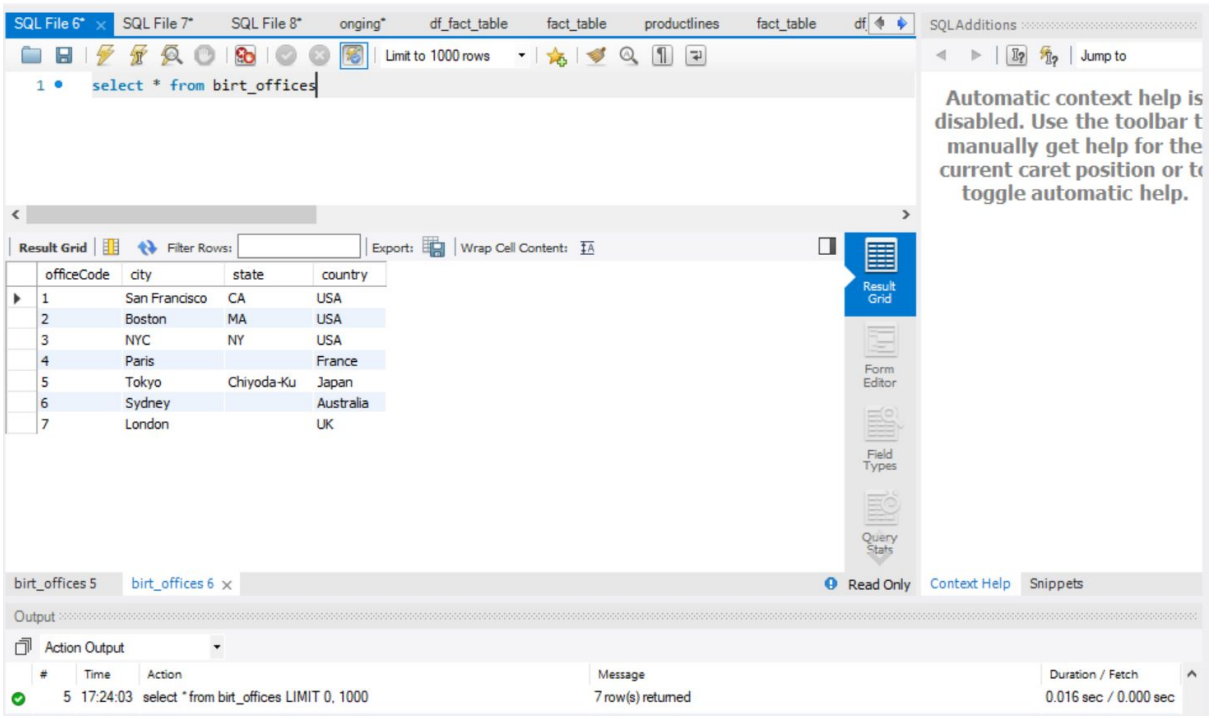


Figure 8: A screenshot of data inserted in the dimension table (Offices)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df_fact_table
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Limit to 1000 rows
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1 • select * from birt_offices
Automatic context help is disabled. Use the toolbar t manually get help for the current caret position or t toggle automatic help.
Result Grid
Filter Rows:
Export:
Wrap Cell Content:
officeCode city state country
1 San Francisco CA USA
2 Boston MA USA
3 NYC NY USA
4 Paris France
5 Tokyo Chiyoda-Ku Japan
6 Sydney Australia
7 London UK
Result Grid
Form Editor
Field Types
Query Stats
birt_offices 5
birt_offices 6
Read Only
Context Help
Snippets
Output
Action Output
Time Action Message Duration / Fetch
5 17:24:03 select * from birt_offices LIMIT 0, 1000 7 row(s) returned 0.016 sec / 0.000 sec