National University of Computer and Emerging Sciences, Lahore Campus

Course:	**Data Warehousing and Business Intelligence**		**Course Code:**	**DS3003**
Program:	**BS (Data Science)**		**Semester:**	**Fall 2023**
Out Date:	**19-Sep-2023**		**Total Marks:**	
Due Date:	**Tue 26-Sep-2023 (start of class)**		**Weight:**	
Section	**BDS-5A**		**Page(s):**	
Assignment:	**2 (Dimensional Modeling)**			

Instructions/Notes:
- *Use any valid assumption where needed.*
- You are required to submit the hard copy of your assignment at the start of your class.
- For any query, please contact your TA.

<u>You are required to design a Dimensional Data Model in the way that it fulfills the requirement for the following system.</u>

The TU Hotels is a chain with properties throughout Pennsylvania, Arizona, Florida, and New York. They have a central database to store and track guest reservations. But following the prevailing trend, in 2018 they put cafes in many of their hotels, called "Café in the Hotel." They have an order-tracking system that relays customer orders from the wait staff to the kitchen. The chain has access to a database managed by an IT Department of its own. Despite expansion in business, the Sales and Marketing department has not been meeting its budgeted numbers. As a result, this department has been challenged to develop a successful sales and marketing strategy as TU Hotels operate in an extremely competitive market where competitors are numerous, and customers are especially sensitive to food quality, service, and price. In order to grow profitably, TU Hotel chain must increase sales.

Various factors in TU Hotel chain current business point to a decline in sales and profits:

- Traditionally, TU Hotel chain experiences low third-quarter sales (July through September). However, recent sales in other quarters have also been lower than expected. The chain has experienced bursts of growth but, for no apparent reason, has had lower first-quarter sales during the last two years as compared with recent years.

- TU Hotel chain has been successful with its newest sales channel, the social media. Although sales within this channel are growing, overall profits are declining.

TU Hotel chain needs to understand how these factors are affecting its business.

The Sales and Marketing department has been struggling with a lack of timely information about sales, customers etc. mainly because current reporting is done by the IT department, which produces certain standard reports on a monthly basis, whereas ad hoc reports are handled on an as-needed basis and that delays the whole process quite a bit. Complaints have also been numerous in the IT department, with regard to analysts who change their minds frequently or ask for further information.

Reporting Requirements

When asked to be more specific about what is needed, the VP of Sales and Marketing identifies the following requirements:

- Trended sales data for specific customers, segments, regions.

- The ability to provide information and some analysis capabilities to the field sales force. A Web interface would be preferred since the sales force is distributed among different regions.

- In case of home deliveries, detail regarding mail-order, phone, and e-mail sales on a monthly and quarterly basis, as well as a comparison to past time periods.

- Knowledge of percent change versus the recent and year-ago period for sales, units, and margin.

- The ability to perform analysis of the data by ad hoc groupings.

Based on these requirements, VP and the team concludes that a standard reporting solution against the whole system (Hotel and Cafe) would not be flexible enough to provide the required analysis capabilities because of the diversity of the reporting requirements for business analysis.
So, the VP and the team agree upon building an analytic workspace that meets their needs for information analysis.

Business Goals
The team identifies the following high-level business goals that the project must meet:
- The Strategic goal is to increase chain profits by increasing sales of higher margin products and by increasing sales volume overall.

- The Sales and Marketing department objectives are to:

  o Analyze market trends and target specific market segments.

  o Analyze sales channels and increase profits.

  o Identify product trends and create a strategy for developing the appropriate channels.

Business Analysis Questions
Interviews with the VP of Sales and Marketing, salespeople, and market analysts at TU Hotels reveal the following business analysis questions:
- Which products are profitable (in case of Cafe)?

- Who are our customers and what and how are they buying?

- Which segment (Hotel/Cafe) is most profitable?

- What is the performance of each segment?

- Is there still a seasonal variance to the business?

We can examine each of these business analysis questions in detail.

1. What products are profitable (in case of Cafe)?
This business analysis question consists of the following questions:
- What is the percent of total sales for any item, product family, or product class in any month, quarter or year, and in any distribution channel? How does this percent of sales differ from a year ago?

- What is the unit price, unit cost, and margin for each unit for any item in any particular month? What are the price, cost, and margin trends for any item in any month?

- Which items were most profitable in any month, quarter, or year, in any distribution channel, and in any geographic area or market segment? How did profitability change from the recent period? What was the percent change in profitability from the recent period?

- Which items experienced the greatest change in profitability from the recent period?

- Which items contributed the most to total profitability in any month, quarter, or year, in any distribution channel, and in any geographic area or market segment?

- Which items have the highest per unit margin for any particular month?

2. Who are our customers and what and how are they using our services?
This business analysis question consists of the following questions:
- What were sales for any item, product family, or product class in any month, quarter, or year?

- What were sales for any item, product family, or product class in any distribution channel, geographic area, or market segment?

- How did sales change from the recent period? What was the percent change in sales from the recent period?

- How did sales change from a year ago? What was the percent change in sales from a year ago?

3. Which segment (Hotel/Cafe) is most profitable?
This business analysis question consists of the following questions:
- Which segment is most profitable in any month, quarter, or year.

- What was sales and extended margin (gross profit) by segment for any month, quarter, or year.

- How does segment profitability compare to the recent time period?

- Which segment experienced the greatest increase in sales as compared to the recent period?

- What is the percent change in sales from the recent period? Did the percent change in profitability increase at the same rate as the percent change in sales?

4. What is the performance of each distribution channel?
This business analysis question consists of the following questions:
- What is the percent of sales to total sales for each distribution channel for any item, product family, or product class, or for any geographic area or market segment?

- What is the profitability of each distribution channel: direct sales, catalog sales, and the Internet?

- Are customers simply switching ordering methods, or is the newest distribution channel, the Social Media, reaching additional customers?

5. Is there still a seasonal variance to the business?
This business analysis question consists of the following questions:
- Are there identifiable seasonal sales patterns for particular items or product families?

- How do seasonal sales patterns vary by geographic location?

- How do seasonal sales patterns vary by market segment?

- Are there differences in seasonal sales patterns as compared to last year?

Submission Requirements:

Here is the eight points of the complete dimensional modeling design:

1. The processes, and hence the identity of the fact tables
2. The grain of each fact table.
3. The dimensions of each fact table
4. The facts, including pre-calculated facts
5. The dimension attributes with complete descriptions and proper terminology
6. How to track slowly changing dimensions
7. The historical duration of the database
8. The urgency with which the data is extracted and loaded into the data warehouse.

You are required to submit the hard copy of your assignment, which includes these points for the above business processes **and draw dimensional model (including aggregate fact tables, if required)** of the above business processes.