Data Warehouse

Experiment No.: 4

Creating and Visualizing a Cube Using any Modern Tool

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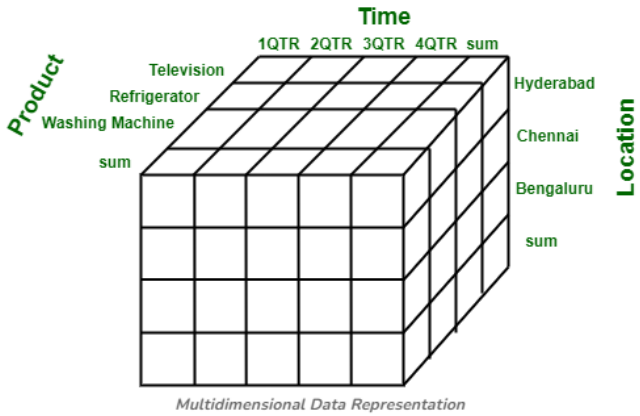
1. **Aim:** Creating and visualizing a Cube using any modern tool
2. **Objectives:** Visualizing a cube in a data warehouse to simplify complex data analysis by providing a multi-dimensional view of the data
3. **Course Outcomes:** Multi-dimensional views provide a clear understanding of relationships and patterns across different data dimensions, making the data more comprehensible.
4. **Hardware / Software Required:** Power BI tool to create the multi-dimensional view.
5. **Theory:** In data warehouse data modeling, a **cube** is a multi-dimensional data structure that allows for efficient querying and analysis of data across various dimensions. It organizes data into a structure that resembles a 3D cube, where each axis or dimension represents a different category of data, and the data within the cube represents metrics or facts such as sales, profit, or inventory. It represents data in the form of data cubes. Data cubes allow to model and view the data from many dimensions and perspectives. It is defined by dimensions and facts and is represented by a fact table. Facts are numerical measures and fact tables contain measures of the related dimensional tables or names of the facts. This is as represented in the below figure.



Multidimensional Data Representation

In the above given presentation, the factory's sales for Bangalore are, for the time dimension, which is organized into quarters and the dimension of items, which is sorted according to the kind of item which is sold. The facts here are represented in rupees (in thousands).

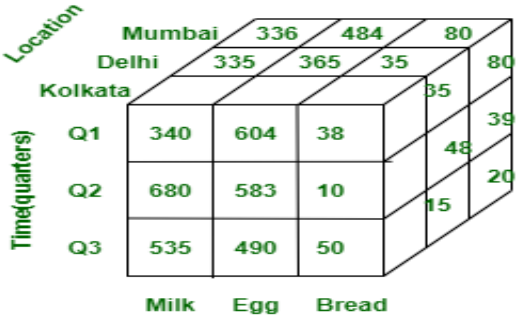
Location = "Bangalore"				
	Type of item			
Time (quarter)	Jam	Bread	Sugar	Milk
Q1	350	389	35	50
Q2	260	528	50	90
Q3	483	256	20	60
Q4	436	396	15	40

2D factory data

Now, if we desire to view the data of the sales in a three-dimensional **table**, then it is represented in the diagram given. Here the data of the sales is represented as a two **dimensional table**. Let us consider the data according to item, time and location (like Kolkata, Delhi, Mumbai).

	Location="Kolkata"			Location="Delhi"			Location="Mumbai"		
	item			item			item		
Time	Milk	Egg	Bread	Milk	Egg	Bread	Milk	Egg	Bread
Q1	340	604	38	335	365	35	336	484	80
Q2	680	583	10	684	490	48	595	594	39
Q3	535	490	50	389	385	15	366	385	20

3D data representation as 2D



3D data representation

6. **Algorithm / Design / Procedure / Flowchart / Analysis:**
    - Load the data of your respective use case into power BI
    - Select the three relevant dimensions to visualize the data
    - Select the relevant visualization format from visualization pane
    - Analyse the 3D data loaded in the form of table

7. **Results/Output Analysis:**

    The sample table of PoweBI for representing 3D data is shown below.

Country	Amarilla	Carretera	Montana	Paseo	Velo	VTT	Total
Canada	646,861.38	436,105.34	321,867.03	1,265,017.99	370,568.34	488,808.81	**3,529,228.89**
France	667,867.63	388,864.90	461,238.37	838,748.56	707,930.24	716,371.09	**3,781,020.78**
Germany	612,137.26	369,674.68	559,438.37	744,416.74	788,789.00	605,932.77	**3,680,388.82**
Mexico	498,611.39	393,668.42	337,689.31	928,651.39	173,303.89	575,598.71	**2,907,523.11**
United States of America	388,626.41	238,491.55	434,521.80	1,020,603.27	265,401.00	647,896.64	**2,995,540.67**
Total	**2,814,104.06**	**1,826,804.89**	**2,114,754.88**	**4,797,437.95**	**2,305,992.47**	**3,034,608.02**	**16,893,702.26**

8. **Conclusions**: By analyzing this 3D data , users can easily identify trends, correlations, and key performance indicators, turning raw data into actionable insights for business strategy and operations.

9. **Viva Questions:** A list of potential questions related to the OLAP operations can be expected.

10. **References:**

1. Kimball Group: Kimball Group’s Website offers articles and resources on dimensional modeling and data warehousing.
2. "The Data Warehouse Toolkit: The Definitive Guide to Dimensional Modeling" by Ralph Kimball and Margy Ross
3. Building the Data Warehouse" by William H. Inmon