Challenges of Dimensional Modeling in Business Intelligence Systems

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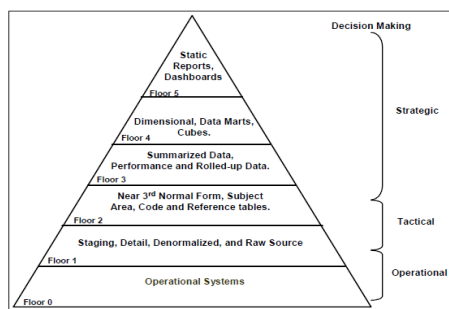
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Abstract— In today's modern business environment, data is growing rapidly and we are drowning in huge data "big data". Increasing in the volume of data, the ways to manage big data have been changed as compare to traditional ways. Concept of Data warehouse emerged to mange this huge data volume and absolute the tradition transaction systems (OLTP). Business adopted them as an alternative of traditional transactional systems. Dimension modeling provides number of different techniques to design these new systems (OLAP) efficiently to meet the intelligence requirements of business by providing intended support of user's inquiries. In this paper, we analyze the challenges faced by dimension modeling for designing these systems especially for business intelligence with respect to their functionality, architecture, structure and enhance the performance and consistency of new business dimensions.
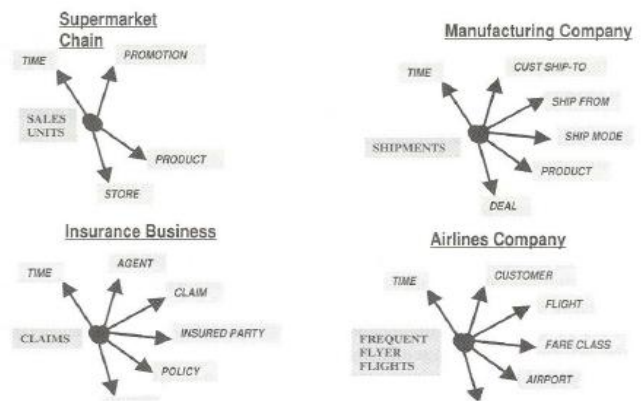
Keywords— OLAP, Dimensional Modeling, Business Intelligence, Data Warehouse.

I. INTRODUCTION

Data warehouse is a subject-oriented, integrated, time variant and non-volatile collection of data to chart out decision-making process [1]. The great concern of top management of any business enterprises is historical data to analyse the business patterns and for the purpose of critical decisions. DW especially designed for analysing and querying the structured data of business by separation into facts and dimensions as the business are more dynamic in today's competitive environment and their dimensions have also been change dynamically.

Businesses are analysed with respect to its dimensions. For example, a manager marketing is more concerning with the revenue by their local offices, diversity of the customers and the version of the product. The fact which the management wants to know is the revenue. How the different dimensions are important for any business?

In this figure, four difference types of business are shown with their different dimensions.

II. APPROCHES

The extraction and capturing of data for any business, organization uses different approaches. ER model approach is use as a basic approach to depict the relationship of any business while dimension model greatly visualize the whole process of the business which can be easy and helpful to understand the whole business process by the analyst.

III. DIMENSIONAL MEDEL

This model is commonly used to enhance the performance of query from huge data. The extraction of business dimension is store in dimensional table to show the dimensions with its description:
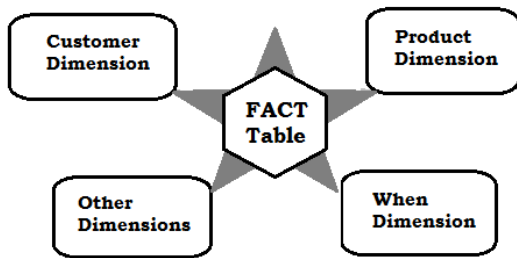
Fact Tables:

The detail of business transactions have been recorded in the fact tables. This table contains the keys and different fact values of the business.
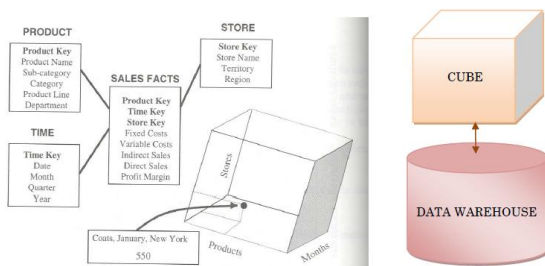

Star Scheme:

After linking all the dimensions to fact table, star schema is developed and represented graphically in the following.

All the dimensions are linked by the foreign keys to the fact table. This schema present the sales fact of the business with the dimensions are customer, product and store.
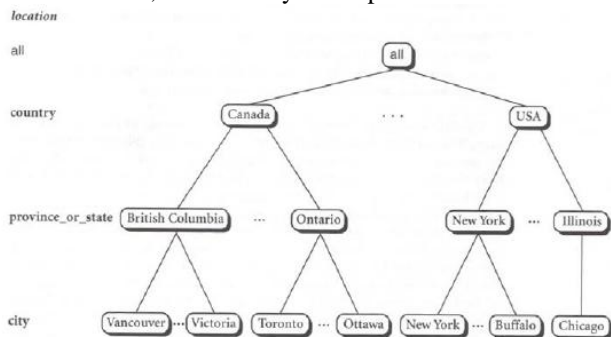
IV. DATA CUBE APPROACH

An important approach which is defined the characteristics of dimensions which are interested for business organization. It is also bases on the dimensions. This approach is quite suitable for analytical processing while the star schema is more suitable for processing query. Cube is also a three dimensional (3-D) which is the product sale in terms of location and time.

V. DIMENSIONAL MEDEL

In DWH, details will be stored in fact table that users can use it many summarization levels known as aggregation. It also defines the mapping sequence from low to high level concepts. Suppose a dimension location hierarchy, if City has the least hierarchy level than it will be connected to State level and then states connected to countries level and so on. In tree structure, leaf members having low level in hierarchy. Therefore, there is only one top level member.

VI. CONCLUSIONS

We can conclude that dimensional modeling is an important set of techniques for designing the business

intelligent systems. There are essential component s are dimensional and fact tables. Dimensional modeling have to face some important issues and challenges which must be consider properly as the efficiency of user inquires depends only one the modeling of the system. In future, we are going to present the dimensional modeling in respect to some specific system.

REFERENCES

[1] Chuck Ballard, Danial M. Farrel, Amit Gupta, Carlos Mazuela, Stanislav Vohnik, Dimensional Modeling in a Business Intelligence Enviorment , IBM, Redbooks.

[2] M. Miskuf, I. Zolotova, Application of Business Intelligence Solution on Manufacturing Data, 978-1-4799-8221-9/15 (2015) IEEE

[3] Ranak Ghosh, Sujay Halder, Soumya Sen, An Integrated Approch to Deploy Data Warehouse in Bussiness Intelligence Ennvioorment, 978-1-4799-4445-3/15$31.00 © 2015 IEEE

[4] Mary Elisabeth Jones, II-Yeol Song, Dimenional Modeling: Identifying, Classifying & Applying Patterns, ACM 2014.

[5] Deepak Asrani, Dr. Renu Jain, Review of techniques used in data warehouse implementation: An imitative towards designing a framework for effective data warehousing, August 01-02,2014, 978-1-4799-6393-5/14 (2014) IEEE

[6] V. Jovanovice, D. Subotic, S. Mrdalj, Data Modeling Styles in Data Warehousing, MIPRO 2014, 26-30 May 2014, OPatija, Croatia.

[7] Vedika Gupta, Anjana Gosain, A Comprehensive Review of Unstructured Data Management Approaches in Data Warehouse, 2013, International Symposium on Computational and Business Intelligence, 978-0-7695-5066-4/13 (2013) IEEE

[8] Changping Yu, Architecture Research of Decision Support System for Tariff and Trade based on the Multi-dimensional Modeling Techniques, Third International Conference on Information Science and Technology, March 23-25-2013, China, 978-1-4673-2764-0/13/$31.00 © 2013 IEEE.

[9] O. Jukic, I. Hedi, The use of call detail records and data mart dimensioning for telecommunication companies, 20th Telecommunication forum TELFOR 2012, 978-1-4673-2984-2/12$31.00 © 2012 IEEE.

[10] Joseph M. Firestone, Dimensional Modeling and ER Modeling in the Data Warehouse, White paper No. 8, June 22, 1998

[11] Suja Ramachandran, S. Rajcswari, S.A.V Satya Murty, M. Valsan, R. K, Dayal., R.V, Subba Rao, Baldev Raj, Design of a Dimensional Database for Materials Data, 978-1-4244-9008-0/10/$26.00 ©2010 IEEE.

[12] Mladen Varga, Conceptual Modeling Styles, 24th Int. Conf. Information Technology Interfaces ITI 2002, June 24-27, 2002, Cavtat, Croatia.

[13] G. Graefe, U. Fayyad, S. Chaudhuri, On the efficient gathering of sufficient statistics for classification from large SQL databases, in: Proceedings of the International Conference on Knowledge Discovery and Data Mining, New York, 1998, pp. 204–208.

[14] [10] D. Chatziantoniou, Ad hoc OLAP: expression and evaluation. in: Proceedings of the IEEE International Conference on Data Engineering, Sydney, 1999.