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CUSTOMER DATA ANALYSIS MODEL USING BUSINESS INTELLIGENCE TOOLS

Case studies

Keywords

Customer Analysis
Business Intelligence
Use Cases Diagram
Logical Data Model
Star Schema
Process Modelling

JEL Classification

O10; O20; O30

Abstract

This article presents a customer data analysis model using business intelligence tools for data modelling, transforming, data visualization and dynamic reports building. Economic organizational customer's analysis is made based on the information from the transactional systems of the organization. The paper presents how to develop the data model starting for the data that companies have inside their own operational systems. Their own data can be transformed into useful information about customers using business intelligence tool. For a mature market, knowing the information inside the data and making forecast for strategic decision become more important. Business Intelligence tools are used in business organizations as support for decision making.

Introduction

Business Intelligence tools refer to those software applications designed to retrieve, analyse or report data. There are included in business intelligence tools a wide kind of applications: spreadsheets, visual analytics, querying software, data mining software, and data warehousing software or decision support software. A business intelligence platform brings together different kind of business intelligence tools which have the final scope to support decision making at all levels in the economic organisation.

Modern Business Intelligence platform should provide an end-to-end infrastructure, solutions and technologies that support the following issues: information integration, master data management, data warehousing, BI tools. A business intelligence platform includes the four levels described in figure 1: operational systems level from which the data is collected, staging level for extracting, loading and transformation of data for modelling in data warehouse. The last level is represented by business intelligence tools used for decision making. In figure 1 there is presented the business intelligence platform structure.

Data Mining means predicting the future based on analysing information from their own systems.

Data Mining is made on large sets of data from different data sources and include four stages Exploration, Model building and validation; Deployment, Reports preparation.

Data Mining could be made using data from staging level or from the data warehouse directly. In figure 2 data mining stages are presented. Examples for Data Mining Business Intelligence tools are SAS Enterprise Miner, IBM SPSS, and Business Analytics for Information Builders. Data Mining could be made also without these tools. Looking for what is inside the data is a beautiful and difficult job.

Self Service Reports

Self-service business intelligence means that business users can create their own reports without IT department help. Usually this is possible after the staging level. The data is organized using OLAP technology, on Data warehouse level. For example the Business Objects universes is a business representation of organization's data that helps end users accessing data autonomously using common business terms and it isolates business users from the technical details of the databases where source data is stored. In figure 3 there is presented a self service business intelligence tool.

Dynamic Dashboards

A way to organize together and manage multiple charts regarding the same subject of interests is on dashboards. If the information in dashboards is not

static and can be changed based on parameters values selections, those dashboards are called dynamic. In businesses it is very often used because the information came from different sources and the volume of data is huge. Dynamic Dashboards are preferred by intermediate level of managers for giving a quick image of their business segment. For example in figure 4 there is presented an example of dynamic dashboard.

1. Interactive Visual Analysis

Interactive Visual Analysis (IVA) is a new part of business intelligence tool. The interactive visual analysis appears as a need for analysing high-dimensional data that has a large number of data points. Simple graphing reports without interactive techniques give an insufficient understanding of what is inside the data. Using interactive visual analysis the user correlated views and iteratively selected and examined features. The objective of analysis is to obtain knowledge which is not apparent from ordinary report. For Interactive Visual Analysis it is important the perceptive and cognitive capabilities of humans who use it. This is necessary in order to extract knowledge from large and complex datasets...Figure 5 presents an example of using interactive visual analysis business intelligence tool.

Business intelligence tools are very useful for large companies. As example, the Telecom Market is very dynamic. Companies are looking for solutions to take advantage in this difficult competition. The analysis of what is inside the data from systems like traffic, sales, accounting become more important. The data from operational systems contain information about the client and how to keep this client, how to offer solutions for giving a better price or a better service. Also, it gives ideas to decision makers on how to improve communication with the client, how to improve network qualities and so on. In this paper the author presents a model of data analysis of a customer.

2. Data Analysis Model

In the first chapter the general context of business intelligence was presented. This article aims to present a model of making a business analysis using business intelligence tools. In this article there are used all the things learned from books *Data Warehouse Project Management* - Adelman & Moss (2004), *Data Warehousing and Mining, Concepts, Methodologies, Tools and Applications* - Wang (2010) and *The Data Warehouse Toolkit, The Complete Guide to Dimensional Modelling, Second Edition* – Kimball (2004).

The customer data analysis model starts with analyzing which elements impact customers' behavior. First, it is clearly understood that to become a company's client, the actor has to sign a contract. The contract is a result of an offer made

by a company. To support the offers the company has her own costs and stocks of products. The company gives to the client, on the offer base, services and/or products. Using the company's services the client makes voice calls, traffic on internet, content usage, transactions. All this traffic is made using the company's network. If the client needs assistance from the company he has to interact using Interactions services (like IVR, Customer Care calls) or using Care Services for problems with devices. All this elements are presented using the use case diagram in figure 6. The use cases diagram helps understanding what are the elements which determine customer's behaviour. This is important for understanding which data needs to be modelled in order to developed dynamic reports necessary for customer analysis. In a telecom company, information from customers comes from different data sources as: operational systems for customer's traffic, operational systems for contracts, invoices, and online systems. The data from operational systems are loaded in Data Warehouses. An example is presented in Figure 7.

All the information from operational systems need to be modeled in order to make possible the customer data analysis.

After business process understanding, the logical business model must be developed. Logical model is necessary for understanding how data will be modeled. For customer analysis the logical model is discussed with the business owner and the sponsors of customer analysis project. The analysis is made by business analyst. For customer analysis the logical model is presented in figure 8.

Based on logical Model it is obvious now the large kind of analysis which can be made on customer. In Table1 there are some examples.

Customer Analysis per Traffic and Customer Type is possible if the Data Warehouse contains information about traffic and customers. Next we will define the steps to implement traffic events in Data Warehouse. This will be made in four steps: ETL stage, Data Marts, Universes Building, and Data Presentation in Dynamic Reports.

In ETL Stage Data of Operational Systems are Extract, Load and Transformed for Data Warehouse. Operational systems involved in traffic events are described in figure 9.

The traffic CDR's must be loaded in Data Warehouse. The ETL is made with a special tool. One tool that can be used is Informatics. Data loading workflow for traffic CDR's from operational systems presented is described in fig. 10.

After data loading in stage, the data will be modeled for data mart. Based on Data Mart there can be constructed cubes for OLAP analysis (base for data mining). The Data Mart model based on information in traffic CDR's is presented in fig. 11.

The business needs for reporting are reflected in the star schema and also in data dimensions tables. In figure 12 there are presented a Data Mart Traffic Dimension Tables.

The data modeled in Data Mart can be used with an OLAP business intelligence tool for Dynamic Reports Building. One example is SAP Business Objects InfoView. The Information is presented in dimensions and measures. We have one example presented in the figure 13.

Using the data modeled in universes, users can develop selfservices reports. They can select information from traffic dimensions and correlate with customer's information. This is made to analyze customer's behavior by traffic components. All the elements presented in logical model needs to be modeled in Data Warehouses and presented in universes. The modelling process will be made following the steps presented in this paper. In this way the final users will have all the elements for a complete analysis of customer's behavior.

3. Conclusions

The analysis of what is inside the data is the base for sales forecast. Also, the future offers, services and products are based on these dynamic reports. The importance of analyzing the own data about personal customers is very important to telecom companies and it is easy to make using business intelligence tools. In this paper I presented a brief overview on how to model the data from operational systems in order to help the final users to develop self-service and dynamic reports.

Acknowledgments

Personal thanks to professor Ion Lungu who helped me in my odyssey of performing. And also to my kids, all special, who let me write in the nights. They sleep so well so I can be very concentrated on my work...

References - Books

- [1] Sid Adelman, Larissa Terpeluk Moss (2004), *Data Warehouse Project Management*. Boston: Addison-Wesley.
- [2] John Wang (2010), *Data Warehousing and Mining, Concepts, Methodologies, Tools and Applications*. New York: Information Science Reference.
- [3]Ralph Kimball, Margy Ross (2004), *The Data Warehouse Toolkit, The Complete Guide to Dimensional Modelling, Second Edition*.

Web

- <http://www.statsoft.com/>
- <http://datawarehouse4u.info/>
- <http://kb.tableau.com/articles/knowledgebase>
- <http://blog.activestrategy.com/performance-management-software-blog/>

Tables

	Kind of Analysis Type
1	Customer Analysis per traffic and customer type
2	Customer with Smartphones Data Traffic Analysis
3	Smartphone Sales per channel distribution
4	Traffic analysis per acquisition channel
5	Geographical repartition of customer per volume of data used and product type
6	Offers and contract type evolution in period per channel

Table 1. Some Possible Customer Analysis

Figures

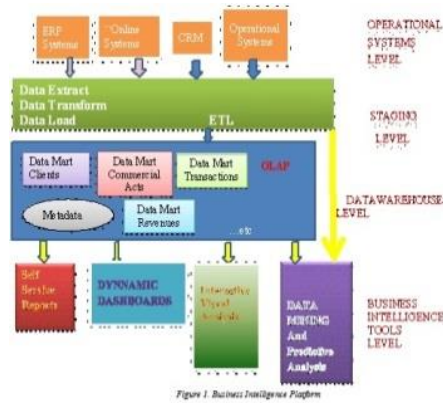


Figure 1. Business Intelligence Platform

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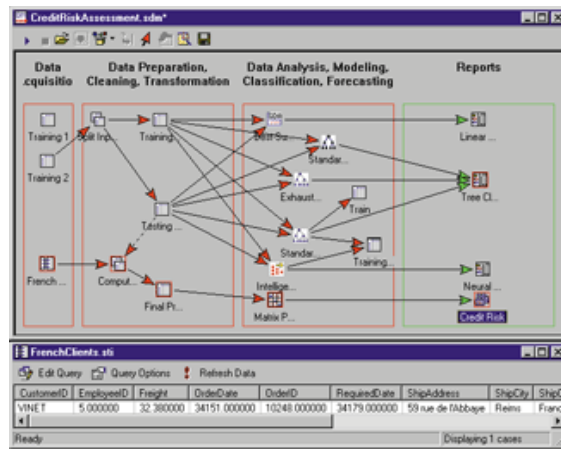


Figure 2. Data Mining Stages, Source <http://www.statsoft.com/>

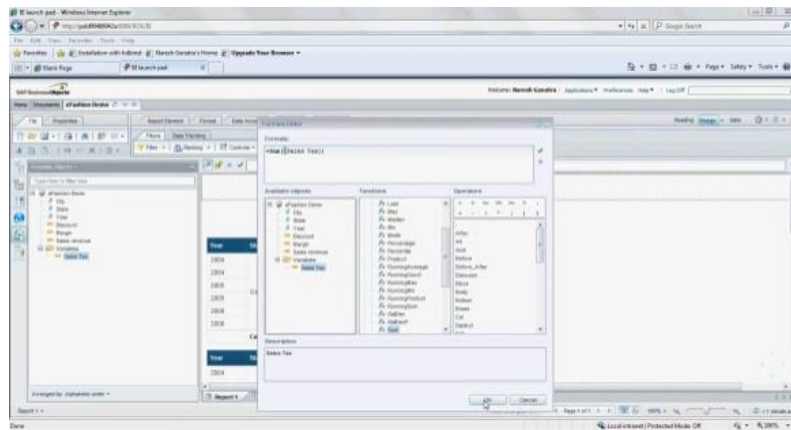


Figure 3. Example of Self Service Report, Source <http://datawarehouse4u.info/>



Figure 4. Example of Dynamic Dashboard, Source <http://kb.tableau.com/articles/knowledgebase>

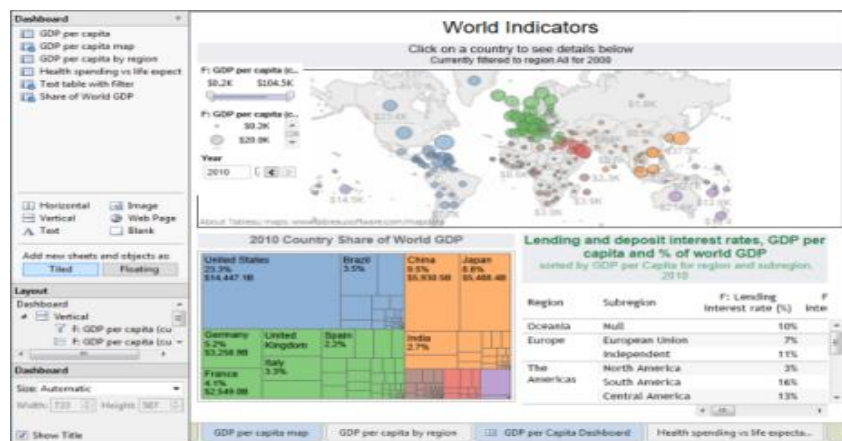


Figure 5. Example of Interactive Visual Analysis, Source <http://blog.activestrategy.com/performance-management-software-blog/>

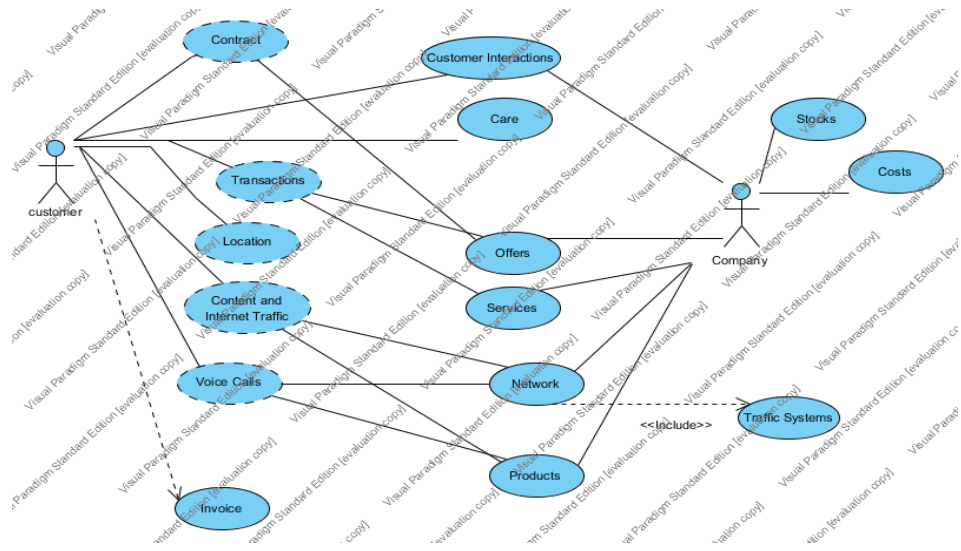


Figure 6. USE CASES DIAGRAM for Customer Analysis

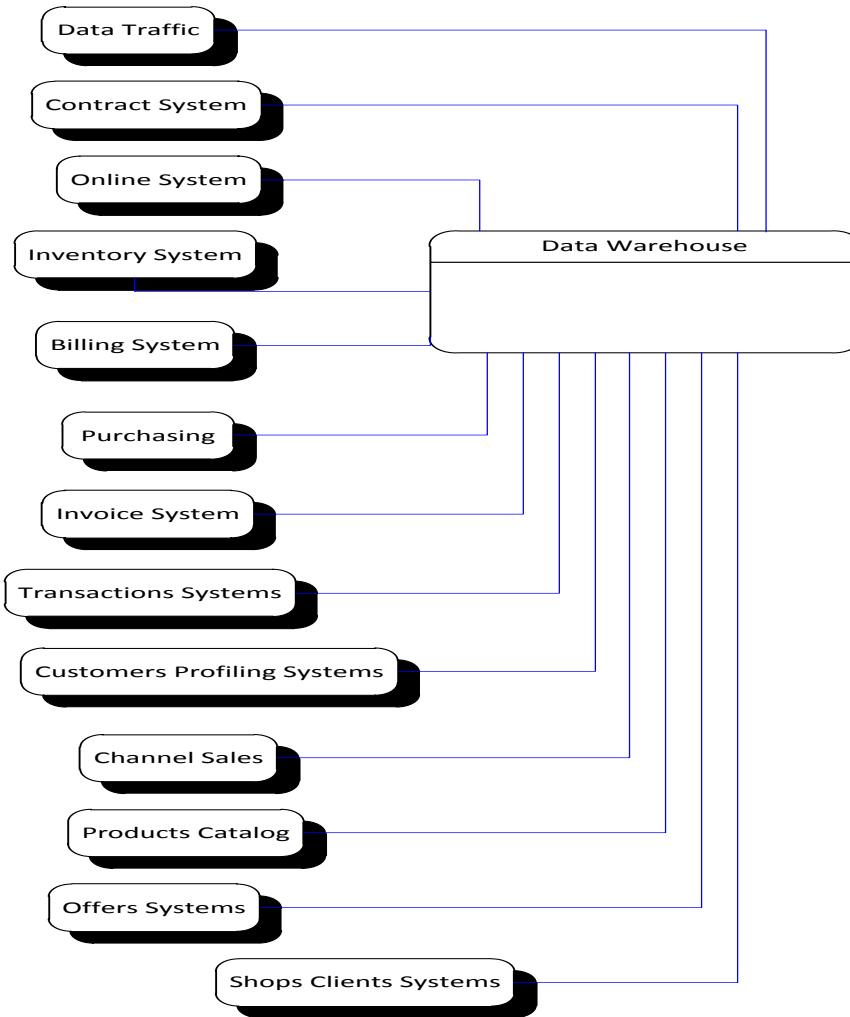


Figure 7. Data Warehouse Inputs

Logical Model

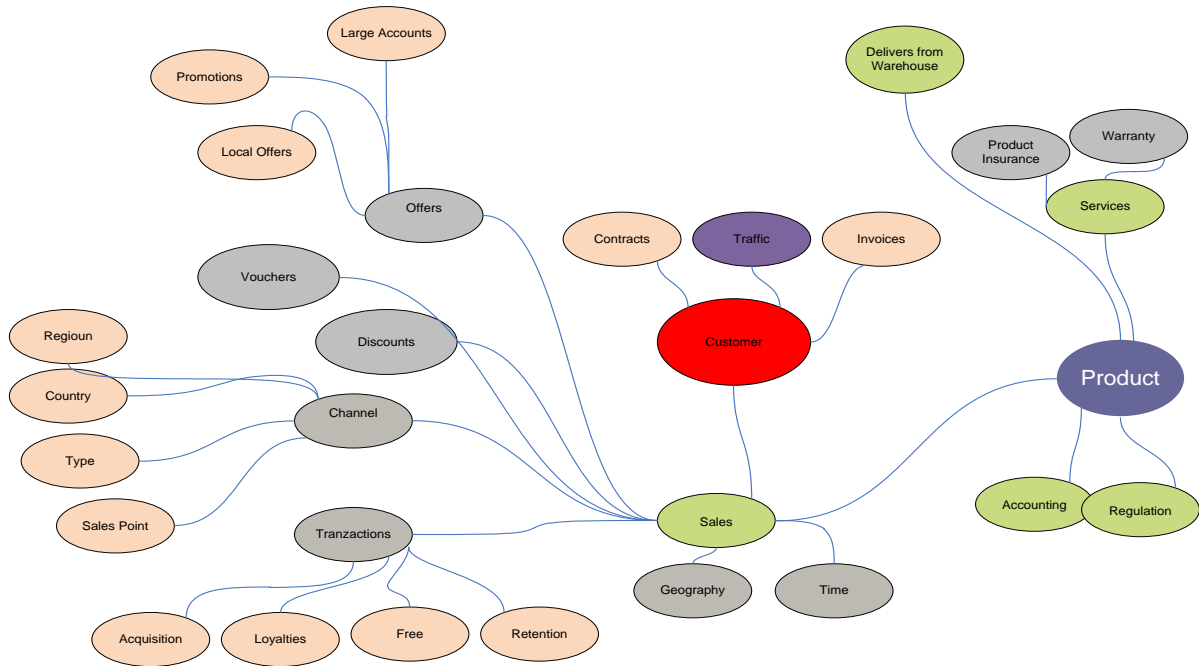


Figure 8. Logical Model for Customer Analysis

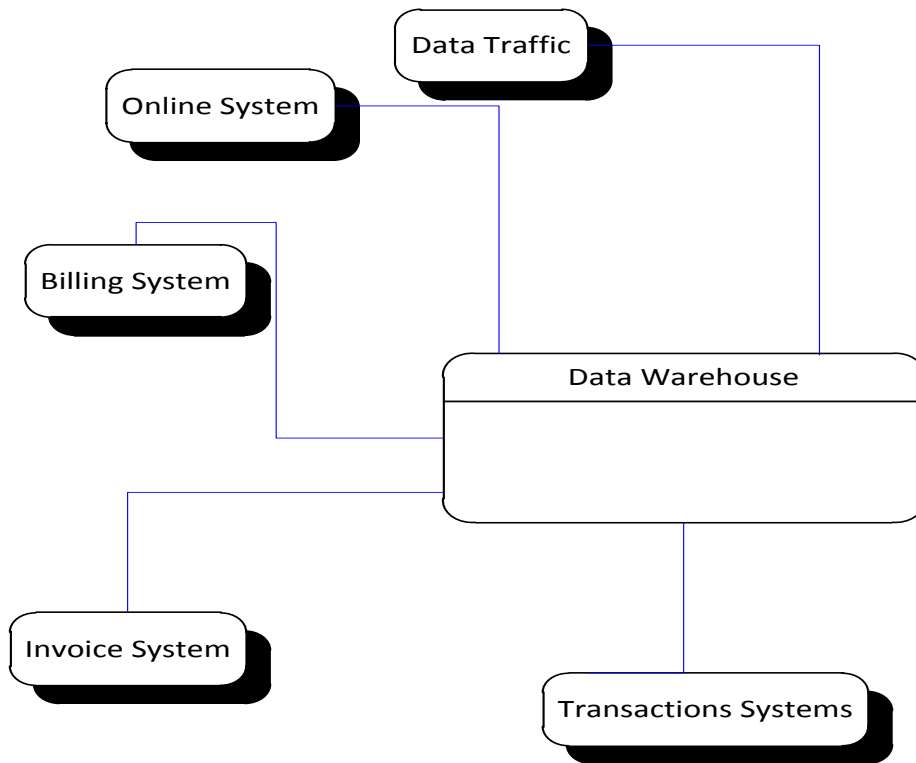


Figure 9. Data Warehouse Inputs for Traffic

ETL STAGE

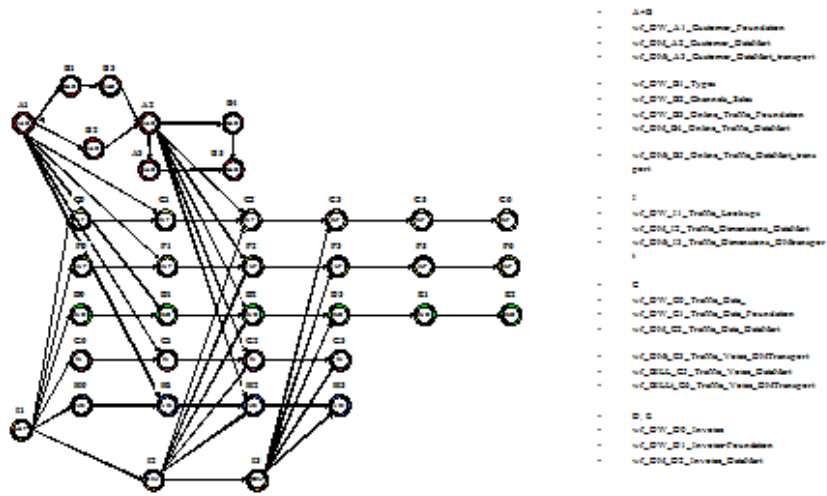


Figure 10 . Traffic ETL Stage Workflow

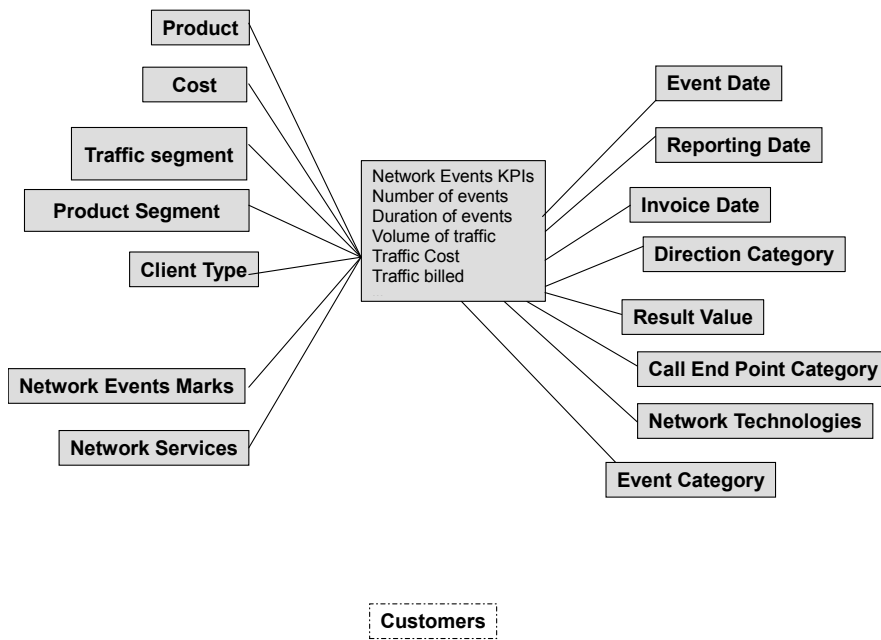


Figure 11 . Traffic Star Schema Data Mart

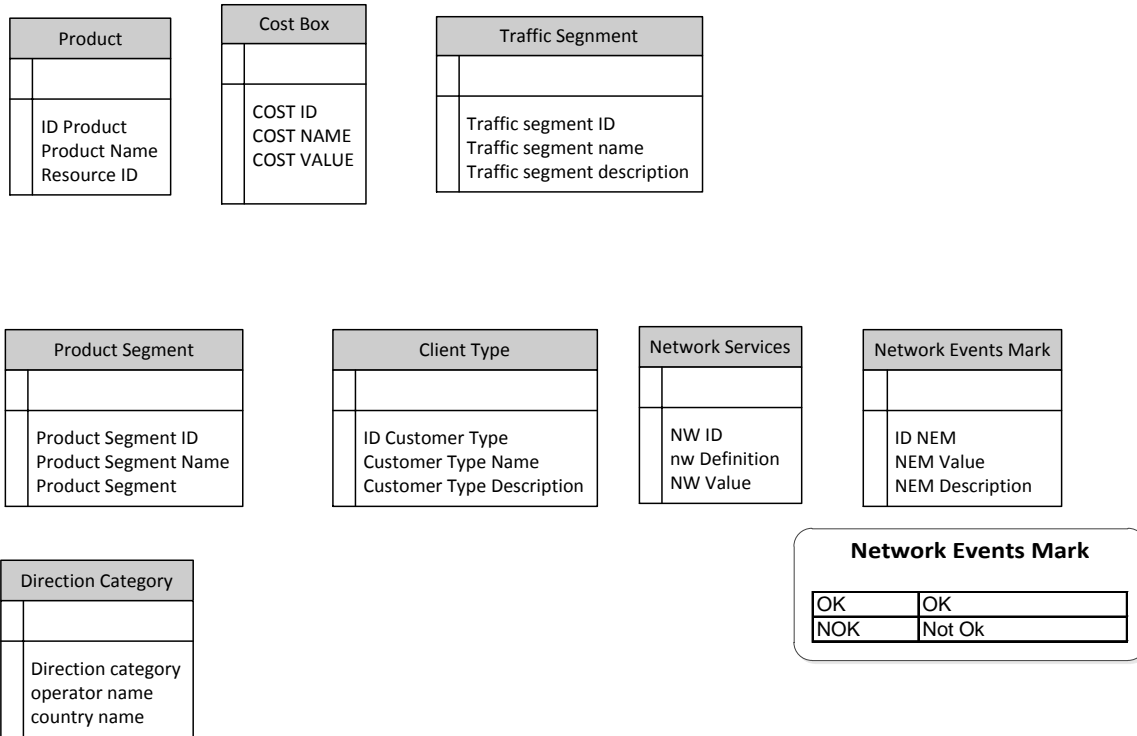


Figure 12 . Traffic Data Mart Dimension Tables

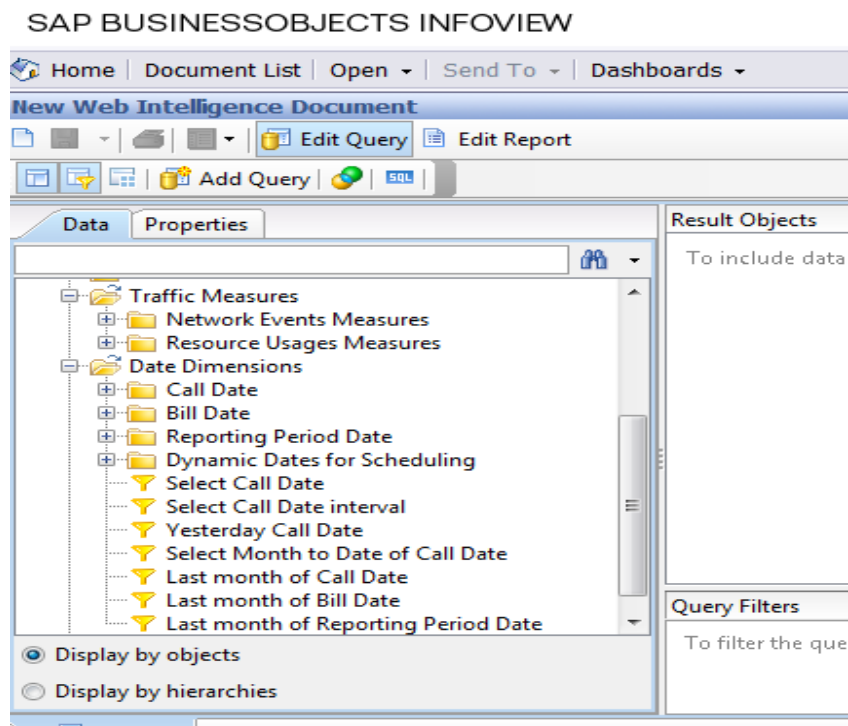


Figure 13 . SAP for Universes Building