Customer Data Analysis Model using Business Intelligence Tools in Telecommunication Companies

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This article presents a customer data analysis model in a telecommunication company and business intelligence tools for data modelling, transforming, data visualization and dynamic reports building . For a mature market, knowing the information inside the data and making forecast for strategic decision become more important in Romanian Market. Business Intelligence tools are used in business organization as support for decision making.
Keywords: Customer Analysis, Business Intelligence, Data Warehouse, Data Mining, decisions, self-service reports, interactive visual analysis, and dynamic dashboards, Use Cases Diagram, Process Modelling, Logical Data Model, Data Mart, ETL, Star Schema, OLAP, Data Universes

1 Introduction

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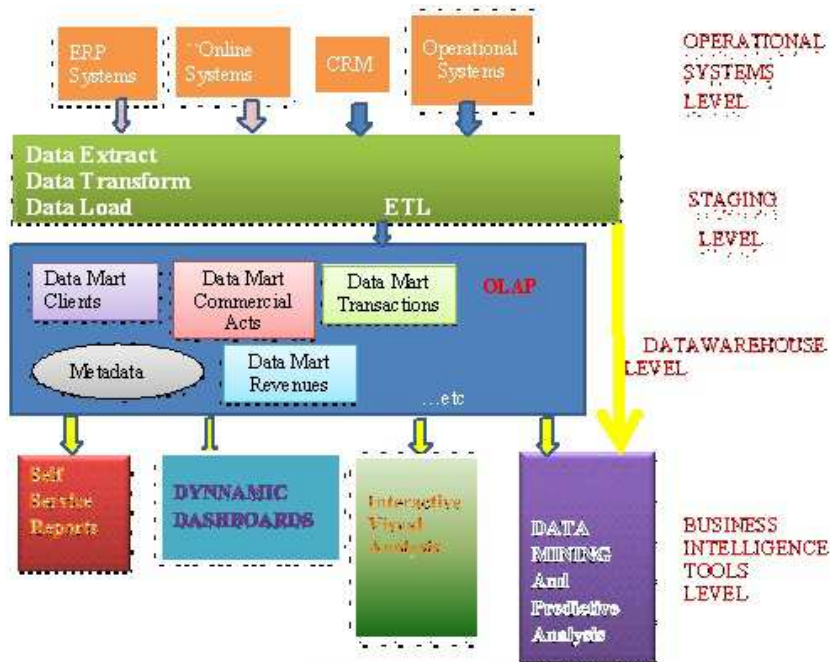

Fig. 1. Business Intelligence Platform

Modern Business Intelligence platform should provide an end-to-end infrastructure, solutions and technologies that support following issues: information integration, master data management, data warehousing, BI tools. A business intelligence platform includes the four levels described in the 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.

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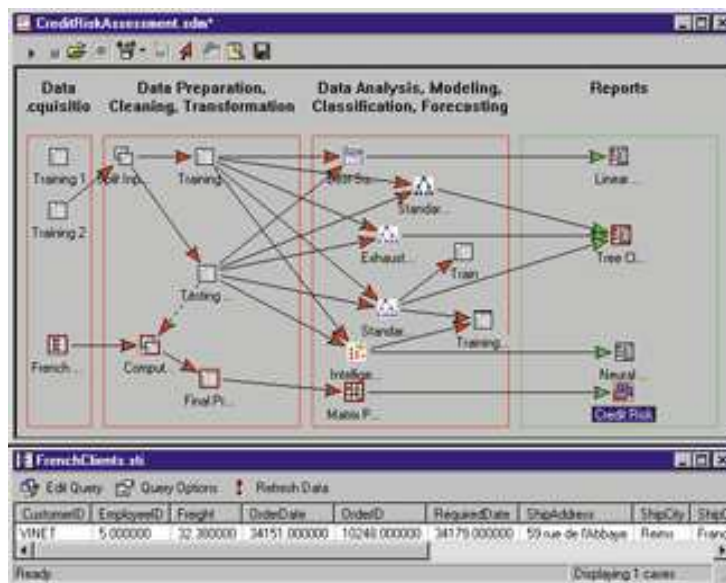

Fig. 2. Data Mining Stages. Source http://www.statsoft.com/

Data Mining could be made using data from staging level or from the data warehouse directly. 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 it 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 access data autonomously using common business terms and it isolates business users from the technical details of the databases where source data is stored.

Fig. 3. Example of Self Service Report. Source http://datawarehouse4u.info/

Dynamic Dashboards

A way to organize together and manage multiple charts regarding on 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 business 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 by their business segment.

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

Interactive Visual Analysis

Interactive Visual Analysis (IVA) is 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. complex datasets...

Using interactive visual analysis the user correlated views and iteratively select and examining features. The objective of analysis is to obtain knowledge which is not apparent from ordinary report. For Interactive Visual Analysis is important the perceptive and cognitive capabilities of humans who use it. This is necessary in order to extract knowledge from large and
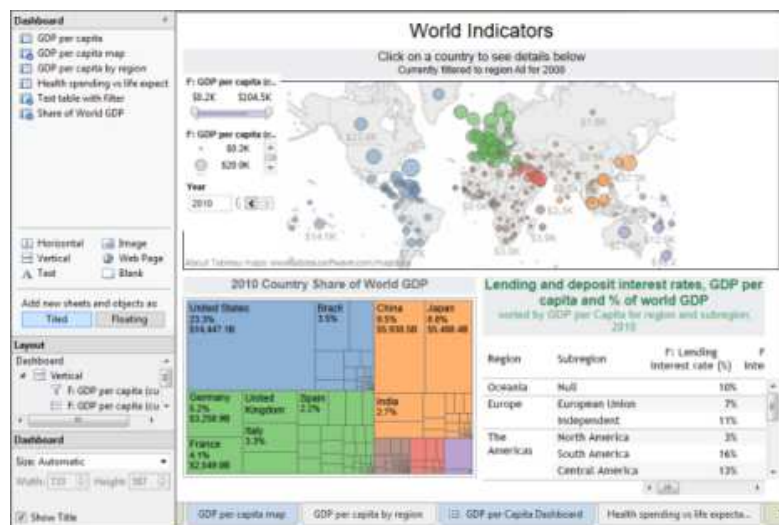

Fig. 5. Example of Interactive Visual Analysis, Source, *http://blog.activestrategy.com/performance-management-software-blog/*

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

2. Data Analysis Model

The customer data analysis model starts

with analysis of which elements impacts customers' behavior. First, is clear 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 company has her own costs and stocks of products. The company gives to the client, on the offer base, services and/or products. Using company's services the client make 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 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 use case diagram in the figure 7.
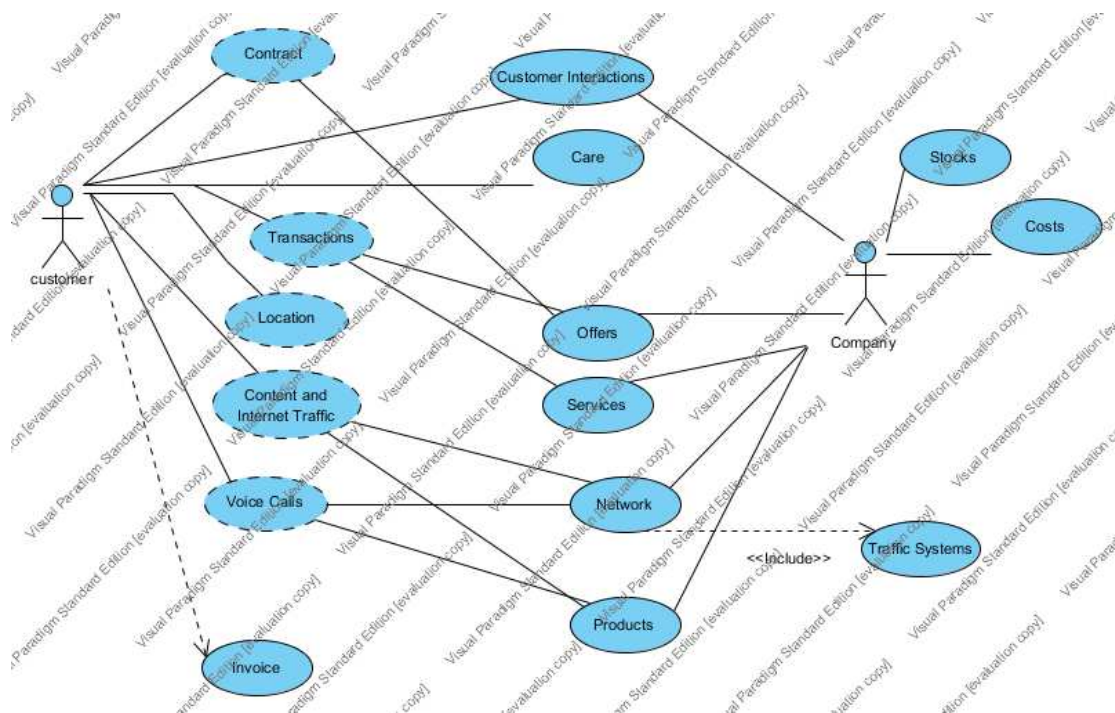

Fig.7. USE CASES DIAGRAM for Customer Analysis

The use cases diagram helps the understanding of 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 load in Data Warehouses. An example is presented in the Figure 8.
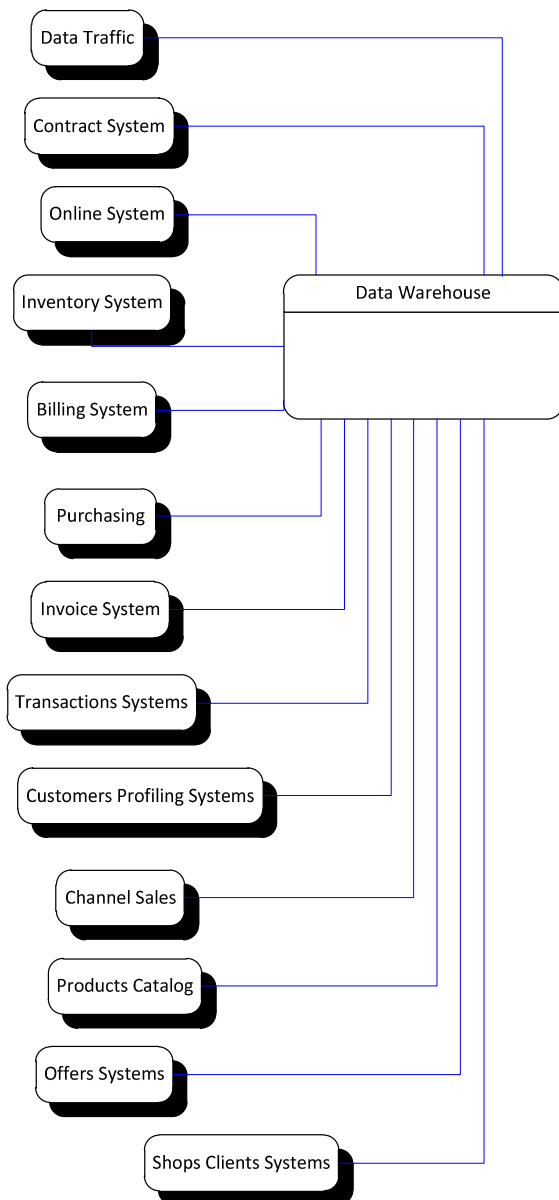
Fig.8. Data Warehouse Structure in Telecommunication Companies

All the information from operational systems needs to be modelled in order to make possible the customer data analysis.
After business process understanding, the logical business model must to be developed. Logical model is necessary for

understanding how data will be modelled. For customer analysis the logical model is discuss with 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 the figure 9.

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

Table 1. Some Possible Customer Analysis

	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

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.
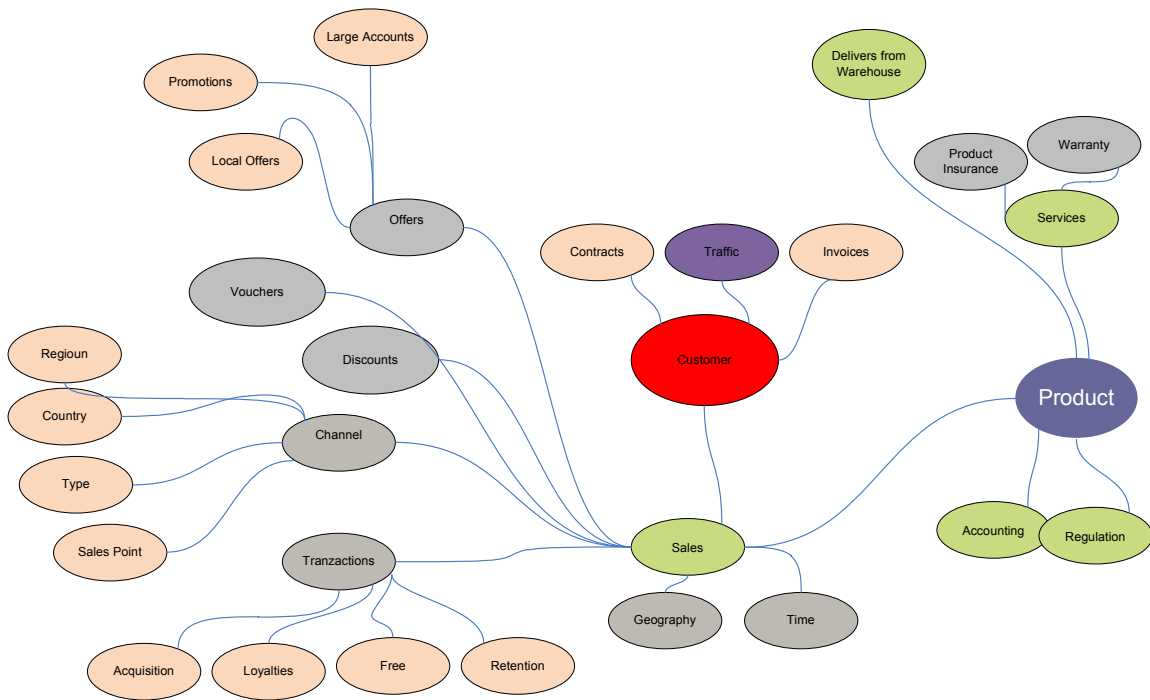
Logical Model

Fig.9. Logical Model for Customer Analysis

In ETL Stage Data of Operational Systems are Extract, Load and Transformed for Data Warehouse. Operational systems involves in traffic events are described in figure 10.
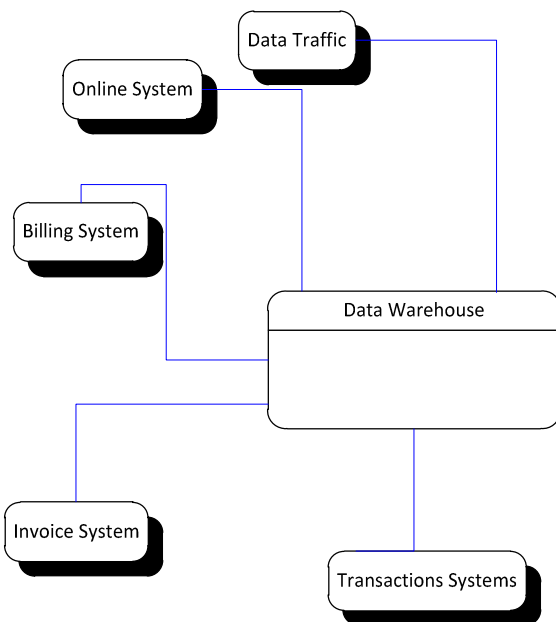
special tool. One tool that can be used is Informatica. Data loading workflow for traffic CDR's from operational systems presents is described in figure 11.
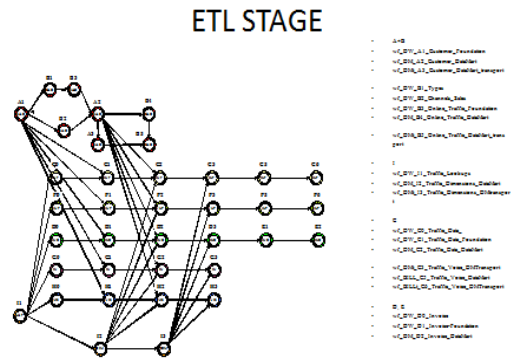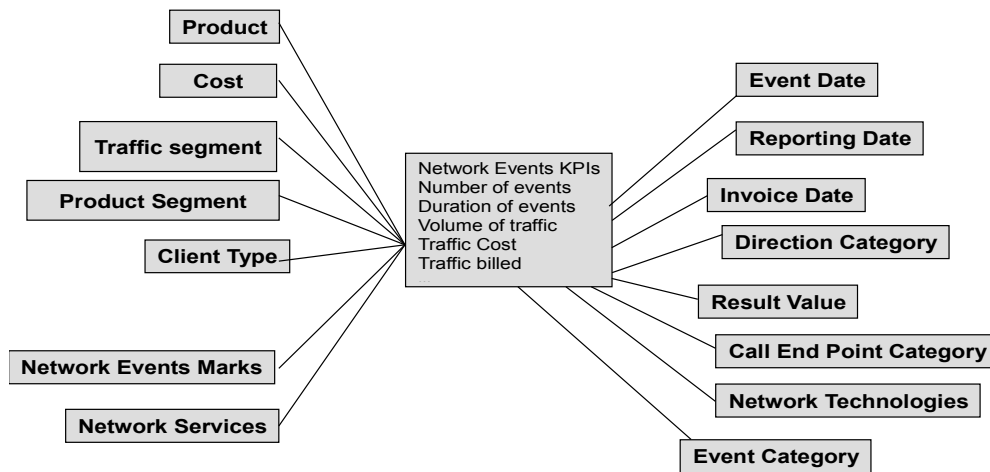

Fig. 10. Traffic Star Schema

The traffic CDR's must be load in Data Warehouse. The ETL is made with a

Fig. 11. Traffic ETL Stage Workflow

After data loading in stage, the data will modeled for data mart. Based on Data Mart can be construct cubes for OLAP analysis (base for data mining). The Data Mart model based on information in traffic CDR's is presented in the figure 12.

Fig.12. Traffic Star Schema Data Mart

The business needs for reporting are reflected in the star schema and also in data dimensions tables. In figure 13 are presented a Data Mart Traffic Dimension Tables.
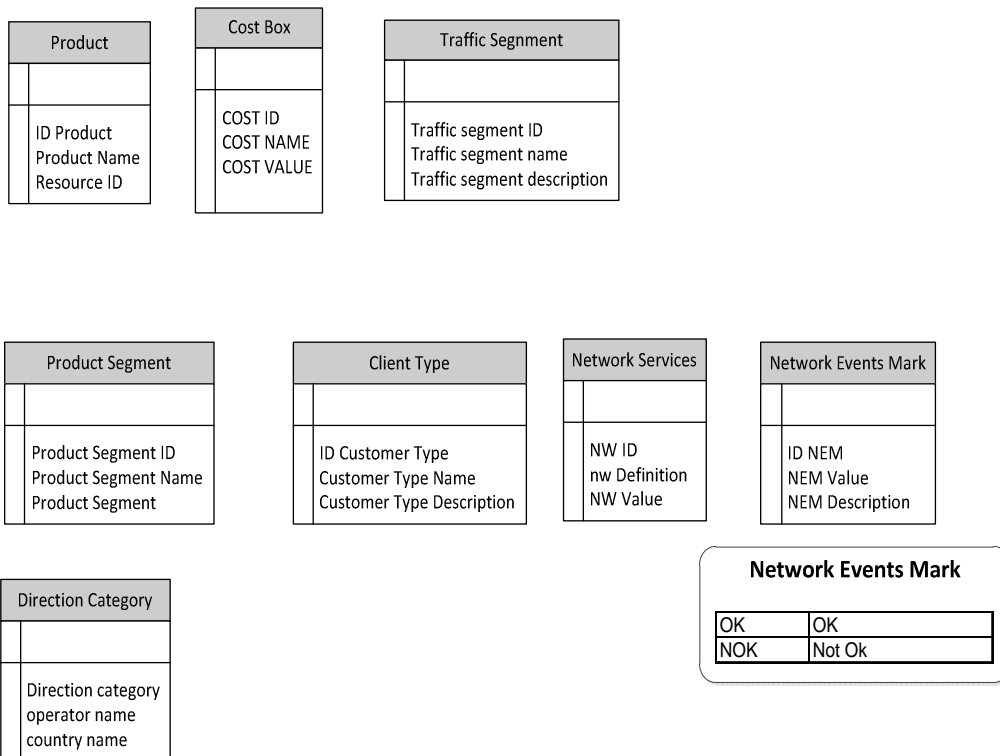

Fig.13. Traffic Data Mart Dimension Tables

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 14.
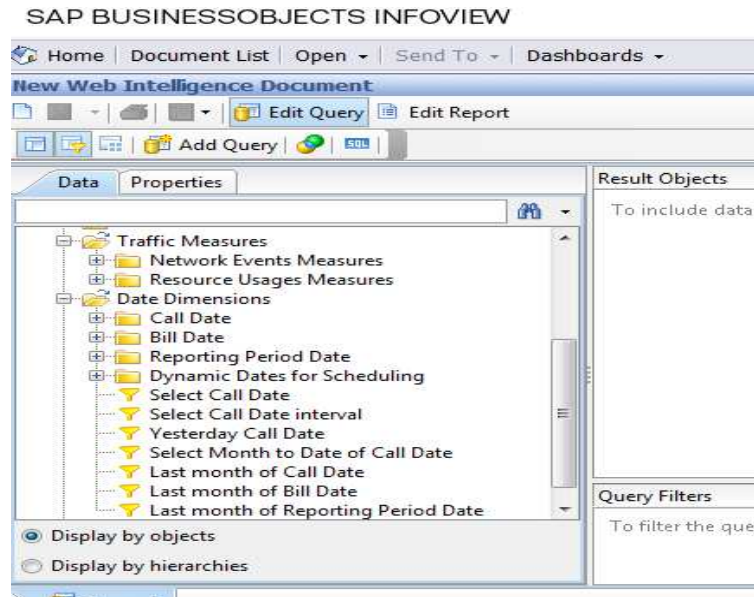
Fig.14. Traffic Star Schema

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

References
[1] Sid Adelman, Larissa Terpeluk Moss, *Data Warehouse Project Management*, Ed. Addison-Wesley, Boston, 2004.
[2] John Wang, *Data Warehousing and Mining, Concepts, Methodologies, Tools and Applications,* Ed. Information Science Reference, New York, 2004.
[3] Ralph Kimball, Margy Ross, *The Data Warehouse Toolkit, The Complete Guide to Dimensional Modelling, Second Edition*
[4] I. Lungu, A. Bara, *Sisteme informaticeexecutive*, ASE Publishing House, 2007
[5] http://www.statsoft.com/
[6] http://datawarehouse4u.info/
[7] http://kb.tableau.com/articles/knowledgebase
[8] http://blog.activestrategy.com/performance-management-software-blog/

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