An Implementation of Scheme Performance Analyser Intelligence System

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Abstract: Business intelligence is a computer-based approach that analyses and interprets the business data. Typically, any business have a sales campaigns which include "trade promotion phase" where in the dealers are incentivized with gifts, coupons, discounts, prizes, etc. based on the targeted business results such as product lift, market share and revenue growth. The existing systems are slow, costly and do not provide user friendly unified view about the data including retailer performance. The rapid development in the amount of data generated and organized retailing has lead to the need of visualizing, analyzing and exploring data for better decision. Scheme Performance Analyzer (SPAN) is a Business Intelligence (BI) system, which helps in taking faster decisions and responds to market response for the sales head and the sales team of the organization.

Keywords: Business Intelligence, Visualization, Data Warehouse, DSS.

I. INTRODUCTION

Scheme Performance Analyzer (SPAN) is a Business Intelligence (BI) system, which helps faster decisions and responds to market response for the Sales Head and the sales team of the organization. Typically, sales campaigns have "trade promotion phase" where in the dealers/channels are incentivized with gifts, coupons, discounts, prizes, etc based on the targeted business results such as Product lift, Market share and revenue growth. The main motivation behind this implementation is because in spite of widespread use of BI systems, very less study was found which examine the scheme performance or sales promotion performance integrated with data visualization to provide decision support system. The rapid development in the amount of data generated and organized retailing has lead to the need of visualizing, analyzing and exploring data for better decision.

SPAN system provides the performance of schemes or incentives and integrates the sales data at point of sale level with Distributor stock levels to deliver real-time insights on the trends of product or sales lift, dealer channel performance, schemes performance and return ratios.

All the underlying trends needed to be understood by executives and managers to create sales opportunities which result in determining positive or negative response for a particular scheme. These schemes may vary depending on the geography, presence of competitor or similar products and most important the characteristics of sales representative. The characteristics of sales representative can be determined by their achievements, experience, education and tenure. No study was found which integrated or showed retailer/sales representative wise performance.

The Business and marketing sector is one of the first sectors which made significant investment in collecting and integrating customer data in data warehouse. The reports from different sources within the organization make it difficult for business head to analyze and make decisions. Business need and business strategy is the need of building DW and BI. Measurement of various other factors can also be performed with this foundation like supply chain, customer's preference, demography, geographic which can assist the decision makers for customer retention process and trend. Data driven decision making is key to successful decisions.

The main functionality provided is an interactive graphical user interface or dashboard which helps in determining the area of adjustment in business which responds to the changing trends and developing consistent data based decision. The software helps the user to upload the raw data in comma separated value format into the system. The system performs the computation and generates the report in the form of graphical visualization onto the dashboard. It also helps the user to download the generated report. Thus, helping them to spend their time in introducing new scheme and improving sales rather than spending time in figuring out where exactly sales is going down.

II. LITERATURE SURVEY

In today era, most of the data are stored electronically. The most common of them all is storing in a database and other solution like storing in a plain text file also exists. For better functioning of any enterprise, the operational data which supports day-to-day operations are very crucial and can be used for analysis. Analyses of these operational data and external data are great help to managers and

others (whose decisions affect business). Answers to the questions like "How many particular products sold in particular area?" or "How much did particular scheme affected profit?" are important when making business decisions.

The business intelligence and analytics software market is fast gaining its grip in the market primarily due to the drastic increase in the competition between organizations; they are adopting many tools to optimize their business for better operations. These tools have unforeseeable roles in every functional unit (sales, security, logistics etc.) within an organization. Hence, business intelligence and analytics plays exceptional role in the debilitate business operations and provides holistic view of data by easy integration to any CRM and ERP tools [1]. Marketing and other areas is becoming increasingly dependent on data and information. Businesses collect huge amounts of data from every part of the sales funnel, starting from the point when a potential customer first buys anything of that company to the point where they become a loyal customer. However, making sense using all the data available and to make decisions is difficult from collection. Creation of the right tables, charts, and graphs to summate important facts is one of the most desired skills in marketing, because it empowers decision-making at the highest levels. This skill is referred to as data visualization, and it is in high demand.

BI tools are adopted by many companies in the current environment to perform efficiently. [2] Shows BI adoption to retail chain and figured out the importance of requirements engineering. They also present the benefits considered by retail chain managers. One of the most important factors manager consider is improves decision making. Reference [3] provides the implementation of BI and analytics in public sector and discusses about the issues and challenges. However, one of the key finding is BI and analytics has lot of government agencies handling information and hence these agencies could increase the effectiveness of decision making. [4] Applied BI into a social security system which provides business analysis to the decision makers. They proposed a 3-D (dimension of user role, contents and instruments) BI framework which is based on three level of screening funnel. The three screening funnel indicates the screening based industry positioning, value-chain positioning and positioning of the stage for expanding users. This lead to best match to BI applied.

[5] Introduces BI system methodology mainly focused on functional area of an organization. Authors describe about two stages of BI – creation and consumption; creation involves many tools and technologies such as ETL, Data Warehouse (DW), On-Line Analytical Processing (OLAP), Data Mining (DM) and visualization tools. Consumption involves the fundamental changes in a particular enterprise. They also focus on the issues that require some cultural background along with information system of an organization when building or

implementation of a BI system. This suggested methodology of building and implementing BI system also need sound business practices set by the enterprise. They also provide a real time application proving the same.

[6] Suggested an integrated approach to build and implement BI solution which is composed of four basic dimensions. Authors say that adequate approach is required for building BI. The same approach has been suggested by the [7] and [8] with the only difference of one dimension. [7] Proposed a stakeholder model for the purpose of increase in the organization performance, this model is generic which overcome the limitations of [9][5]. It is divided into two parts; internal and external environment, and are potentially useful for designing, diagnosing, and enhancing BI because it integrates stakeholder system with technical and human knowledge systems. Large number of BI tools exists because of fast growing competitive market. But some of the disadvantages of these BI tools are:

- Longer computation time
- Poor visualisation
- Difficulty in finding complex relations
- High level of technical knowledge required
- Costly
- Poor analytical answers

An implementation of scheme performance analyzer intelligence system overcomes all the above mentioned disadvantages and presents a faster, friendly UI and cost effective product.

III. OBJECTIVE

The main aim is to develop a user friendly DSS for an organization that enables the business heads to take accurate and timely decisions and plan for the future by providing the insights of the data. SPAN, which is implemented for this meets the following objectives:

(a) Promotion/Scheme performance- which means finding the performance of retailers in terms of sales done and number of products sold which is done by managing the promotion scheme budget and analyzes scheme performance in near real time with pin-pointed data insights.
(b) Territory Lifting- which means finding the sales and volumes of the product for a particular territory and this is done by making use of lift analysis.
(c) Product performance-gives the product performance in terms of volume of a product stocked out by using nominal comparison distribution.
(d) Retailers sales- provide the retailer-wise product sale.

IV. DESIGN AND DEVELOPMENT

The data gathered are from different functional areas of a company such as inventory, warehouse, product etc. The first point is to analyze the business model to be

considered and related strategic requests. Then this model is mapped to the logical and physical design in DB and from there it is used by DV for presentation. Business user makes use of their visual mining technique to gain insight of the presentations. These models represent the extension of the relational model which also can be multidimensional view over facts. There are two classifications of multidimensional models:

- Models which are based on star schema representing the relation between some dimension and facts and are extension for relational model.
- Models that are based on cubes of n-dimensional representing a single situation using multidimensional view.

For any BI system, model has to work in correspondence to a business request. So the model (star schema or cube) have to include this feature in addition to the relation between data. The requests from business heads are basically synthetic which are taken from the key performance indicator within the organization. The system should also have a friendly graphical user interface with the added feature of slicing or dicing of the data for obtaining a different perspective. So this product makes use of model which can perform these operations in real time without over head. This is done by extending star schema with the aggregate data in the fact table. And this fact tables are also used for drill down or roll up operations.

SPAN follows MVC design pattern. Basically MVC architecture has three main components i.e. model, view and controller. The functions of each component are:

- Model: It's nothing but SPAN database model, entities i.e. tables such as products, promotions so on. And the relations and mappings between them such as, a promotion can have multiple products and a retailer can participate in multiple promotions.
- View: are the JSP's used to display the end result/visualizations. It's a combination HTML, jquery, JS and D3.
- Controller: are servlets which serve requests and responses. And contains business logic and also interacts with JSP's and DB.

A. General model

The figure 1 displays the general model or the high level context diagram of the architecture, which is made use for building the SPAN.

This model includes the general components used for building the system and hence gives a clear understanding about the system. The first step is data uploading through the GUI which is further carried out through the ETL process. The next step is the communication of these input data for storage and computation in a specified format; this is done with the help of servlets. Finally, the computed result data objects are taken for the visualization where it is analyzed.
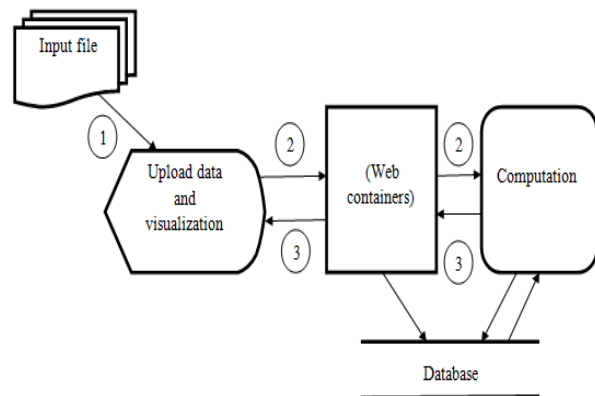

Fig. 1 A high level context diagram
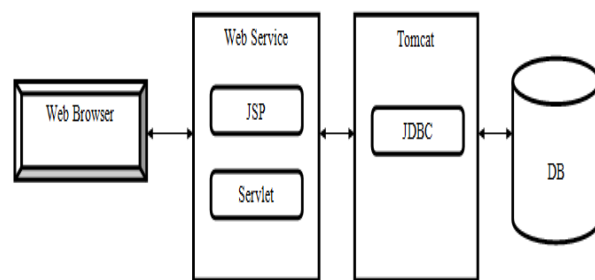
B. Communication Mechanism

Fig. 2 Communication mechanism of SPAN

For the communication mechanism, JDBC is used to fetch the data from the DB to Servlets and the system converts the result set into json objects and passes these objects to views of architecture as parameters. Then the D3 functions take json as input and hence it is passed for the visualizations. Figure 2 gives an eagle view to communication mechanism followed.

C. System Architecture

SPAN can associate information sources utilizing interfaces that are adjusted to the origin and organization of the information. This makes it conceivable to stack the information into the entry layer, the Persistent Staging Area. From that point, one or more layers of the DB architecture set up the information so it can be utilized for a particular reason and stores it in operational data store. While information can be reproduced from the source to the SPAN BI framework, it is likewise conceivable to get to the source information straight forwardly from the SPAN framework by utilizing documents repository.

The analytic engine gives strategies and administrations to investigation and planning (model design) and in addition non specific administrations, for example, caching. The model configuration is utilized to characterize models that permit information to be entered and changed in the extent of business planning. The Query Designer is used to create perspectives of the operational data that are enhanced for analysis or planning purposes. These perspectives are called queries and structure the premise for analysis,

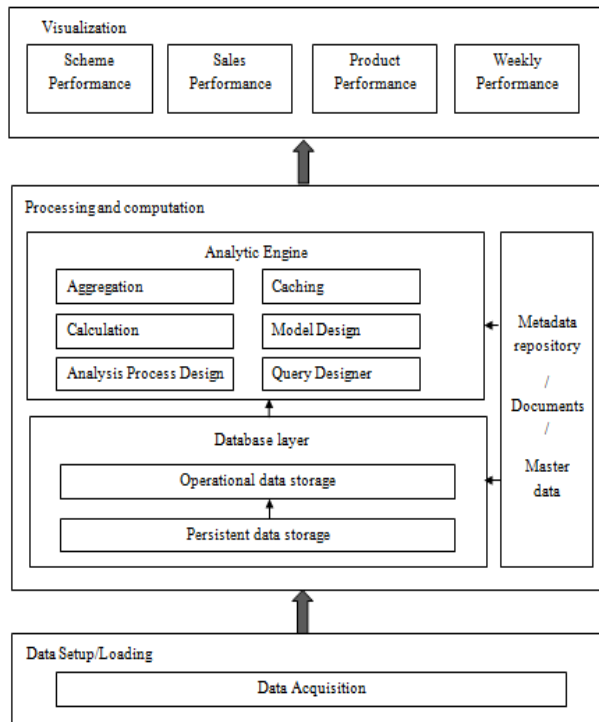planning and reporting. The figure 3 shows a complete BI solution for SPAN.

Fig. 3 System architecture

V. IMPLEMENTATION

BI techniques like DW, OLAP, and Data visualization are used for the implementation phase. The system takes the input as a CSV file from different functional areas or modules such as products, promotions, customer, sales, inventory and warehouse. For the business heads, the system is able to provide analytical reports and dashboards. Different data base management systems (DBMS) were tried as a platform for building the data warehouse as the storage solution.

The product is implemented in following steps.

- First, the data model was created with its name along with (key, value) and an information cube i.e. scheme performance, for data storage. For example, Product is a dimension name and it has various attributes and entities as key, value pair. The value figures are the transaction data to be analyzed.
- Second, mapping the source file data structure in the BI system and then transforming it to a particular target format. As there are different files to be provided as input, so mapping should be done correctly.
- Third, loading of the data is done to the target tables. When this process is executed the data are subjected to corresponding transformations and then finally directed to target tables were it is ready for computations.
- Fourth, writing the analytical functions using PostgreSQL. Everything needed for visualizations and various calculations logic is written which require

defining various queries and looping and joining of tables.
- Fifth, developing the front end to display the results obtained with various features of navigation and downloading functions.
- Finally, analyzing the data using visualization by making use of D3.js integrated to front-end.

For the computation there are mainly four module, namely, login and authentication, data setup and loading, promotional setup and analytical module.

VI. RESULT

The user must load the data from the application to the system and then click the compute button. The backend of the system does all the necessary computations and the front end utilises the result from the backend for visualisations to better understand the complex relationships.

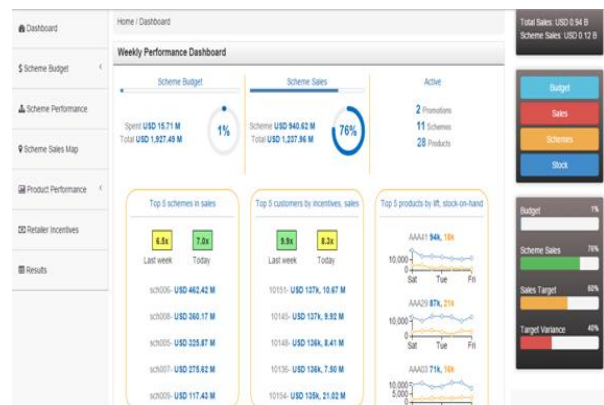The weekly performance dashboard, figure 4 displays the results based on KPI.

Fig. 4 Weekly performance dashboard

The decision maker sometimes requires making a comparison of the budget vs. Spent, and then this visualization is very helpful. It also gives the contribution ratio and scheme contribution towards sales as shown in figure 5.
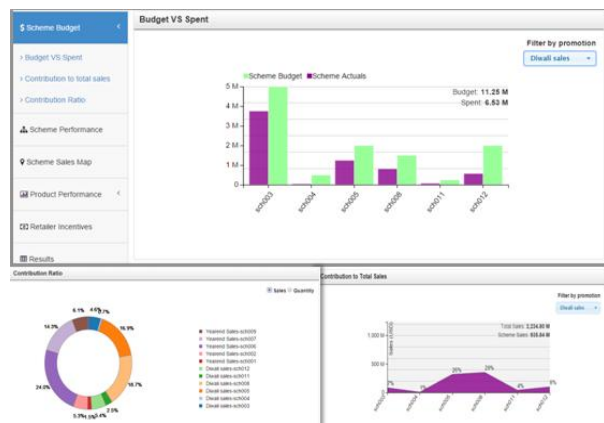

Fig. 5 Budget vs. Spent visualizations

Channel performance shows the terriority lifting which means finding the sales and volumes of the product for a particular territory and this is done by making use of lift analysis. It helps in drilling through various tables. Figure 6 shows channel performance visualization.

Fig. 6 Channel performance

The below visualisation figure 7 show the Promotion/Scheme performance- which means finding the performance of retailers in terms of sales done and number of products sold which is done by managing the promotion scheme budget and analyzes scheme performance in near real time with pin-pointed data insights.
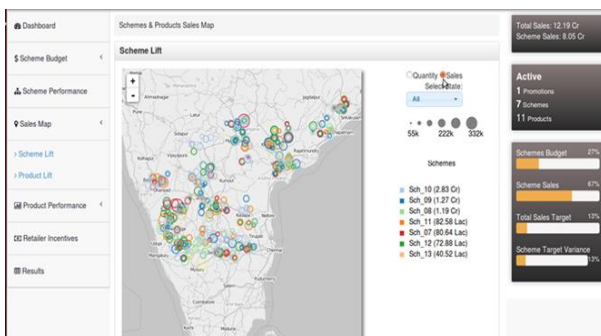

Fig. 7 Scheme performance

The details about the retailers help the business head to understand the retailer behaviour with respect to scheme sales. The product also provides a feature to download the report as shown in figure 8.

Fig. 8 Retailer Incentives

The product performance gives the performance in terms of volume of a product stocked out by using nominal comparison distribution. It displays the amount of product sold and unsold as shown in figure 9.

Fig. 9 Top sold and unsold products

It is clear from the results that SPAN converts raw data into meaningful visualizations which help Business-heads to analyze their business data in a very minimal amount of time. From the result analysis it becomes clear that all the objectives are met. As a result business-heads spend time in analyzing or introducing new schemes to improve the sales rather than spending time in figuring out where exactly sales is going down.

VII. CONCLUSION AND FUTURE ENHANCEMENT

This product helps the business heads to monitor and visualize the patterns of their sales business. The main functionality provided is an interactive graphical user interface or dashboard which helps in determining the area of adjustment in business which responds to the changing trends and developing consistent data based decision. The implementation makes the system fast, user friendly and cost effective. It requires granular level of technical expertise for the user to use the system.

The future version of SPAN can include the following features making it easier for the user to analyze. The feature with their benefits can be:

- Feature: Alerts for stock-out predictions.
- Benefits: Helps in ATP decisions based factual product lift data calculations.

This will help to promote schemes through SMS or email to targeted customers to attract and cross-sell or up-sell. And provide product availability list by warehouse for backordering of high-in-demand and out-of-stock products.

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