Business Intelligence Computing Issues

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"Business Intelligence"(BI) is a business management term that refers to applications and technologies used to gather, provide access to, and analyze data and information about their company operations. Business intelligence systems can help companies have a more comprehensive knowledge of the factors affecting their business, such as metrics on sales, production, internal operations, and they can help companies to make better business decisions.
Elaborate Information

Technology networks enable users to extract data (demographic and transactional) into structured reports, which can be distributed throughout an enterprise via intranets. Today the competitive forces prevailing in the world of commerce require firms to operate as efficiently and productively as possible in order to maintain and enhance market share, profitability and shareholder value. An essential element to achieving success involves the continuous enhancement of knowledge and understanding the business environment by all levels employees.

 Business intelligence is a constant routine of extracting corresponding information, creating and distributing accurate reports and updating cubes for information consumers to analyze, identify successes and failures and take appropriate actions. It is a continuous process of implementing policy and receiving how those policies either successfully or ineffectively achieved the goals they were set and to attain results in increased efficiencies for the organization. Business Intelligence incorporates analytical technology that produces forecasts and identifies cause and effect relationships corresponding to a particular business scenario. At this level, business intelligence involves the utilization of data mining.

The term data mining today is characterized as the technology that incorporates the application of statistical techniques in conjunction with mathematical formulae that attempt to identify significant relationships between variables in historical data, which can then be used to forecast, perform sensitivity analysis, (e.g., what happens to someone's target/dependent variable when he/she changes one or more of his/her explanatory/independent variables) or just identify significant relationships that exist in the data at hand. Some of the common methodologies that make up the world of data mining include: (a) Clustering, (b) Segmentation and classification, (c) Neural networks, (d) Regression, and (e) Association analysis.

Data storage, extraction and report writing technology helps users access and transform vast amounts of information located in data warehouses to a more user friendly format that creates business related reports in a timely fashion. As a result, the vast number of consumers of static reports within an organization receives information that corresponds to their functional areas in a timelier manner. These software applications also enable users to manipulate granular

level warehouse data into more manageable aggregated data that can be stored in a multidimensional cube. Once again, information consumers can readily analyze data according to business related subject areas. Effectively created cubes provide the environment for users to quickly slice and dice and filter on particular dimensions in order to conduct static analysis both in a numeric and graphic view.

BI Computing Implementation Issues

Understanding the various Business intelligence (BI) computation and implementation issues is very necessary to avoid failure in its implementation and BI execution. As we know that BI refers to various software applications meant for analyzing an organization's raw data. BI is an interdisciplinary complex field that includes several related activities like data mining, online analytical processing, querying and reporting. Any failure in BI implementation might cause huge loss for an organization as BI is useful for companies to identify new business opportunities, improve decision making, and to cut costs. BI is more than just corporate reporting and more than a set of tools to coax data out of enterprise systems. BI is also useful to identify inefficient business processes for re-engineering. Data feeding to BI applications should be clean and consistent in order to get benefit out of BI. BI is useful for making company's strategic decisions and also for tactical matters.

Business analytics is an important component of BI. BI uses data and analytical models. Yahoo and Amazon are not just e-commerce sites; they are extremely analytical and follow a "test and learn" approach to business changes. Wal-Mart uses large amounts of data and category analysis to dominate the industry. Information sharing is vital to the success of BI projects, because everyone involved in the process must have full access to information to be able to change the ways that they work. Employees modify their individual and teamwork practices that lead to improved performance by using BI systems. While implementing BI, companies must first analyze the way they make decisions and must consider the information that executives need to facilitate more confident and more rapid decision-making, as well as how they'd like that information presented to them (for example, as a report, a chart, online, hard copy). Discussions of decision making will drive what information companies need to collect, analyze and publish in their BI systems. Chief Information Officers (CIO) should be attentive to users' feelings while implementing BI. In order that BI technology system works effectively, companies should address the need to have a secure computer system that can specify different levels of user access to the data 'warehouse', depending on whether the user is a junior staff, manager, or executive. As well, a BI system needs to have sufficient data capacity; a plan for how long data will be stored (data retention). Analysts must set benchmark and performance targets for the system. Traditionally, the tools for accessing large amounts of unstructured data for the purpose of analysis were available only to people with years of experience in data warehousing or

data mining. Publishing to the Web by using data from multiple sources is something historically restricted to developers and consultants.

Critical Factors to BI Computing Success

We need to follow the following important steps while implementing BI computing for its success:-

a) Making sure that our data is clean
b) Paying attention to data quality
c) Training the users effectively
d) To deploy quickly, and then adjust as we go. We should not spend a huge amount of time up front developing the "perfect" reports because needs will evolve as the business evolves. We should deliver reports that provide the most value quickly, and then tweak them
e) To take an integrated approach to building our data warehouse from the beginning. We should make sure that we are not locking ourselves into an unworkable data strategy further down the road
f) To define Return On Investment (ROI) clearly before we start. We should outline the specific benefits we expect to achieve, and then we should do a reality check every quarter or six months
g) To focus on business objectives
h) To analyze how executives make decisions
i) Not to buy business intelligence software because we think we need it. We should deploy BI with the idea that there are numbers out there that we need to find, and know roughly where they might be
j) To consider what information executives need in order to facilitate quick, accurate decisions
k) To devise performance metrics those are most relevant to the business
l) To provide the context that influences performance metrics.

BI Computing Implementation Problems

Many organizations find the following Business Intelligence problems:-

a) The User resistance
b) Winnowing through voluminous amounts of irrelevant data and poor data quality
c) Getting standard data
d) Core of BI tools is still reporting rather than process management
e) Lack of appropriate attention to understand all the activities that make up a particular business process, how information and data flow across various processes, how data is passed between business users, and how people use it to execute their particular part of the process.

Business Intelligence Computing Implementation Methods

Different forecasting methods including *Time Series* (e.g. Seasonally Adjusted Regression, Moving average, Exponential smoothing, Extrapolation, Linear prediction, Trend estimation, Growth curve) or *Causal / econometric* methods those use the assumption that it is possible to identify the underlying factors that might influence the variable that is being forecasted (e.g. Regression analysis using linear regression or non-linear regression, Autoregressive moving average (ARMA), Autoregressive integrated moving average (ARIMA)), *Simulation, Probabilistic forecasting* are used for intelligent processing. Organization should choose an appropriate technique that should meet its requirements.

BI Computing based on Seasonally Adjusted Regression Model

A classical statistical technique such as, the Linear regression, tries to determine the relationship between two random variables. It is to develop a line ***Y = (M * X + C)*** that best fits a set of historical data points (x, y). Here, *M* and *C* stands for the slope and intercept respectively, and their values are estimated by the method of ordinary least squares. The method is called "least squares," because the estimates of *C* and *M* are to minimize the sum of the squared error estimates for a given data set. The estimates of *C* and *M* are often denoted by **C** and **M**. It can be shown that least squares estimates are given by

M = $(\Sigma(xi - \check{n})(yi - \check{r})) / \Sigma(xi - \check{n})^2$, and
C = $\check{r} - M^* \check{n}$, here **ň** is the *mean* of X values
and **ř** is the *mean* of Y values.

The table-1 lists the history demand data and the derived forecast, seasonal index, seasonally adjusted forecast data for various periods. A graph is plotted using demand data for various periods (shown in fig- 1).

Seasonal Index for each period number is the ratio of actual demand (history data) and the forecast data, and the seasonal index is obtained by taking the arithmetic mean of the seasonal indices for a specific period. Forecast Error is the difference between the Actual Demand and the Regression Forecast. From the fig.1, it is obvious that the obtained value of **M** is 40.476 and the obtained value of **C** is 295.36. The Best Fit Curve, here is Y = 40.476 * X + 295.36.
Seasonal Index for the winter quarter = (Actual Demand / Forecast Demand), for winter quarters. Seasonal Index for winter quarter (2004-2005) is 340 / 335.8, or 1.012.
Seasonal Index for winter quarter (2005-2006) is 400 / 497.7, or 0.803.
Average of these two winter quarters is (1.012 + 0.803) / 2), or 0.9.
That is, the Seasonal Index for the winter quarters is 0.9.
Seasonally Adjusted Forecast Model for the Period of *December-February:-*
Seasonally Adjusted Forecasted *Demand* = *(295.36 + 40.476 * Period) * 0.9*, or,
Seasonally Adjusted Forecasted Demand for the *Dec'06 - Feb'07* Period = 593.7.

Table 1. Regression Based Seasonally Adjusted Forecast

Period	Period Num	Actual Demand (History Data)	Forecast	Seasonal Index	Seasonally Adjusted Forecast
Dec'04 -Feb'05	1	340	335.8	0.9	302.25
Mar-May'05	2	400	376.3	1.08	406.4
Jun-Aug'05	3	350	416.8	0.85	354.27
Sep-Nov'05	4	560	457.3	1.15	525.8
Dec'05 -Feb'06	5	400	497.7	0.9	447.99
Mar-May'06	6	600	538.2	1.08	581.3
Jun-Aug'06	7	500	578.7	0.85	491.9
Sep-Nov'06	8	670	619.2	1.15	712.04

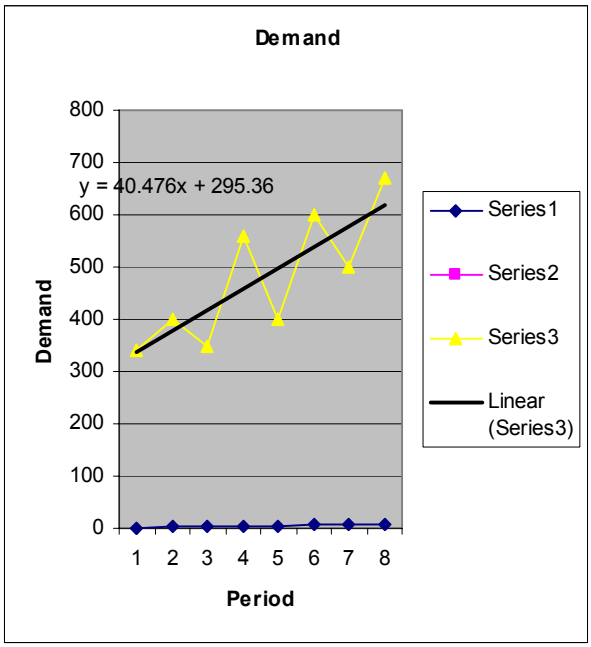

Figure 1. Plot for BI Computing Using Linear Regression Forecast

Business Intelligence Computing Benefits

BI computing helps many companies in raising Return on Investment (ROI) figures. Business intelligence has helped to identify cost-cutting ideas, uncover business opportunities, roll ERP data into accessible reports, react quickly to retail demand and optimize prices. Besides making data accessible, BI software gives companies more leverage during negotiations by making it easier to quantify the value of relationships with suppliers and customers in the supply chain cycle. Proper design of a BI system provides managers with information on the state of economic trends or marketplace factors. It also provides managers with in depth knowledge on internal operations of business.

Final Thoughts

To stay competitive, companies must meet or exceed the expectations of consumers. Real Time Business intelligence is going to be of high demand in the near future especially in the front line operations. This paper has briefly described many important factors for successful implementation of BI. We have tested the result of regression using previous years' data and 91% accuracy in the result has been obtained here by means of the seasonally adjusted regression model. This working model of BI is also applicable for other scientific forecasting tasks equally. For a suggested reading list, please contact the author: Goutam Kumar Saha <sahagk@gmail.com>

Author's Biography

In his last nineteen years' R&D and teaching experience, Goutam Kumar Saha has worked as a scientist in LRDE, Defence Research & Development Organisation, Bangalore and at the Electronics Research & Development Centre of India, Calcutta. At present, he is with the Centre for Development of Advanced Computing, Kolkata, India, as a Scientist-F. He is a fellow in IETE and senior member in IEEE, Computer Society of India, and ACM etc. He has received various awards, scholarships and grants from national and international organizations. He is a referee of CSI Journal, AMSE Journal (France), IJCPOL (USA), IJCIS (Canada) and of an IEEE Journal / Magazine (USA). He is an associate editor of the ACM Ubiquity (USA), International Journal of the Latin American Center for Informatics Studies (CLEIJ) and of the International Journal of Computing and Information Sciences (Canada). His fields of interest include software based fault tolerance, web technology, EIS, Ontology Engineering and Natural Language Processing. He can be reached via sahagk@gmail.com, gksaha@rediffmail.com.

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