

BUSINESS INTELLIGENCE: A NEW DIMENSION TO BUSINESS

Azimuddin Khan
Karunesh Saxena
Faculty of Management Studies
ML Sukhadia University, Udaipur (India).

Abstract

Due to numerous factors such as global competition, technological breakthroughs, changing regulatory requirements, customer expectation, structural changes, environmental concerns and also the impact of economic recession, business organizations are compelled to reshape and restructure their business processes.

Due to the fiercely competitive environment and also high stakes of making wrong decision, it has become inevitable to design and implement Business Intelligence solutions which proved to be immensely beneficial in decision making.

An attempt has been made in this paper to develop the conceptual framework pertaining to Business Intelligence and also to discuss its application, decision making as well as to analyze its significance in creating business value.

Keywords: Business Intelligence, Data Warehouse, ETL, Dashboard, Reporting and Querying.

JEL Classification: A19, D78, D79, O29

1. Introduction

Today, organizations have lots of data and available systems but they are not effective at turning all that data into useful strategic information. Over the past two decades, companies have gathered tons and tons of data about their operation. Information is said to double every 18 months. Most organizations are faced with information crises because the available data is not readily usable for strategic decision making. These large quantities of data are very useful and good for running the business operations, but hardly acquiescent for use in making decisions about business strategies and objectives. This happens due to spread of data across many types of incompatible structures and systems. Sales and marketing data is lying with newly developed systems whereas financial and accounting data be kept with old legacy systems, while material and inventory data is collected through client server application. Another problem which exists with data is that available operational data cannot be readily used to spot trends. Operational data is event driven. The data in organizations resides in various disparate systems, multiple platforms, and diverse structures. For proper decision making on overall corporate strategies and objectives, the organization has to integrate information from all the systems. Managers should be in a position to review the sales by product, sales person, district, region, and customer group.

2. Concept of Business Intelligence (BI)

Business Intelligence is the process of getting information about the business from available data sources. These systems are essential for organizations to keep track of their affairs. Data becomes information when you can use it to answer business questions, so you can understand business better. Business Intelligence allows you to answer the questions, so that executives and managers at all levels can respond quickly to changes in the business.

Business Intelligence can provide answers to the following questions:

- What happened?
 - What are my five top selling products?
- What is happening?
 - How do my sales this year compare to last year?
- Why did it happen?
 - Why are sales down in this region?
- What will happen?
 - What can we predict the sales of the next quarter to be?
- What do I want to happen?
 - How will our margins improve if we run this promotion?

Business intelligence starts with day to day information that organizations need to run the business and assist to take correct decisions based on facts at the right time and at the right place through out the life of the business by doing business analytics.

According to Devenport and Harris (2007), Business Intelligence (BI) is required to encompass analytics as well as the processes and technologies used for collecting, managing, and reporting decision-oriented data and information. The Business Intelligence architecture (a subset of overall IT architecture) is an umbrella term for an enterprise-wide set of systems, applications, and governance processes that enable sophisticated analytics, by allowing data, content, and analysis to flow to those who need them, when they need them. Top management, unit heads, functional heads, knowledge workers, and business analysts all need such information in various forms at various times to take decisions.

Mike Steadman (2003) defined Business Intelligence as the act of capturing raw data, then transforming and combining that data into information that can be proactively used to improve

business. The goal of BI is to empower decision makers, allowing them to make better and faster decisions.

As per Wikipedia, Business Analytics (BA) is the set of skills, technologies, applications and practices for continuous iterative exploration and investigation of past business performance to gain insight into and drive business planning. Analytics are a subset of business intelligence, a set of technologies and processes that use data to understand and analyze business performance. Analytics is a critical component of business intelligence, one that delivers the ability to derive more value from data and answer the more challenging questions.

Analytics enables us to make smart business decisions which provide a competitive advantage to leading organizations across the industry. Analytics such as statistical analysis, forecasting, predictive modeling and optimization, provides actionable intelligence and insight to support the changing need of the organization. It provides confidence to the business with maximum efficiency and effectiveness, supporting continuous learning and improvement for developing a sustainable competitive edge.

Strategic BI is to align multiple business processes with key business objectives through integrated performance management and analysis. The emphasis is on achieving long term, strategic goals like increasing revenues, cost controls, increasing market share and profitability with the improvement of customer satisfaction. Top level management uses Business Intelligence to assess the company's key performance indicators (KPI) in terms of targets. It also provides in depth analytics to take corrective action if it is not achieved. This type of analysis is based on time series data. Strategic business intelligence, is also called performance management (PM) with other prefixes like corporate performance management (CPM), enterprise performance management (EPM) or business performance management (BPM).

Tactical BI is to optimize business processes by identifying trends, anomalies, and behaviors for initiating appropriate management action at the right time. Tactical use of Business Intelligence addresses short term goals such as marketing campaigns, introduction of new products, pricing, buying of raw material, production scheduling and management of funds. The analysis is based on weekly or monthly data. It is used to predict business trends, provide periodic comparative study of sales and expenses, need for inventory to meet expected demands, advertisement schedules etc.

Operational BI is a means for helping businesses to make more informed decisions and take more effective action in their daily business operations. Operational Business Intelligence provides analytics based on real time, low latency and historical data to the operation managers. It can be used in reducing fraud, decreasing loan processing times, optimizing pricing, monitoring current campaign, checking order status etc. It helps employees to make knowledgeable decisions before their daily problems become corporate disasters. Colin White (2009) noted that "Competitive pressures ... are forcing companies to react faster to changing business conditions and customer requirements. As a result, there is now a need to use Business Intelligence to help drive and optimize business operations on a daily basis and, in some cases, even for intra-day decision making. This type of BI is usually called operational business intelligence. The objective of operational BI is to make more timely business decisions.

3. Applications of Business Intelligence

Companies like Netflix, Google, CEMEX, Proctor and Gamble, Amazon.com, Wal-Mart, Fed ex, Capital One have shown their presence as the best and fast growing companies. There to take decisions are based on analytics by extensive use of data, statistical and quantitative analysis, predictive modeling, forecasting, optimization and simulation techniques. In India, Business Intelligence Implementation is at its initial stage but a lead has been taken by banking, financial services and insurance (BFSI) sector companies. ICICI, IDBI, Standard Chartered Bank (SCB) and Max New York Life are the companies which have taken the lead in implementing Business Intelligence. Industries

such as airlines, telecom, retail, hospitality, and healthcare are also realizing the need of business intelligence. Borojardi, Ayatullah Tabatabai, Ayatullah Hakim, Imam Shariat Madar – none of whom was a sectarian and all of whom stood unflinchingly for Shia-Sunni unity and for Islam’s universal dominance. The Shia segment of the contemporary Islamic revolutionary movement has developed this line of thought and gone from strength to strength – specially in Iran, Labnan and Iraq⁴ – in the twentieth century.

Table1: Examples of BI Applications

<p>Retails</p> <ul style="list-style-type: none"> - Sales patterns - Integrated customer view - Campaign management - Customer valuation - Analytical CRM - Space planning - Mark down optimization 	<p>Manufacturing</p> <ul style="list-style-type: none"> - Order life cycle - Inventory analysis - Quality assurance - Supplier compliance - Distribution analysis - Defect analysis - Preventive maintenance analysis - Schedule analysis
<p>Telecom</p> <ul style="list-style-type: none"> - Call behavior analysis - Fraud detection - Service usage analysis - Number portability - Promotion effectiveness - Unbilled sales analysis - Price plan optimization 	<p>Healthcare & Pharmaceutical</p> <ul style="list-style-type: none"> - Patient flow analysis - Health plan analysis - Equipment utilization - Pharmaceutical analysis - Testing and clinical trial analysis - Sales force analysis - Back order and lost sales analysis
<p>Financial</p> <ul style="list-style-type: none"> - Credit Risk - Monetary risk - Asset management - Liability management - Fraud detection - Compensation analysis - Regulatory compliance - Aging analysis 	<p>Government</p> <ul style="list-style-type: none"> - Policy formulation - Logistics - Disaster management - Citizen relationship management - Education management - National security - Crime analysis - Health & welfare analysis - Fraud detection
<p>Airline</p> <ul style="list-style-type: none"> - Revenue management and accounting - Customer relationship management - Crew operations - Security and fraud - Flight operations - Peak performance analysis 	<p>All industries</p> <ul style="list-style-type: none"> - Profitability - Performance analysis - Value chain analysis - Profiling - Operation management - Attrition analysis - Customer service analysis - Customer complaint analysis

4. Business Intelligence Solutions

With the consolidation of Business Intelligence use over the last few years, Business Intelligence market will be driven by some big companies. There are seven major players in the Business Intelligence solution provider industry, namely SAP (Business Objects), IBM (Cognos), Oracle (Hyperion), Microsoft, Information Builders (IBI), MicroStrategy, and SAS. MicroStrategy, SAS and IBI are independent and mainly focused on BI only. 75% of the market share has been acquired by five major vendors only.

In the current climate with economic downturn, proactive business people will focus on improving business processes to gain efficiencies with the same or lower budget, improving customer service to reach new and existing customers, complying with regulation; and addressing risk associated with business. Business Intelligence solution can be implemented based on its architecture. Following Conceptual framework of BI, helps in implementing the successful BI.

- o Existing IT Setup for data collection
- o Data transformation tools
- o Data warehousing and Data Mart
- o Tools for Analytics

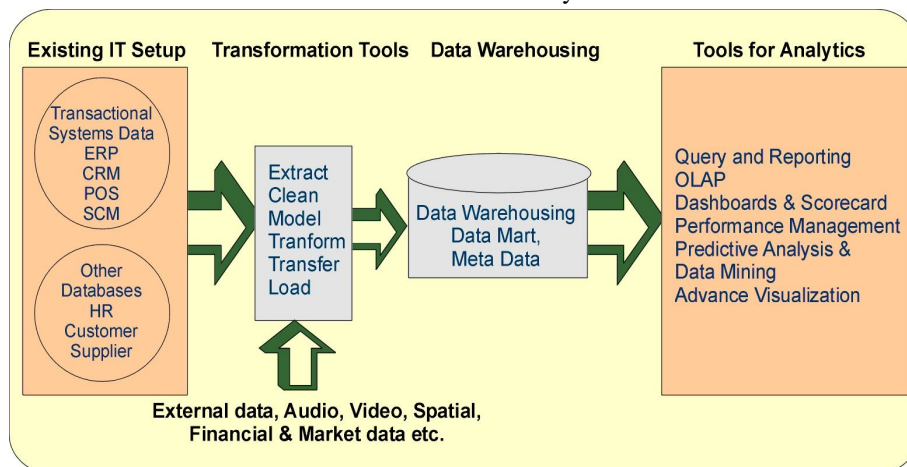


Figure 1: Framework of Business Intelligence (Source: Khan & Saxena, 2010)

We must begin by defining and designing data management strategy to ensure that the organization has the right information and uses it properly. The challenge is to collect clean data, from various sources so that BI solutions deliver the correct actionable information to management at different levels. The organization should concentrate on quality of data, and investment must be made to ensure high levels of data quality. The duplicate data should be unified as it comes from various sources. The data coming from the transaction system is atomic level data and should be recorded in detailed form.

The integration of data is important as it is generated by various operational systems with different naming conventions, attributes, codes, business rules and measurement. Inconsistencies have to be removed by standardized various data elements. The data should be distributable among various users at various levels located at different locations.

Most companies don't have a precise view about their customers, products, suppliers, inventory or even employees. Whenever organizations add new enterprise applications to "manage" data, they unwittingly contribute to an overall confusion about an organization's overall view of the enterprise. As a result, the concept of master data management (MDM), creating a single, unified view of an organization is growing in importance now a days.

Data transformation is one of the most important stages, where the data coming from various sources gets into the data warehouse after going through the various stages of data cleansing. It is necessary to first clean and validate data using business rules through data cleansing tools. Transformation procedure defines business logics which maps data from its source to destination. ETL (Extract, Transfer and Load) tools are very mature and helpful for reducing the development time, managing the flow of data from source to destination and uploading data to the tables of data warehouse. ETL tools can assist in ensuring that data is cleansed and conforms to standards before entering into the data warehouse. The ETL processes consist of the following steps:

Initiation - Building reference data – Extract from sources
– Validate – Transform – Load into stages tables – Audit reports
– Publish – Achieve - Cleanup

Effective data ETL processes represent the number one success factor for data warehouse projects and consume 70% of the total time spent on the project. Data extraction also takes time depending on the complexity of source systems. The data extraction strategy can be defined by considering sources identification, extraction method (manual or tool based), extraction frequency (daily, weekly, quarterly etc.), time window for extraction process, and job sequencing and exception handling for input records that cannot be extracted.

Inmon (1995) defined a data warehouse as a centralized repository (collection of resources that can be accessed to retrieve information) of an organization's electronically stored data, designed to facilitate reporting and analysis. Inmon (1995) is one of the leading proponents of the top-down approach to data warehouse design, in which the data warehouse is designed using a normalized enterprise data model. A data warehouse is a subject-oriented, integrated, time-variant and non-volatile collection of data in support of management's decision making process. The top-down design methodology generates highly consistent dimensional views of data across data marts since all data marts are loaded from the centralized repository and also proven to be robust against business changes. Generating new dimensional data marts against the data stored in the data warehouse is a relatively simple task. The main disadvantage to the top-down methodology is that it represents a very large project with a very broad scope.

Kimball (2002) has given the bottom-up approach where data marts are first created to provide reporting and analytical capabilities for specific business processes. Data marts contain, primarily, dimensions and facts. Facts can contain either atomic data and, if necessary, summarized data. The single data mart often models a specific business area such as sales or production. These data marts can eventually be integrated to create a comprehensive data warehouse.

Data Mart: To improve the query performance, a partitioned sector of the overall data warehouse is known as Data Mart. The emphasis of a data mart is on meeting the specific demands of a particular group of knowledge users in terms of analysis, content, presentation, and ease-of-use. Data marts are designed to support business function like sales, marketing, finance, inventory, HR, production etc. In general, a data warehouse tends to be a strategic but somewhat unfinished concept; a data mart tends to be tactical and aimed at meeting an immediate need.

Meta Data: Meta Data is the data about data. It is basically a data dictionary which acts as the glue that connects all the part of the data warehouse. Metadata can be stored and managed in a database, often called a registry or repository. It provides information about the contents and structures of data, such as means of creation, purpose of the data, time and date of creation, creator or author of data, placement on a network (electronic form) where the data was created, what standards used etc.

Organizations are increasingly using of business intelligence to identify cost saving opportunities and to improve quality of products and services as a way to beating the competition. There are many categories of tools available in the Business Intelligence market from simple query and reporting to complex performance management and advanced visualization systems. Business Intelligence vendors are now also consolidating tools in every category to provide complete business intelligence solutions to companies.

However, some organizations still prefer to have a 'best of breed' strategy in which they select Business Intelligence tools in each category from different vendors.

i. Query & Reporting:

It is the process of putting a query to database, then formatting it to create a report. There are two types of reporting,

one is “Production Reporting” and the other is “Business Query and Reporting”.

ii. Online Analytical Processing:

The objective of Online Analytical Processing (OLAP) is to promote information based insight and understanding by providing decision makers with information they need quickly, and in the form they want it. An OLAP allows manager to tailor their information and knowledge requirements by discriminating according to user defined criteria by making comparisons, analyzing trends based on past and current data. Online Analytical Processing is a category of software tools that provides analysis of data stored in a database. The OLAP cube consists of numeric facts called measures which are categorized by dimensions. Measures are derived from the records in the fact table and dimensions are derived from the dimension tables.

According to industry visualization expert Stephen Few (2006), a **dashboard** is a visual display of the most important information needed to achieve one or more objectives; consolidated and arranged on single screen so the information can be monitored at a glance. These tools can display multiple objects by connecting from multiple data sources. These tools provide the user specific dashboard at all the three hierarchical levels of the organization by combining ease of use with meaningful information.

Scorecards are a management system that enables organization to set, track, and achieve key business strategies and objectives. It has four business perspectives Customer (e.g. Customer satisfaction), Financial (Operating income and cash flow), Internal business process (Productivity) and Learning & Growth (No of training Hours). It focuses on metrics and compares it with targets. It also generates alerts when potential problems arise, analyzes the root cause of problems by exploring relevant information in detail and allows the user to take corrective action. The scorecard allows a user to answer the question: “How does my

goal support the corporate strategy?” Scorecards enable an organization to improve processes and reduce cost by aligning strategy, plans, targets, and forecasts by creating a consolidated, strategic view of existing data.

Performance Management is involved with monitoring and managing an organization’s performance, according to key performance indicators such as revenue, return on investment, overhead, and operational costs. These applications include budgeting, planning and financial consolidation. Performance Management may be related to workforce planning, supply chain optimization, capacity planning etc. other than finance. Craig Schiff (2007) stated that performance management is really about the business process that enables a business to set strategic goals and measure how successfully it is performing in terms of its objectives. The technology that supports these processes include BPM packaged applications such as budgeting, planning, and consolidation, as well as BI tools such as ETL, Query and Report, and OLAP cubes.

Predictive Analytics and Data Mining provide highly specialized functionality for statisticians and skilled senior analyst to find the pattern in data and generate statistical models and rules. These tools are based on neural network, decision tree, artificial intelligence, Bayesian network theory, and statistics.

Predictive analytics is an area of statistical analysis that deals with extracting information from data and using it to predict future trends and behavior patterns. The core of predictive analytics relies in capturing relationships between explanatory variables and predicted variables from past occurrences, and exploiting it to predict future outcomes. The accuracy and usability of results will depend greatly on the level of Business and Data Understanding of the user.

Data mining is the technology for the extraction of hidden predictive information from large databases, with great potential to help companies focus on the most important information in their data warehouses. Data mining is more popular in strong consumer focused organizations such as retail, financial, communication, and marketing firms. It enables these organizations to determine relationships among “internal” factors such as price, product positioning, or staff skills, and “external” factors such as economic indicators, competition, and customer demographics and enables them to determine the impact on sales, customer satisfaction, and corporate profits.

Advanced visualization and discovery tools often use an in memory architecture to provide highly interactive dashboards. Advanced visualization and discovery, are interactive ways of working with the data. With advanced visualization, the visualization and query process is one and the same. It’s much more exploratory.

The “in memory technologies” basically load data from sources into the memory of the computer they are running on, rather than landing or reading data to the disk as is done in other business intelligence tools. It provides nearly instantaneous response times to user queries. These tools provide the business user to see the data in graphical form including representation of data in heat maps, histograms, waterfall charts, decomposition trees, geographic maps, spark lines, and bullet graph etc.

5. Business Value of Business Intelligence

In the 1990s, most business reports were developed by IT departments, even though the implementation of ERP, SCM and CRM was started by the organization to get the benefits of transactional efficiency, process improvements and integration, process automation, better control over day to day operation, and information availability across the organization on reduced cost and time. These systems had generated huge volumes of

data which were stored in the newly developed concept of data warehousing. With the attainment of maturity Data Warehousing, organizations were able to collect good quality transactional data, which in turn, initiated the concept of business intelligence tools where business reports were developed by business users in place of IT.

Business Intelligence can empower people to make their decisions effective and correct. It can deliver many tangible and intangible benefits to the organization. These include.

- Alignment of an organization around a set of Key Performance Indicators (KPIs) & Metrics and generate graphical presentation
- Better strategies and plans
- Respond faster to new opportunities and changing demands
- Timely and accurate data helps to identify and quickly address inefficiencies
- Improve productivity by reducing the decision making cycle time
- Reduce costs by minimizing the time required to collect data
- Optimize customer relationships and increase customer loyalty
- Allows organizations to monitor competitor information, giving extra edge needed to stay ahead
- Supports interactive exploration across multiple dimensions of business
- Helps to identify the issues that fall outside norms and signals potential problem
- Supports what-if analysis to model the operational and financial impact of multiple scenarios on revenue, cost and cash flow
- Provides the predictive analysis based on the current and past data

A structured approach should be used to capture the business value of BI investments by implementing business intelligence best practices, involvement of top level executive and IT department, support of finance, engagement of end users, strategic alignment and business process engineering, change management and encouraging the data through out the organization

More and more organizations are now implementing business intelligence in their IT setup. With the increase in demand of BI, a lot of research is being done to provide ease of use with reduction of cost for its deployment. New initiatives such as Master Data Management, Customer Data Integration, Business Process Management and Service Oriented Architecture, Software as a Service, and Decision Services will enhance BI usage business intelligence market;

Software as a Service (SaaS) BI is gaining momentum in small and mid size organization which reduces the cost, complexity, and economies on IT resources and time requirement to implement. Instead of purchasing and implementing BI solutions, organizations are taking services from vendors through secure internet connection.

With the implementation of business intelligence solution, organization can generate actionable information by utilizing various analytics. Dashboard and Scorecard are the best tools to visualize the organizations performance. Business intelligence usage increases the business value in terms of efficiency, cost reduction, margins, profits and customer satisfaction.

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