A REVIEW OF REAL TIME BUSINESS INTELLIGENCE

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Business Intelligence (BI) is becoming more necessary for firms to make better decisions. In today’s competitive environment analyzing data to predict market trends and to improve enterprise performance is an essential business activity. This requires data analysis and resulting actions to be carried out in real time in keeping with frequently changing customer demand and regulatory needs. This paper presents a framework for real time business intelligence and their role in business firms along with hurdles and opportunities it creates.

Key words: Business intelligence (BI), traditional business intelligence, real time business intelligence.

INTRODUCTION

The speeds at which today’s businesses are moving fast have changed the competitive landscape drastically. Customer loyalty is driven by product quality and price as well as a new set of criteria such as product choices, service quality and ease of access. Today’s customer requires intelligent, technology driven automated services. Corporations have increasingly come to realize that performance data is important corporate asset. In today’s tough competitive world and strict economic climate the lack of tangible return on investment makes it difficult to fund activities to manage data as a strategic asset. Data management platform of any organization would comprise of data sources like data marts, data warehouses, data models, extract, transform load tools, data cleaning and integrating mechanisms, and other data repositories. Data need to be cleansed to ensure integrity and consistency before data marts are built.
Business transactions, customer demographics, seasonal ebbs and flows, supplier’s data and inventory levels all need to be analyzed and managed to arrive at informed decisions. The ability to perform timely an accurate enterprise analytical solutions depends on data bank which every organization needs to maintain. As companies increasingly depend on analytical tools, the business intelligence has acquired over-riding importance in the enterprise IT infrastructure.

All corporate decisions need to be made in real time whereby many people are affected simultaneously. Business time is increasingly becoming real time. Earlier, customers used to call a company’s accounting department with a query on statements or invoice which used to be retrieved from filing cabinets. Most often the information was sought on phone which was sent a few hours later or even few days afterwards. Today a customer need not call the accounting department but to obtain all needed information online. One can quickly find out when the cheque was dispatched and obtain the courier tracking number and expected delivery date. Online data availability alongwith instant data analysis has improved business intelligence. This facility has improved organizational competitiveness by improving its performance indicators.

Traditional business intelligence has transformed monitoring business processes to driving business and marketplace. What is happening today will determine what will happen tomorrow. Thus funds need to know what is happening at present in order to analyze future course of events. Unless the technology is real time the business cannot consider real time as right time. The real time business intelligence should deliver real time capabilities to facilitate choice of most appropriate latency level. The term ‘right time’ should be a component of decision latency - a user preference that determines when the action would take place. In fact business intelligence is relevant for all important areas, be it, Enterprise Resource Planning (ERP), Customer Relationship Management (CRM) or Supply Chain Management (SCM).

It has been attempted to take stock of both traditional and real time business intelligence. It reviews opportunities and difficulties of business intelligence with reference to diverse business needs.
Business intelligence involves several related concepts such as query tools, multidimensional analysis, Online Analytical Processing (OLAP) and respective data mining. However, for an end-user it is set of technologies that support their decisions. The important issue in incorporating business intelligence is that different tools may be required by different departments based on their operational requirements in an enterprise. Different people request for different reports, used different tools and look for different answers. This makes the data management more complex. The key issue to understand is what the use of data is, what the need to use is and what type of data is available.

Business intelligence helps via enterprise portal to analyze specific business areas in such a way that users and employees raise their own queries using check boxes and menus. Business intelligence combines several business processes together so that all decisions are made in unison. Every organization makes decisions and service customers based on data it creates and maintains. A data warehouse needed to analyze business trends to establish a strategy for the future.

Any business process generates variety of process related data which needs to be examined and duly linked with other company data to facilitate enterprise-wide analysis. Company-wide business process analysis is sum total of process related data analysis of individual functions. Firms that focus on various business performance management issues have to combine their both strategic and operational issues. Mapping and monitoring of strategic and operational issues involves monitoring of related key performance indicators (KPIs) which helps implement organizational strategies (Melchert, et al., 2004). Mapping can help detect process related variations and detect areas for remedial actions within respective business processes. Effectiveness of effect of business intelligence on business processes can be analyzed in terms of improvement on productivity levels of different processes, which in turn drive productivity or reduce costs (Williams and Williams, 2003)

RELATED LITERATURE REVIEW

An early reference to business intelligence was made by Gartner in early 1990s. Business intelligence denotes an analytic process that transforms
internal and external data into information about capabilities, market positions, activities, and goals that the company should pursue in order to stay competitive. It thus covers data warehousing but with interactive features for monitoring and decision-making, and resulting actions to suit a combination of corporate and business strategies (Golfarelli, et al. 2004). Business intelligence covers such features as Online Analytical Processing (OLAP), querying and reporting, or data mining that facilitates higher performance and productivity standards.

According to Adelman, et al. (2002), business intelligence encompasses a broad range of analytical software and solutions for gathering, consolidating, analyzing and providing access to information for improve decision-making. According to Malhotra (2000), business intelligence facilitates connections in the new-form organization, bringing real-time information to centralized repositories and support analytics that can be exploited at every horizontal and vertical level within and outside the firm. Business Intelligence describes the result of in-depth analysis of detailed business data, including database and application technologies (Gangadharan and Swamy, 2004). Business intelligence is broad-based covering knowledge management, enterprise resource planning, decision support systems and data mining (Gangadharan and Swamy, 2004). Fig. 1 presents a schematic view of business intelligence.

Fig 1 A Schematic View of Business Intelligence

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An organization can be perceived as made up of single or several value chain comprising primary secondary activities that create value for customers. Denison (1997) examines several activities critical for a value chain.

Business intelligence is most important aid for performance improvement in process oriented industry. Companies need to have relook at business processes for effectively managing and controlling business. According to Grigoria, *et al.* (2004), management information systems are designed only for traditional reporting but not necessarily for measuring performance of business processes. Geishecker, (2002); and Moncla and Arents-Gregory (2003) present closed loop support interlinking strategy formulation and process design for operationalizing business intelligence. In order to achieve competitive advantage, companies strive towards reducing time needed to react to relevant business operations. By organizing and deploying business intelligence as tailor made for its own characteristics value of data stores can be harnessed for improved organizational value. Data warehousing and business intelligence approaches form integral part of decision support systems (Seufert Andhreas and Schiefer Joesf, 2005). However, they are not adequate in dealing with real-time and closed loop decision making (Seufert Andhreas and Schiefer Joesf, 2005). Data warehousing is generally more appropriate for retrieving information in bottom-up but many not be equally effective in top-down hierarchy. Williams and Williams (2003) accordingly emphasize on achieving business value by using traditional data warehousing and business intelligence tools.

Real-time analytics (Raden, 2003) enables to use all available resources in an organization to improve operations and quality of service at any moment they are needed. Any change offering anywhere in the system is automatically taking into account and acted upon by an analytical process. Real-time analytics complement real-time operational systems. Agile organizations will need to measure, evaluate and react to events with a closed-loop of telemetry-like information, rules, decisions and triggers, all in real-time.

Till date, most of existing data analytical solutions are based on traditional data warehousing concepts. However, according to Chen, *et al.* (2000); and
Streambase Systems (2005), more and more data originates from data streams rather than from finite stored datasets. This especially applies for manufacturing processes, click-streams (Widom, 2003; and Babcock, et al., 2002) and needs detail records in telecommunications. The Gartner Group identified requirement for real-time business intelligence as ‘zero latency’. There are several research results available such as zero-latency enterprise (Compaq Corp, 2003; Gartner, 1998; Hewlett-Packard, 2002), active data warehousing (Langseth, 2004; Thalhammer and Schrefl, 2002; Terr, 2004; White, 2002; Haisten, 2002; Brobst and Ballinger, 2000), real time business analytics (Raden, 2003), service oriented architecture (Pallos, 2001), etc.

Objective of ‘zero latency strategy’ by enterprises is to speed up the flow of information and business processes to achieve competitive advantage and reducing the service time by business processes. In essence, this means that business processes organizations have to sense an event and respond to that event quickly and correctly.

Active Data Warehousing (Thalhammer and Schrefl, 2002) employs active mechanisms of event-condition-action rules to extend (passive) systems with reactive capabilities. An active data warehouse is event-driven that reacts (Brobst and Ballinger, 2000) in a time-frame appropriate to business needs, and results in tactical decisions rather than mere report generation.

ETL (extract, transform and load) is essentially a data integration technology. In ETL, data is brought from several sources, transformed, correlated and loaded into a real time data warehouse, which is done on weekly or daily basis. Users may raise occasional queries and contain segmented results as they knew how many blankets were sold in Delhi during a storm and separately cross referenced with how many blankets were sold in other locations. The amount of data was statistically meaningful for real time business intelligence to make predictive analysis. If there was a storm in China the business could predict that blankets sales would jump 60 per cent in Delhi but would remain unchanged in Chennai. This means the time value of data became important. That is, rather than monthly weekly updates, data warehouse started receiving daily and hourly updates. With the help of operation data warehouse a business analyst can analyze the quantity of blankets sold as a storm hits Delhi and call the store managers to move the merchandise from the warehouse to shelves.
and offer discounts at the checkouts. Data updation in a warehouse has to be as fast as real time, there is much less gain in knowing the data when the event is past except when the past data is to be used for forecasting.

Businesses no longer want to know what has happened but they want to know the underlying reasons. Rather than knowing how many blankets were sold in December, businesses want to understand how many were sold in China during a storm. Business Intelligence provides unified integrated view of business activities. A retailer knows how many blankets were sold in December across India and therefore make better purchasing and stock management decision for the upcoming year.

Nguyen Manh, et al. (2005) introduced an advanced business intelligence architecture that covers the complete process to sense, interpret, predict, automate and respond to business environments. It aims to minimize the reaction time for business decisions. Nguyen Manh, et al., (2005) evolved an event-driven IT infrastructure to operate business intelligence applications which enable real-time analytics across corporate business processes, notifying the business of actionable recommendations or automatically triggers business operations, and effectively minimizing the gap between business intelligence systems and business processes. Seufert Andhreas and Schiefer Josef (2005) evolved an architecture for improved business intelligence that serves to increase the value of business intelligence by reducing action time and interlinking business processes and decision making.

New service-oriented-architecture link different data sources concurrently, which help integrate various data sources thus making them interactive and useful for variety of applications. A customer might be on the phone or an e-commerce website for only a few minutes, accordingly the company has to be ready to furnish the desired information instantly.

Fig. 2 shows real-time business intelligence architecture. Robinson Mark (2002) evaluated the completeness and adequacy of business intelligence infrastructures based on the information available from effective data integration process, continuous monitoring processes, automated information delivery process, fully automated warehouse administration infrastructure, availability of information on standardized dimension such as customer, product, and geography, higher end user acceptance, etc. Fig 3 depicts real-time business intelligence architecture.

Concept of service-oriented architecture is a new area of research in business technology area. These service-oriented architecture tools provide multiple interfaces to various heterogeneous types of data and integrate different data sources in an organization which facilitates diverse data application simultaneously. Several service-oriented architecture adapters and interfaces have been developed for integrating and accessing various heterogeneous data sources. Lawton George (2006) illustrates the information on these type of adapters that enables Google One-Box search appliance to track in real-time data stored in more than 85 types of data-bases and generated by more than 150 transaction types.

![Real Time BI Architecture](image)

**Fig. 2** Real Time BI Architecture. Adapted from Nguyen Manh, *et al.* (2005)
Business intelligence do not change the way people carry out business rather they enhance how they do it. Real time business intelligence are deployable across all levels of an enterprise, from top to bottom, and can be applied immediately to specific day-to-day business issues, such as with a customer call center, where information about each customer (e.g. account balance) should ideally not only be current in real time but also suggestive of what needs to be done further. Real time business intelligence delivers key metrics and precisely tailored information directly to casual users and decision makers. While enterprises will increasingly require business intelligence tools, complementing these capabilities with analytic intelligence applications substantially this increases the overall value of their enterprise information store and drives both productivity and financial performance.

REAL TIME BUSINESS INTELLIGENCE BENEFITS AND HURDLES

A study reports that a business intelligence implementation generates a median five-year return on investment (ROI) of 112 per cent with a mean payback of 1.6 years on average costs of $4.5 million. Of the organizations included in the study, 54 per cent had an ROI of 101 per cent or more. Largest benefit was due to ‘business process enhancement’, where business intelligence was applied to operational decisions in areas such as logistics, call centers, fraud detection, and marketing campaign management (Eastwood, et al., 2005). Real time business intelligence benefits do not come without effort. From an organizational perspective, business units affected by the business intelligence project need be intimately involved and committed with the project.

Data needs to be one and the same across the organization though some departments may tend to distort due to vested interests. Whatever data is generally distorted it should be reviewed whether it is really required or whether it is dispensable. An organization which successfully integrate business intelligence into a business process can achieve a significant return on investment. Some organizations may view it differently. The cost of deploying a large data warehouse to support a business intelligence system is still high for many organizations. However, calculating business intelligence systems’ return on investment is difficult as business intelligence provides business related insights rather than direct links to sales or cost savings.
Some firms regard that business intelligence does not integrate with their CRM and ERP applications. Vendors need to offer business intelligence systems only as stand-alone products that did not always integrate well with other corporate software such as customer-relationship management (CRM) and financial applications (Lawton George, 2006). As a result, firms do not achieve worthwhile results in such areas.

While ERP processes integrate firms data pertaining to firm’s internal processes while supply chain management (SCM) integrates processes and monitors firm’s external data. Integrating them and giving a correct relevance and timely business decisions based on bundles of very large volumes of both internal and external data is possible only with real time business intelligence. The biggest challenge is the users’ ability to determine how to take action based on the results of real time business intelligence analysis in an organization.

There exists no widely implemented benchmarked real time business intelligence standards for any firm. This exacerbated limitation has caused firms to consider business intelligence as complex systems. Real time business intelligence products and their interfaces have also been more complex than most applications need and require too much technical sophistication for most employees to set up and use effectively. Many such tools are appropriate for very small proportion of company’s employees.

Another limitation in real time business intelligence is that data marts needed to store amounts of data necessary as business intelligence operations are too expensive for most firms. A terabyte-sized data mart cost $5 million five years ago. However at present though use of inexpensive open source software as well as proprietary software and hardware are far less costly than in the past which has subsequently reduced the cost of marts (Lawton George, 2006).

CONCLUDING REMARKS

Real time business intelligence makes possible seamless integration of related technologies into a coherent business intelligence environment that facilitates a simplified data delivery and low latency analytics. Businesses need to
operate in real time to stay competitive. Enterprises today demand quick results. It is becoming increasingly important that not only the business analysis is done on real-time data, but also actions in response to analysis of results are performed in real time that instantaneously change parameters of business processes.

The company management needs an in-depth understanding of its business processes and a clearly defined set of goals to be achieved. Technology platform for business intelligence should be capable of delivering information on demand, at the point of an operational decision, in a cost-effective manner. Real payback for business intelligence applications comes from business value disguised in the organization’s data. Training of business staff and top management support are vital for the success of business intelligence (Gangadharan and Swamy, 2004).

In order to support firms that are service oriented and desperately seeking customer loyalty and retentions timely, it is necessary to revisit traditional business intelligence concepts that integrate and consolidate information in an organization. Real time business intelligence systems typically support querying, reporting and multidimensional analysis of any enterprise data in real time. Real time business intelligence is certainly appropriate for supporting the needs of many companies.

REFERENCES


INTERVIEW

Some months after 21-year old Gandhi returned to India in 1891 after he had been called to the Bar in England, he looked for a part-time job, if possible of a literary type, since his practice was not coming along too well. On spotting an advertisement by ‘a famous high school’ in Bombay for someone who would teach English for an hour a day, Gandhi applied for a post that offered Rs. 75 a month, which was considered good pay in 1891 or 1892.

Certain that his skills in the English language were more than adequate for the job, young Gandhi went off in high spirits when called for an interview, but was rejected because he did not possess a B.A. degree at that time. ‘But I have passed the London matriculation with Latin as my second language and I am a Barrister,’ he pointed out. He was told that a graduate was needed – not merely someone who could teach English.

- Rajmohan Gandhi

BEST REVENGE

If you prick us, do we not bleed? If you tickle do we not laugh? If you poison us, do we not die? And if you wrong us, shall we not revenge? If we are like you in the rest, we will resemble you in that.

- William Shakespeare

The best revenge is to be unlike him who performed the injury.

- Marcus Aurelius

An eye for an eye leaves everyone blind.

- Mahatma Gandhi

Before you embark on a journey of revenge, dig two graves.

- Confucius

CASUE AND EFFECT

Life is a perpetual instruction in cause and effect.

- Ralph W. Emerson

Everything has a cause and for everything there is an effect.

- Walter J. Turner

The will is not free – it is bound by cause and effect – but there is something behind the will which is free.

- Swami Vivekananda