Advance Architecture of Business Intelligence for Collaborative Competitive Environment : An IT Perspective

Sunil Kr.Pandey[1] , R.B.Mishra[2]
1-Department of Computer Sciences ,SMS, Varanasi, India
E-mail:sunilmca5@rediffmail.com
2-Department of Computer Engineering , IT-BHU, Varanasi, India
E-mail:rbmbhu@yahoo.com

Abstract

There is a need for a new architecture that serves the needs of the enterprise in the 21st century – an updated architecture that provides a foundation for business intelligence (BI) , customer data integration, predictive analytics, master data management and more. There are many other aspects of this architecture that are intriguing as well, such as the support of online transaction processing, the linkage of structured and unstructured data and selection/deselection of certain unstructured data as part of the infrastructure.

The best infrastructure in the world will not deliver the desired results from an operational business intelligence application unless the very best planning and management of the project are in place and are practiced. Business intelligence will always have a key role to play in serving as a platform for decision making as we have to choose between several courses of action. Only if there is a rigorous and methodical analysis of the facts we have at hand, will we purposefully move in the right direction. And, illicit trade makes it very clear that, at the very least, we have to try. When implementing business intelligence, cultural considerations may equal technical considerations in importance. This research covers the rigorous study of practical implementation of Business Intelligence in the enterprise. It provides a novel framework for BI which can be benefiacil in ideal conditions .

1.Introduction

What is the market doing? What are your competitors up to? What is happening to the demand for certain products and services? What capacity is there to service those needs? The answers to those questions are found in business intelligence and business intelligence is all about having a competitive edge.

Leading organizations are looking for ways to approach business intelligence more strategically to address the needs of diverse users while avoiding the proliferation of tools and applications. Approaching business intelligence from a business perspective is key to success. The use of business intelligence and performance management is becoming pervasive within organizations at every

level. Use our novel framework to build a more complete and integrated plan for these initiatives, and to yield better returns from related business and IT investments.

The Japanese are masters of business intelligence[R1], and some American companies were founded on the eyes and ear's culture. Business intelligence is rapidly becoming a major source to achieve competitive advantage. This innovation is a legitimate business function, and businesses over time have collected data about a whole range of issues - mostly about their competitors. In today's competitive global environment, organizations seeking to make informed strategic decisions, manage their assets and maximize shareholder value must turn to business and competitive intelligence in order to act ahead of the curve.

It adds value to your existing information to give you a market advantage. In a responsive environment, well managed business intelligence enables senior management to create the right company profile at the right time[R2,R3]. Its value is seen in companies that position themselves to capture the lead, just as the market adjusts. In extreme cases, they may even create that market adjustment.

Why use an Intranet for Business/Competitive Intelligence ?

- You just got the mandate from your boss
- It's a New Year's resolution
- You have decided to deal with the sixteen boxes full of brochures sitting in the corner of your office... or under your desk
- There has been a great deal of publicity done by your competitor about the great way it uses Intranet to be more competitive

How is Intelligence best structured on an Intranet?

The principle is to establish a network of "Champions" who are legitimate owners of the content. They will make sure each piece of content they are responsible for is updated.

Those champions are responsible for:

- the quality of the information: they directly edit the content under their responsibility and decide what should appear on the Intranet and what should be excluded.

Users access the information from their computer after logging in their username and password. Once they have accessed the content they are looking for, they can either view it, print it, download it into a spreadsheet if they need to analyze the data further, or even update the content if this option is open. They can find the documents they are looking for by using a search engine (as on the Internet) or by "surfing" through given categories available to them.

What form can information on an Intranet take?

Type of information	Format
Raw information	A list of information observed in the market by product category
Synthesized format	A more elaborated form where the raw information has been analysed and is displayed in a synthesized fashion
Searchable database	Users can request a competitor's information depending on the components of the competitor's products; the database searches the components, adds them up, and displays the anticipated action of the competitor
Links to sources of information	Users can view a list of providers of this type of information and access their Internet site or e-mail address directly to request information. You might also negotiate specific rates with those providers: having the final invoice for unlimited users access forwarded to you

(Table-1)

What type of competitive or business intelligence information should be included on an Intranet?

The following is a list of categories that are usually found on an Intranet:

- Organization: organizational structure and profile of key executives
- Financial: latest annual reports, quarterly reports, analysts reports, press releases of earnings, comparison with other companies in the industry, projected results
- Products: description of products and comparisons with your company's own products, pictures, technical content, new products, patents, description of capabilities
- Pricing: competitor pricing expectations, prices by regions or customer segments, rumors
- Alliances: alliance partners and date of alliance, implications for your company
- Customers: your competitors' customer lists
- Technology: product description, comparisons
- Customers: profile, key contacts, action list, strategy to approach, customer service fields, financial status
- Regulation: key regulatory texts and interpretation, future bills pending

- Market: size of actual and future market, main market trends affecting the industry, key economic reports, prospective
- Customer surveys: key results of customer surveys, analysis and action plan for the company
- Marketing toolkit: latest company presentations, travel schedule, visitors schedule, database of images and pictures, argumentation
- Jungle phone: rumors, unchecked facts...
- Suppliers: profile and offerings, strategy

2. Software as a Service for Business Intelligence

As companies move toward the use of software as a service, they must carefully evaluate the impact of this on the overall enterprise business intelligence system[R8,R14,15].

Software as a service(SaaS) is a confusing term that means different things to different people. To the consumer, it may mean the ability to buy and download desktop software using the Internet, or to pay an annual fee to vendors like McAfee or Symantec for keeping desktop virus definitions up to date via the Internet. At the other extreme, for a business organization, it may mean purchasing Internet-based application services from a third-party vendor.

Broadly speaking, SaaS can be broken down into three main types of service:

- **On-demand software purchasing** where individual users or organizations try, buy and download personal, workgroup, or enterprise software across the Internet. For vendors, software-on-demand provides a cost-effective sales channel and software delivery mechanism. For users, it provides a fast and easy way to obtain software.

- **On-demand IT service-oriented architecture (SOA)** where IT system and application processing is defined and developed as a set of services that can interoperate and exchange information with each other. A SOA offers a flexible approach to application development that encourages service re-use and reduces the need to build point-to-point connections for data and application integration.

- **On-demand application services** where individual users or organizations pay external third-party providers for the use of their application services. The objective of this type of SaaS is to trim software and hardware costs, and to reduce IT staffing and skill requirements. This approach may also be used as an interim step before bringing application software in house.

Some industry analysts describe the on-demand application services model as SaaS 2.0, because it extends the capabilities of earlier SaaS initiatives. An on-demand application services vendor may, for example, support a SOA for providing easier access to the services it offers.

Two key characteristics of SaaS 2.0 are:

- Network and Web-based access to commercial software computing services where the processing is done on a third-party server, rather than at each customer's location.
- A *tenant-based* pricing model for hardware, software, administration and consulting services.

3. SOA and ESB in Business Intelligence

There are several new and evolving enterprise integration and Web technologies that are likely to have a profound effect on the business intelligence (BI) marketplace. In this section service-oriented architecture (SOA) and enterprise service bus (ESB) are discussed[R16,R17,R19,R22,R24].

3.1 Service-Oriented Architecture

A service-oriented architecture consists of a set of components that enable distributed resources (applications, database systems, etc.) to interact with each other in support of business processing. Organizations have been doing distributed business processing for many years, and an SOA is simply a way of formalizing this processing. In an SOA environment, resources are exposed as service providers. The interfaces to these providers are registered with a broker. Resources that want to consume services locate and interact with providers through the broker.

A key point to note is that an SOA can interconnect resources that operate at the user interaction, application and data levels of an IT system. In a data warehousing environment, for example, a data validation service could be defined as a service provider and called by data integration application. Other examples of services providers include user authentication, search, data transformation, BI analysis, data mining models, legacy applications and business transactions. To support an SOA environment, most business intelligence and data integration vendors are building service interfaces to their products.

The advantage of an SOA is that it enables common and shared interfaces to be defined and created for distributed resources. This eliminates the need to develop multiple proprietary point-to-point connections between resources, which reduces IT development and maintenance efforts and encourages service reuse.

A variety of different technologies can be used to build an SOA environment, define service interfaces and enable service brokers. One of the prevalent technologies is Web services, which has garnered industry acceptance because of the availability of open standards, vendor independence and product support. Web services are easier to implement than earlier SOA technologies, which are

often proprietary and complex to use. Most of the SOA support coming from BI and data integration vendors is, in fact, based on Web services.

3.2 Enterprise Service Bus

Another important development in the SOA environment is an enterprise service bus (ESB). An ESB is a message-based capability that facilitates interaction between distributed resources. An ESB is not required for SOA, but it does increase the power and flexibility of SOA usage.

The objective of an ESB is to route messages between resources in a reliable manner; that is, it guarantees message delivery. Message routing may be done synchronously or asynchronously between source and target systems. Messages may be also be transformed from a source format into a target format as they pass through the bus. Other facilities offered by an ESB include load balancing and failover.

ESB middleware is available for both the Microsoft. NET and Java J2EE environments. This middleware may support a variety of SOA broker technologies such as Web services, Java JCA, Microsoft DCOM and CORBA. The advantages that an ESB brings to the SOA environment are security, reliability, scalability and the ability to interconnect older SOA broker technologies with Web services.

One of the potential users of an ESB is a data integration service. In fact, several vendors have modified their data integration and ETL (extract, transform and load) tools to be event-driven so that they can consume event messages from an ESB. These events can carry information about source data changes, which can be used by the data integration service to incrementally update an operational data store (ODS) or data warehouse. This approach is particularly useful for operational BI applications that require intra-day data.

When a data integration service is connected to an ESB, the question arises as to whether data transformation should be done in the ESB or in the data integration service. Some people even argue that an ESB service could be used to populate an ODS directly without the need for a data integration ETL tool. To answer this question, we need to examine how an ESB works and is used.

An ESB is used frequently to route transactions and data between operational applications, from a CRM application to an ERP application, or between B2B systems, for example. The data passing through the bus is usually reformatted to suit the needs of the target application. In some cases, the source data is transformed into a common XML format as it flows from the source system, through the ESB and to the target system. The advantage of a common format is that the same data can be consumed by several target applications and reformatted to suit the needs of each target. A message coming from a CRM system, for example, could be transformed into a common XML format, and then routed to both an ERP system and a data warehousing application. Common XML formats are also very useful when sending and receiving data from external systems.

Two things should be noted about potentially doing data transformation in an ESB. The first is that messages passing though the hub are usually routed in close to real time; and given the message volume involved, there is often not sufficient bandwidth to do significant data transformation and lookup. An ESB, therefore, is usually more suited to doing basic message reformatting than complex data transformation. The second point to note is that regardless of where data transformation is done, the business views, models and rules for doing that transformation should be common to all ESB and data integration applications.

It has always puzzled why organizations focus on building shared business views and models of information in a data warehouse for use by BI tools, but don't do the same thing for source data flowing into a data warehouse. A shared business view of source data (an invoice, for example) simplifies access to source data and can insulate data integration services from source data structure changes. A business view of the operational source data can be used in an ESB to map the source data into a common XML message, which can then be consumed by a data integration service. If the location or format of the source data is changed, then only the mapping in the ESB to the shared view needs to be updated – the data integration service is not affected.

3.3 Moving to an SOA Environment

We have just touched the surface of how a SOA and ESB can be used in data integration and business intelligence. Although SOA and ESB technologies are immature and still evolving, all BI users should have a plan to move to an SOA environment. This will be particularly important when building operational BI applications, which need to be tightly integrated with operational and collaborative systems. An SOA and ESB environment provides significant advantages for enabling this integration.

4. Operational Business Intelligence

A successful operational business intelligence environment requires an appropriate infrastructure[R5,R6,R7]. An enterprise infrastructure is to business intelligence (BI) applications what a transportation infrastructure is to automobile owners. In order to safely and comfortably travel with an automobile, there must be a suitable physical (could also be called technical) infrastructure, such as roads, bridges, traffic lights and traffic signs, as well as non-physical (could be called non-technical) infrastructure, such as standardized traffic rules and their uniform interpretation. For example, without the universal interpretation of the rule that "green means go and red means stop," traffic lights would be useless and could even be hazardous.

An enterprise infrastructure for operational business intelligence applications consists of two major components:

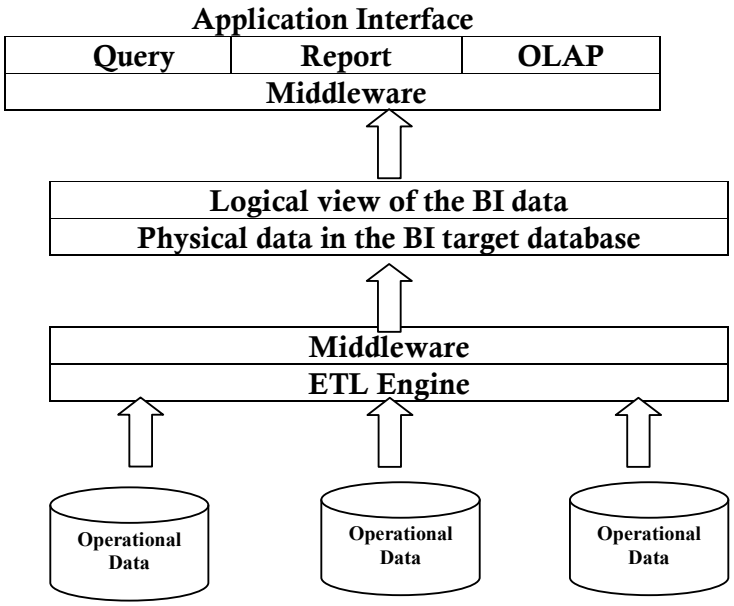
- Technical infrastructure, such as hardware, middleware and database management system (DBMS)
- Non-technical infrastructure, such as standards, metadata, business rules and policies

Hardware Platform Requirements

The hardware must have sufficient power to handle complex access and analysis requirements against large volumes of data. It has to support not only predefined, simple queries on summary data, but also ad hoc complex queries and reports on detailed data. It must also be scalable because rapid changes will occur in:

- Data volume, Updating frequencies, Data access patterns, Number of reports and queries, Number of people accessing the BI target databases ,Number of tools running against the BI target databases, Number of operational systems feeding the BI target databases

It is appropriate to think of an operational business intelligence environment in terms of a three-tier computing architecture (Figure 1).



(Figure 1: Three-tier Computing Architecture for BI)

Middleware

Middleware refers to runtime system software, which is layered between the application programs and the operating system. It acts as a bridge to integrate application programs and other software components in an environment with multiple network nodes, several operating systems and many software products. Middleware is needed to run client/server implementations and other complex networked environments in a distributed computing environment. It must be determined if the organization has the necessary middleware to retrieve the source data from heterogeneous platforms and transfer it to the BI application environment.

Most of the middleware falls into two major categories: distributed logic middleware and data management middleware, as shown in Table-2.

Distributed Logic Middleware	Data Management Middleware
Supports program-to-program communication between two pieces of custom-written code.	Connects an application or DBMS on one platform with a DBMS running on another platform.

(Table2: Distributed Logic Middleware vs. Data Management Middleware)

DBMS Function Selection Criteria

The following basic functions are some of the important and necessary attributes of a DBMS for handling the workload of a large business intelligence target database or very large database (VLDB):

- Degree of parallelism in handling queries and data loads
- Intelligence in handling dimensional data models and optimizers
- Database scalability
- Internet integration
- Availability of advanced index schemes
- Replication on heterogeneous platforms
- Unattended operations

DBMS for the Operational BI Environment

A DBMS is a sophisticated piece of software and consists of a number of features that need to be evaluated. Features to look for in the DBMS for business intelligence applications include:

- **Network support.** The network support provided by the DBMS should be compatible with the organization's data communications standards.

- **Dimensional capability.** For better performance, it is necessary to have dimensional capability in the form of seamless support for fast and easy loading and maintenance of pre-compiled summaries.
- **Adequate state-of-the-art triggers and stored procedures.** It is important that procedures can be used as "event alerts," which trigger an action in response to a given set of circumstances (e.g., cash flow below a certain level).
- **Administrative support features.** These features should provide for maintenance of consistent historical data; support for archiving (for example, drop the oldest week when a new week is added); controls for implementing resource limits to display a warning when a query that consumes excessive resources is about to be terminated; workload tracking and tuning mechanisms; and careful monitoring of activity and resource utilization.
- **Location transparency across the network**. This feature must allow the access and analysis tools to retrieve data from multiple BI target databases from a single workstation.
- **Future usage explosion.** Future usage must be supported by effective caching and sharing of data to minimize input/output (I/O) bottlenecks, by the ability to effectively manage task switching of many concurrently running queries and by compatibility with multiple processors.
- **Scalability.** Don't jump to implement a VLDB unless the vendor's VLDB features have proven themselves.
- **Query performance optimization**. The query performance optimization should address CPU-intensive aspects of query processing such as joins, sorting and grouping.
- **Load process and performance.** The chosen DBMS must address: *Data obtained directly from a variety of feeds including disk files, network feeds, mainframe channel connections and magnetic tapes.

  *Complete data loading and preparation, including format conversion, integrity enforcement, and indexing.

- **Security system**. The security system must support unique passwords, password protection and authorization constraints necessary for specific persons and for specific tables of the database. The system administrator should provide restricted access to the views and virtual tables.
- **Data repository.** The data repository should feed into a metadata repository, and the database objects should be linked to all data objects described in the enterprise logical data model.

Technical Infrastructure Activities

Review the existing platform in terms of hardware, middleware, DBMS and tools. It is important to evaluate the interdependence of the tools for their various purposes, such as the interdependence between a multidimensional reporting tool and an ad hoc querying tool. In addition, review the existing network architecture. One of the biggest bottlenecks today, especially in

organizations with decentralized applications, is the lack of bandwidth coupled with a limited capacity for network growth.

After assessing the existing platforms, identify which types of new hardware, software or networking component must be acquired. If the existing hardware platform appears to be sufficient, be sure to determine that it will be able to provide the productivity and performance that is expected from it. Engage business representatives and stakeholders in the decision-making process by including them in peer reviews during the selection process[R25,26,27,30].

Compile all findings about the existing platform into a report. Explain the strengths and weaknesses of the current hardware, middleware, DBMS and tools. Provide a list of missing technical infrastructure components necessary to meet the project requirements.

A *technical infrastructure assessment report* should itemize the scalability and limitations of the hardware, middleware, DBMS and tool platform. It should cover the following:

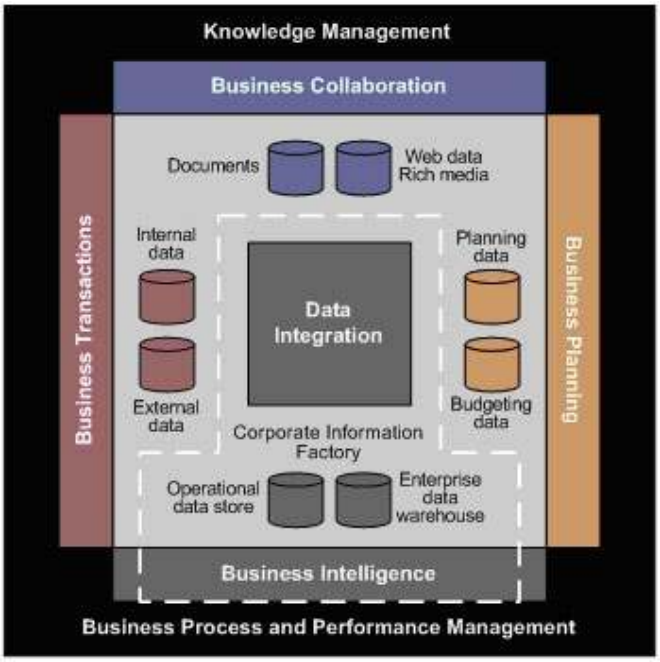
- Servers
- Client workstations
- Operating systems
- Middleware
- Custom interfaces
- Network components and bandwidth
- DBMS functionality and utilities (backup and recovery, performance monitoring)
- Development tools such as computer aided software engineering (CASE) and extract/transform/load (ETL) tools, access and analysis tools such as online analytical processing (OLAP) and report writers
- Metadata repository

Include a gap analysis section and provide recommendations for upgrading the platform. Incorporate the product evaluation and selection results, listing the weighted requirements and the product features that were evaluated.

5. Advance Business Intelligence Framework

The Smart BI Framework brings together the four forces that drive business operations: people, plans, processes and performance.

I've often made the point in my articles that business intelligence is no longer just nice to have, but is essential to business success. I've also commented at the same time that business intelligence applications and their underlying data warehouses can only support the needs of the business if they are tightly integrated into the overall IT environment. To highlight the importance of business intelligence and the need to integrate it into the enterprise, I developed the concept of the *Smart BI Framework*. The latest version of this framework is shown in Figure-2.



(Figure 2. The Smart BI Framework)

The Smart BI Framework brings together the four forces that drive business operations and the IT systems that support them. These four forces are people, plans, processes and performance.

A company's *people* are the underlying foundation on which the business is built. Without good employees a company will fail. How people perform their role in the organization is changing. The speed of business today means that people can no longer sit in ivory towers, or control and restrict the flow of information within the organization. If information is power then it must be made available to the people that need it for their jobs.

Key to collaboration and the sharing of information is knowledge management (KM), which brings together portals, content management and collaboration

tools. The growing importance of business intelligence also means that it too must be integrated into the KM environment.

As senior executives define business *plans* and goals they must communicate them down through the corporate hierarchy. Targets must be developed and measured, and employees must be told what is expected of them. Employee compensation should generally be tied to achieving expected targets. Planning, budgeting and forecasting systems form the basis of the planning process, but collaboration capabilities are required for communicating plans and goals, and business intelligence is essential for monitoring and managing targets. Methodologies like balanced scorecards are also valuable for formalizing the planning process and managing targets.

Once business plans and initiatives are agreed on, they are implemented in business *processes*. Business process management is a growing technology for modeling, simulating, deploying, integrating and monitoring business processes. At present, process management is used primarily with operational business transaction applications, but the need to manage document and information workflows is bringing process management concepts and technologies into the collaborative application environment.

Business transaction applications run business operations and associated business processes and underlying activities. The role of business intelligence applications is to monitor, analyze and report on those operations. The output from business intelligence applications is used to determine how well actual business operations are doing, compared against business goals and targets. If these business goals and targets are not being achieved, then either business plans or business operations must be adjusted accordingly. This aspect of business intelligence is often called *business performance management*, which is easily confused with *business process management*, especially given that process management also supports the monitoring of business performance.

Business performance management is a term that is becoming increasingly abused by vendors. Vendors will use the term to describe a product even if it simply creates a business dashboard showing basic performance measures that are unrelated to business plans, goals or targets. A *true* business performance management application is closely tied to business plans and planning systems so that performance measures can be related to business goals and targets.

Most business performance management applications deliver information that is reactive in nature, i.e., the information produced identifies business problems after they have occurred. Ideally, business users would like to be able to predict or anticipate business issues *before* they occur. The integration of business intelligence predictive technologies and planning methodologies into the business performance management environment helps satisfy this requirement.

At present, business intelligence is data-centric, but as it becomes more integrated with business operations it will need to become more process-centric so that business intelligence results can be more easily related to business

processes and their associated business activities. This involves integrating performance management and process management technologies. Perhaps the term to use here is business process and performance management, or BPPM. This term would at least remove the current industry confusion over the BPM acronym!

BPPM would allow business intelligence to be integrated into business transaction processes and also allow business processes to be added to business intelligence applications. An application example in this latter case would be for a performance management application to alert a business user about a business problem and provide a guided analysis workflow or procedure that helps the user investigate the problem in more detail based on best practices.

At the heart of a business intelligence system are the operational data store, enterprise data warehouse and data marts that supply the integrated, clean and consistent data for analysis. Many traditional data warehouse implementations have been deployed.

6. Conclusion

We can see that a BI Framework involves connecting together business intelligence, business transaction and collaborative applications and their underlying data and information stores. Further enhancing are integration connections to business planning systems, and support for knowledge management, business process and business performance management technologies. Such a framework brings together the four main business drivers of an organization: people, plans, processes and performance.

7. References

[R1] Quinn, James Brian. *Intelligent Enterprise.* New York: The Free Press-2005

[R2] Kahaner, Larry. *Competitive Intelligence: how to gather, analyze, and use information to move your business to the top.* New York: Simon & Shuster-2003

[R3] Harrington, James H. *Business Process Improvement.* New York: McGraw-Hill, Inc-2003.

[R4] Russo, Edward J. and Schoemaker, Paul J. H. *Decision Traps, the ten barriers to brilliant decision-making and how to overcome them.* New York: Simon & Shuster-2004

[R5] Zahedi, Fatemeh. *Intelligent Systems for Business.* Belmont, California: Wadsworth Publishing Company-2004

[R6] Inmon, W.H., Zachman, John A. and Geiger, Jonathan G. *Data Stores, Data Warehousing and the Zachman Framework, Managing Enterprise Knowledge.* New York: McGraw-Hill,2005

[R7] Adriaans, Pieter and Zantinge, Dolf. *Data Mining.* Harlow, England: Addison-Wesley-2004

[R8] Business Intelligence Roadmap: The Complete Project Lifecycle for Decision-Support Applications , by Larissa T. Moss, Shaku Atre, Addison Wesley Professional, 2003

[R9] Adelman, Sid, and Larissa Terpeluk Moss. *Data Warehouse Project Management.* Boston, MA: Addison-Wesley, 2000.
[R10] Adelman, Sid, et al. Impossible Data Warehouse Situations: Solutions from the Experts. Boston, MA: Addison-Wesley, 2003.
[R11] Charvat, Jason. Project Management Nation: Tools, Techniques, and Goals for the New and Practicing IT Project Manager. New York: John Wiley & Sons, 2001.
[R12] DeMarco, Tom. Slack: Getting Past Burnout, Busywork, and the Myth of Total Efficiency. New York: Broadway Books, 2001.
[R13] Humphrey, Watts S. *Winning with Software: An Executive Strategy.* Boston, MA: Addison-Wesley, 2002.
[R14] Jarke, Matthias, Maurizio Lenzerini, Yannis Vassiliou, and Panos Vassiliadis. *Fundamentals of Data Warehouses.* New York: Springer, 2000.
[R15] Marmel, Elaine. *Microsoft Project 2000 Bible.* New York: John Wiley & Sons, 2000.
[R16] Moeller, R. A. Distributed Data Warehousing Using Web Technology: How to Build a More Cost-Effective and Flexible Warehouse. New York: AMACOM American Management Association, 2001.
[R17] Chitwood, Kera, Hehhof, Bonnie. "At a Crossroads: Information Professional to Intelligence Analyst". *Information Outlook* 4:2 (February 2000), pp. 22-25.
[R18] Fuld, Leonard. *Competitor Intelligence: How To Get It; How To Use It*. New York: John Wiley & Sons
[R19] Kassler, Helene. "Competitive Intelligence and the Internet: Going for the Gold". *Information Outlook* 4:2 (February 2000), pp. 37-42.
[R20] Moon, Mary D. "Effective Use of Information and Competitive Intelligence". *Information Outlook* 4:2 (February 2000), p.20.
[R21] "Competing on Analytics", Thomas Davenport, Optimize Magazine, February 2006.
[R22] "The Well-Timed Strategy: Managing the Business Cycle," Peter Navarro, Harvard Business Review, November 2005.
[R23] "New Horizons: Multinational Company Investment in Developing Economies: Impact on Global Industry Restructuring & Implications for Companies," McKinsey Global Institute, 2005.
[R24] "Innovation Blowback: Disruptive Management Practices from Asia," The McKinsey Quarterly, No. 1, 2005.
[R25] "Strategic Sourcing: From Periphery to the Core," Harvard Business Review, February 2005.
[R26] "Even if IT Doesn't Matter, Informational Capabilities Still Do", Henry Morris, The CIO Magazine, October 2004.
[R27] "Analytic Applications and Decision-Centric BI (Business Intelligence)," DM Review Magazine, June 2004.
[R28] "Field of Online Dreams," Mohanbir Sawhney, The CIO Magazine, October 2002; ITC e-Chaupal (http://www.itcportal.com/sets/echoupal_frameset.htm).
[R29] "Moving Upward in a Downturn," Darrel Rigby, Harvard Business Review, June 2001.
[R30] Cronin, B. (2000). Strategic intelligence and networked business. *Journal of Information Science, 26*(3), 133-138.

==========X==========

About the Authors

1. **Sunil Kr.Pandey**
   Asst. Professor
   Department of Computer Science,
   School of Management Sciences(SMS),
   Varanasi(UP)
   India.
   E-mail:skphind@rediffmail.com

2. **R.B.Mishra**
   Reader
   Department of Computer Engineering
   Institute of Technology(IT),
   Banaras Hindu University(BHU),
   Varanasi(UP)
   India.