



Business Intelligence Report

Submitted By TechStone Technology Partners LLC

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I. The Origins of Business Intelligence

Business Intelligence began in companies when management and those whose job required the manipulation of data started to seek better ways to report information. In essence, Business Intelligence as we know it today began with early mainframe reports printed out on greenbar paper decades ago. Managers picked their ways through clusters of data in hopes of finding some information that would be relevant to their decisions.

Organizations then prepared custom reports that took weeks to write as well as required skilled programmers. Primitive ad-hoc queries increased the production but this required trained and technical managers to use the information. Once the data warehouse entered the picture companies could really begin to use the advantages that are today known as Business Intelligence. Data warehouses aggregate data in a single location where it is queried having little impact on production applications. These were followed then by data marts that are specialized data stores that further accelerate the process of producing information for management and decision-making. Multi-dimensional analytical tools like OLAP came into wide use and they allow managers to manipulate the data in countless ways and mine the information for hidden insights.

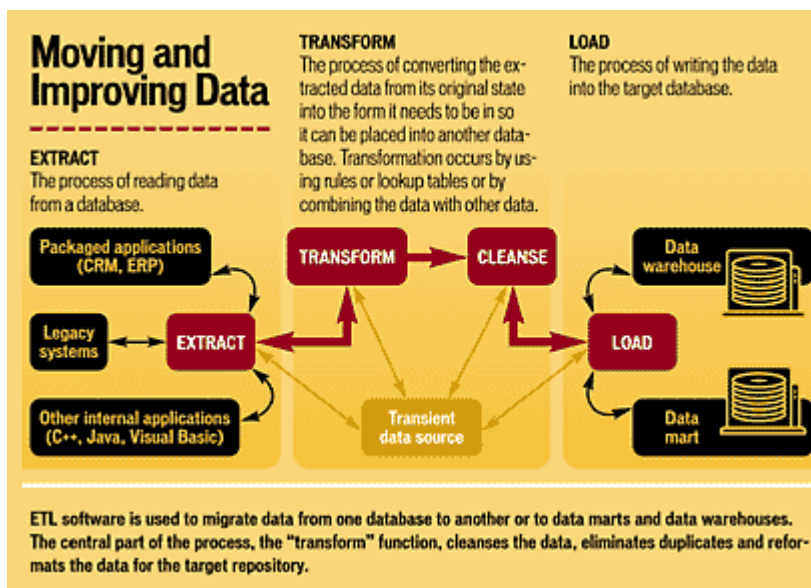
However, it was only when Business Intelligence began merging with business analytics did corporations begin to harvest the reality of gains from Business Intelligence. Currently, Business Intelligence (*BI*) and business analytics (*BA*) are used as applications that run on top of databases, data management systems and have ETL capabilities. They now include features such as dashboards, scorecards, and a variety of tools that allow users to locate and manage information proactively.

Data integration is the key to pulling this data together and delivering information in an infrastructure that meets strategic *BI* initiatives. The integration of all data sources is the start to capturing the big picture and leveraging *BI*. Data integration allows an organization to consolidate the current data contained in its multitude of operational and production systems and combine it with its historical values. The best *BI* solutions use ETL to move this data within the integrated systems.

The following report should serve as an educational document to be used by those investigating *BI* solutions for their organizations. The following sections will include the major components of *BI* such as ETL, Data Warehouses, OLAP, Databases, Dashboards, Ad-hoc Querying and Business Analytics. Further research is encouraged as these sections although informative are only snapshots of each component that all play a major role in a successful *BI* platform.

II. What is ETL?

ETL stands for 'extract, transform and load,' and are the processes that enable companies to move data from multiple sources, reformat and cleanse it, load it into another database, data mart or data warehouse for analysis or to support a business process. ETL software solves the problem of heterogeneous systems where data is disparate. ETL extracts the data from its source, formats it and then writes it to the system to be used. Data used in the ETL process comes from a variety of sources such as mainframe systems, ERP applications, Excel spreadsheets and CRM tools.



Extraction can also be done in a variety of means including proprietary code, Java Database Connectivity, Microsoft Corp.'s Open Database technology and even flat files. Following extraction, the data is transformed or modified depending on the specific business process. ETL operations also involve cleansing the data to reinforce consistency. The ETL process could involve standardizing name and address fields or expanding records with additional fields containing demographic information. After reconciliation, data is transported and loaded into a data warehouse for analytics.

III. Data Warehousing in the Enterprise

Bill Inmon is considered by many as the father of data warehousing. He defines a data warehouse as, “a subject-oriented, integrated, nonvolatile, time-variant collection of data in support of management’s decisions.” A data warehouse addresses a wide variety of analytical problems. Below is a list of attributes from building a data warehouse:

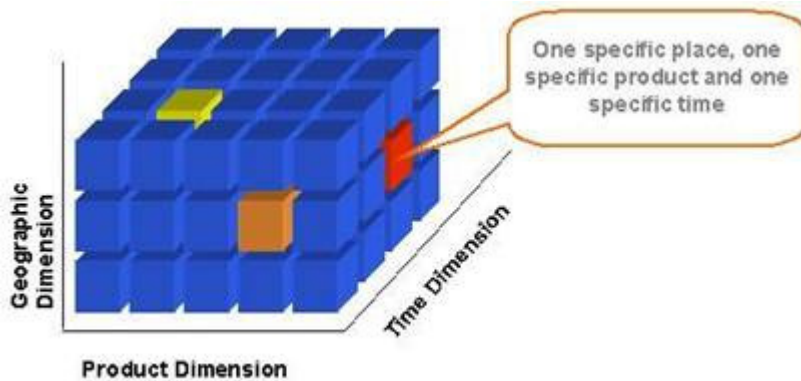
- a. Combine data from disparate sources
- b. Create a data foundation for analytical purposes
- c. Integrate current and historical data values
- d. Establish consistency throughout the organization
- e. Facilitate the adoption of corporate data standards
- f. Enable trend analysis

Although data warehouse content is updated with new values each time a new snapshot is added, the general use of the data warehouse is for read-only analysis purposes. A data warehouse typically adds new time-stamped values of existing data elements. For example, a production application for payroll may contain the salary for each employee while a data warehouse would contain the salary history for each employee. When an employee receives a salary change, the new value would replace the old value in the payroll production application system while the data warehouse would add the new data content where it would reside along with the previous salary.

By integrating data within the data warehouse, organizations can more effectively use this data for analytical purposes.

IV. OLAP Past & Present

OLAP is the abbreviation for ‘*online analytical processing.*’ OLAP had its breakthrough in the *BI* market more than ten years ago just following the emergence of ad-hoc querying and reporting tools. Although ad-hoc querying works pretty well, it tends to have long response times. OLAP offers a multidimensional way to store and handle data. This allows for short response times that encourage further in-depth analysis.



OLAP CUBE

Multidimensional analysis, the basis for OLAP is not new. It actually goes back to 1962 with the publication of Ken Iverson's book, [A Programming Language](#). APL was the first language with multidimensional variables and abstract processing operators. This was long before the benefits of GUI screens and the APL Greek symbols needed special screens and keyboards. APL also needed vast amounts of machine resources because the early APL systems were interpreted rather than compiled. With all of these issues, APL didn't go away. It was used in the 1970's and 1980's in many business applications that had similar functionality to today's OLAP systems.

Another multidimensional product made its appearance in 1970 and was known as Express. In a completely rewritten form with a modern code-base it became widely used more than APL. Even after more than 30 years, Express remains one of the major OLAP technologies. Oracle announced in late 2000 that it would build OLAP server capabilities into Oracle 9i starting in mid 2001. The second release of the Oracle 9i OLAP option included a version of the Express engine. Oracle is still selling Express and applications based on it in 2005, some 35 years after Express was first released.

OLAP has established itself as one of the pillars of a modern *BI* package coming in all types including; ROLAP, MOLAP, HOLAP, LOLAP, DOLAP and WOLAP. ROLAP stands for relational OLAP which means that the underlying database is a relational database. MOLAP is a multidimensional database that uses a proprietary format for handling its data. HOLAP is a hybrid OLAP taking the best advantages out of ROLAP with its ability to handle large amounts of data with MOLAP and its quick response times.

There's also LOLAP or local OLAP and DOLAP or desktop OLAP. They're essentially the same other than there's data processing done on the client desktop. WOLAP which is web OLAP includes a web interface for accessing the OLAP application. In the end, no matter which version is used, OLAP is a very good solution for providing quick answers and in-depth understanding to many business queries.

V. Databases in the World of Business Intelligence

Since the advent of the internet and data tracking systems, data volumes continue to double on average of every nine months. The widening gap between computer power and exponentially growing data is made worse by the increasing need for in-depth analysis as companies move from standard reporting to more sophisticated *BI* and discovery analysis. Vendors have handled this rapid growth in database size with expensive and consistent upgrading of hardware and software.

The current *BI* infrastructure is a patchwork of hardware, software and storage that continues to grow more complex. Typically, a database management system (DBMS) is architected for transaction processing holding several hundred megabytes worth of records. The DBMS has been improved over the years with increasingly complex layers to support terabyte-sized databases. This basic patchwork has not changed during the past 10 years. On the DBMS front, there's been attempts at grid management placed on top of already complex DBMS. Even with the advent of grid and blade architecture, the demands of today's *BI* systems are difficult to address. Terabyte-scale databases continue to grow steadily putting tremendous strain on these systems.

One of the most important trends in *BI* is the development of standardized interfaces, protocols and functionality. Database standards have been set allowing the system to be built around the desires and needs of the end user. Today, unlike 10 years ago, there's a wealth of tools and applications using these standardized interfaces.

VI. The Dashboard Difference

The executive dashboard, also known as the manager dashboard originated in the 1980's as the Executive Information System (EIS). They all have the same goal in providing critical information to decision makers to improve the performance of their business. As organizations become more efficient most managers are now using dashboards. Organizations find that it's better to allow managers to make immediate decisions in response to opportunities rather than be forced to wait for an executive such as a CFO or COO.

A dashboard supports a manager in three ways. First it provides the answer to fundamental questions about the business or business unit. This can include answering questions such as, "Did I reach my sales numbers this month?" Or, "How many projects did we produce in the Middle East in the last three months?" A common one is, "How am I doing in comparison to my competitors?" Without a dashboard, these questions could take multiple spreadsheets and an abundance of administrator hours.

The second manner in which a dashboard supports a manager is through alerts. A dashboard should alert the manager when something goes wrong in a particular case. Typical alerts include product defects, delivery times falling below

normal, sales targets not met, etc.. The third manner of support is in helping managers make decisions that impact the business. Information from the dashboard can be used for decisions that are straightforward or require a variety of inputs. Some examples of these can include, “Do I need to hire more salespeople?” “Do I need to change my product line?” “Do I increase or decrease production?”

Each manager will have their own statistics or Key Performance Indicators (KPI's) that are relevant to them. Usually companies have their own standard set of measures. KPI's are combined to form a scorecard and the scorecard is likely part of the dashboard. KPI's are most often presented in tables, charts and graphs. For each KPI it's important to know which database or system provides the data. It's also important to know the format of the data and how the data will be abstracted from the system. Source data usually comes from multiple places including operational systems such as ERP software like JD Edwards, SAP and Oracle and some will be from data warehouses.

During the implementation of a dashboard in the requirements-gathering phase, executives and managers will define specific KPI's. This process causes the project to move slowly in the beginning since high-level managers have difficult schedules in which to define KPI's. It's helpful when these managers select sponsors for this process in providing the information needed for the dashboard. Another tip is to keep note of any failed systems that were supposed to make management's life better but were accessed only one or two times for demo purposes but never used.

Below are five more tips when developing the dashboard.

- Understand the business including lines and revenues
- Be aware of similar but different KPI's
- Consider access issues in how managers actually get their information
- Choose an effective delivery system such as with PDA's
- Plan for security including who gets to see what and how the site is protected

VII. Speedy Ad-Hoc Querying

In today's business environment, access to data by all users and not just management is important for the success of an organization. The ability for users to access relational data to make key business decisions is part of the daily tasks. Users can now share timely information like customer orders, supplier lists and inventory levels. The process of ad-hoc querying allows organizations to gain this insight to compete in today's business climate.

Typically, ad-hoc querying software uses a web browser to allow users to serve up data quickly and easily. Users can run and modify existing queries, design new queries and even publish them. Querying now includes functionality such as formatting, filtering, sorting, grouping and summarizing. A web client allows anyone with a browser to create and execute queries that span multiple databases.

VIII. Business Analytics in the *BI* Process

Business analytics provide the means to increase levels of intelligence across the enterprise through historical insight and the ability to maintain flexibility to either face adversity or embrace new opportunities. Business analytics software enables companies to monitor, capture, and analyze vast amounts of data and provides management and employees with tools to optimize these processes through decisions. Analytics can be divided into two areas including decision-centric business intelligence and traditional business intelligence.

Traditional *BI* emphasizes information accessed by and delivered to individuals. This data is focused primarily on scheduled and batch-based reporting supplemented with near real-time monitoring of business transactions. This also includes early warning systems for new trends. Traditional *BI* supports activities that include tracking, analysis and the delivery of information.

Decision-centric *BI* focuses on the decision-making steps in a business process. The goal is to assess the relevance of the information in a decision and to gain insight in evaluating possible decision alternatives. The steps involved include the ability to hypothesize, model the likely results, decide and adjust by communicating results to all responsible for execution.

IX. Unified Business Intelligence Approach

Historically, Business Intelligence has been fragmented in its evolution. This fragmented past usually drove up the cost of most *BI* initiatives, limited the very application of *BI* in an enterprise and had reduced effectiveness in driving business improvement. Another problem with a fragmented approach to *BI* is the potential for delivery of inconsistent and unreliable information. Point products, which are part of a fragmented approach where organizations don't standardize on a platform, are difficult to integrate, coordinate and orchestrate. Overall, this strategy is costly.

Companies that maintain multiple *BI* products from different vendors soon find costs in a multitude of areas. Software maintenance spread through multiple providers equals separate charges annually that are typically 15% of the license cost. User training and IT training would come from multiple sources increasing training costs not to mention scheduling hassles and employee time costs. Although some products have 'open' technology, integration still needs to take place and a cost is associated with any integration effort. A redundant infrastructure with multiple *BI* solutions increases management costs from maintaining multiple data stores, repositories and components.

Besides financial ramifications, fragmentation decreases usage. Managers would need to use varied systems with multiple interfaces and would create extra work and effort. This extra time and training could discourage further analytics and the overall pursuit of answers, which is the very reason for *BI*'s existence in the first place.

Forrester Reports finds that, "Companies want a single *BI* reporting and analysis solution. Every company and government organization wants a single, standard reporting and analysis solution for the entire organization. Why? They need to drive down IT support costs and simultaneously increase the likelihood of a single version of critical data." Enterprises with the intentions of cutting costs can save substantial funds from standardization in *BI*. A unified and comprehensive *BI/BA* solution delivers better business information faster, cheaper and more accurately. Environments are more stable and deployments are more efficient. Costs are driven down from not having to maintain multiple point products and usage is encouraged from common interfaces and data repositories.

The following sections describe major players in the *BI* market. Some follow the unified approach more than others but all of these companies have been successful in selling their software to comply with *BI* needs today. These *BI* leaders include Oracle, Information Builders, Business Objects, Cognos and Informatica.

X. Oracle's Unified Solution

Today, most organization have invested in their data infrastructure to provide data-disbursement. The trend now and in the near future demands more in the distribution of information to include broader decision-making capabilities. Business analytics ranging from reporting, data mining and integration and warehousing now help companies consolidate visibility across organizations, streamline operations and even reinvent the approach to business and with the customer.

Oracle is the worlds #1 leader in business analytics software. With Oracle Database 10g data warehousing infrastructure is provided with multidimensional analysis and data mining. Oracle Business Intelligence Warehouse Builder provides data extraction, transformation and loading. This unified platform approach decreases

the need for point product tools and increases data quality and the speed in which data is delivered to the end users.

Oracle provides unique *BI* software tools including Business Intelligence Discoverer and Oracle Business Intelligence Spreadsheet Add-in for ad-hoc query and analysis. There's also Oracle Reports Services and Oracle Application Server Portal for information delivery. Oracle *BI* Discoverer enables seamless access to relational and multidimensional data. Oracle *BI* Spreadsheet Add-in gives users the option to use familiar spreadsheet interfaces for ad-hoc analysis while maintaining data links with the underlying data warehouse. Oracle AS Portal can be the common interface for reports, charts, and other content delivered to end-users.

Oracle started in the *BA* market first delivering a data warehouse platform. Since 2003, Oracle has introduced a new set of *BI* tools for query and reporting providing a more complete and unified solution. Below is a list of Oracle's now complete *BA* offerings:

- **Data Warehousing Platform:** includes Oracle Database 10g with Oracle OLAP and Oracle Data Mining engines and Oracle *BI* Warehouse Builder
- **Business Intelligence Tools:** includes Oracle *BI* Discoverer, Oracle Spreadsheet Add-in, Oracle *BI* Data Miner and Oracle Reports Services
- **Analytic Applications:** includes Oracle Daily Business Intelligence, Oracle Balanced Scorecard, Oracle Planning and Budgeting, Oracle Activity Based Management and Oracle Performance Analyzer

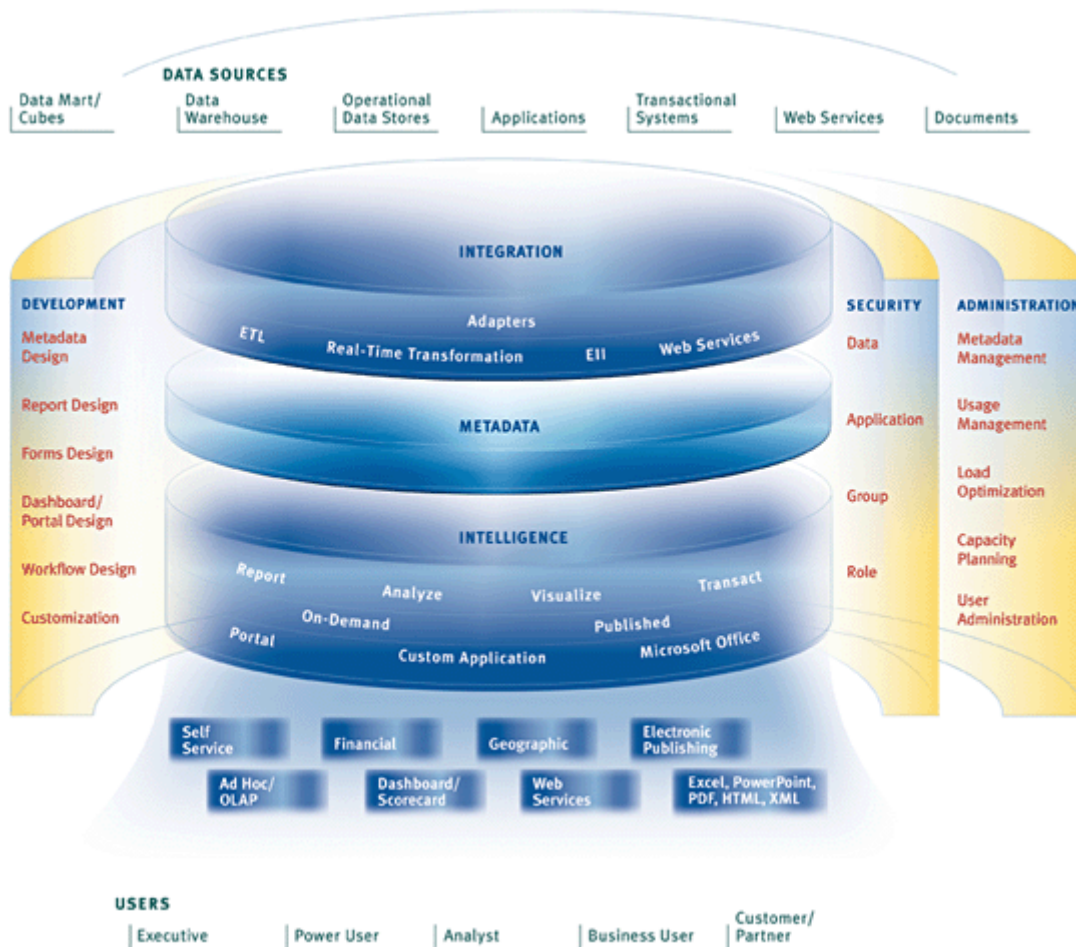
Oracle's data warehousing platform is based on Oracle Database 10g for data warehouse management and Oracle *BI* Warehouse Builder (ETL) tool for data warehouse generation and loading data. Using Oracle Database 10g for data warehousing allows users to inherit all the database availability, scalability and security features from this market-leading database. As well, Oracle Database 10g includes analytic capabilities for multidimensional analysis (OLAP) and data mining. This single data engine delivers both OLAP and data mining functionality eliminating overhead of data synchronization between the data warehouse and individual OLAP or data mining engines.

Oracle *BI* Discoverer is Oracle's flagship ad-hoc query and reporting tool. Discoverer provides an intuitive interface for designing queries and delivering tables and charts. The key enhancement in the latest release is its ability to access both relational and multidimensional data within a single reporting environment.

Oracle *BI* Spreadsheet Add-in embraces the use of the spreadsheet format most users are comfortable. It's actually deployed as a menu item in MS Excel with the ability to dynamically extract data from its secure databases.

XI. Information Builders WebFOCUS

Information Builders specializes in the *BI* product market. Their WebFOCUS Product is a comprehensive *BI* platform whose goal is to make data available, meaningful and accessible to every end user. The product has a service-oriented architecture with self-optimizing autonomic servers and a unifying integration infrastructure. The main goal according to Information Builders is for WebFOCUS to make any data available regardless of its location, storage medium or format.



Data adapters are used to enhance performance by combining the power of the data source with the power of the WebFOCUS engine. This includes more than 280 data and application adapters. WebFOCUS allows users to describe any data source through a single metadata layer that can be leveraged for ETL, reporting and analysis.

The product also encourages decentralized aggregate data marts throughout an organization. WebFOCUS provides a hybrid approach to data allowing drill-through from a central data warehouse to operational applications.

The WebFOCUS ETL solution enables direct access to data in operational systems and staged data in warehouses or marts. WebFOCUS 7 employs different access techniques to produce data, a reusable infrastructure and metadata. This includes using ETL to extract, transform and load data directly into a warehouse or data mart. It also provides drill-down functionality in joining data warehouses to operational data. WebFOCUS 7 allows users to operate their own operational application functions to access data. Real-time transformation is incorporated by trickle-feeding a data warehouse to populate and refresh it.

Information Builder's DataMigrator tool provides automated ETL tools to simplify creation, maintenance and expansion of data warehouses, marts and operational data stores. An intuitive interface enables end-to-end ETL process creation involving heterogeneous data structures across disparate platforms. The DataMigrator tool aggregates, joins, merges and applies selection criteria to information from back-office systems. The tool uses FTP scripts to move data. It executes, schedules, reviews, audits and creates dependencies among ETL requests.

Besides a focus in ETL capabilities, WebFOCUS provides reporting capabilities giving users the ability to create formatted reports from any enterprise data in real time. The WebFOCUS self-service reporting feature uses intuitive drag-and-drop and drill-downs to any other report, program or location without an additional client or viewer. WebFOCUS combines all the functionality of query tools, reporting tools and OLAP into a single solution with one common interface. WebFOCUS provides premier design environments for automated ad-hoc and parameter driven reporting.

Each analytical session starts with a report allowing users to generate ad-hoc queries and analysis. This is followed by users saving the report in a preferred format. The reports are then viewed, printed or taken offline for more analysis. The final reports can be scheduled to distribute to multiple users on a regular or event-driven basis. The WebFOCUS Report Assistant prevents non-technical professionals from the burdens of technical complexities. The WebFOCUS Managed Reporting tool allows data to be provided through secure access and personalized reports to leverage analytical functionality.

To complete their *BI* platform, Information Builders provides their WebFOCUS Business Intelligence Dashboard. This dashboard integrates the reporting environment into one common interface. Each user can personalize their portal with their own reports and how they want to view them. The users can select analytic tools to create reports, graphs and bar charts. The dashboard utilizes a variety of prepackaged templates for look-and-feel.

XII. The Business Objects Enterprise

The Business Objects Enterprise is a *BI* platform that provides tools for reporting, query and analysis, performance management and analytic applications. Business Objects offers a set of analytic engines that provide insight into solving business problems built on top of Business Objects Enterprise. The Business Objects integration products provide extraction, transformation and load (ETL) capabilities. The Business Objects Data Integrator tool helps ensure data integrity, IT productivity, accelerates reporting, query, analysis and performance management.



Business Objects Rapid Marts are built with Data Integrator and provide packaged ETL for building analytic solutions. This tool uses pre-built data models, transformation logic, and data flows for extracting data from enterprise applications like SAP, J.D. Edwards, Oracle and others.

Performance management products from Business Objects help align an organization's strategy by tracking and analyzing key business metrics and goals via dashboards, scorecards and alerting functionality. Groups can analyze information, collaborate with other stakeholders and take recommended actions. The Dashboard Manager enables users to monitor critical business metrics and alert when issues occur. The Performance Manager is the scorecard product that lets users develop and manage goals, track performance through scorecards, collaborate with others and follow recommended actions.

Query and analysis products interact with information and answers ad-hoc questions. It allows users to create queries and perform calculations without the need to understand complex database languages. Business Objects Web Intelligence provides a thin-client interface for ad-hoc queries and allows user access and interaction with business information. The Business Objects OLAP Intelligence tool provides ad-hoc and managed analysis for multidimensional database servers.

Probably the most important recent development for Business Objects was their acquisition of Crystal Reports. As a market leader, Crystal Reports XI allows easy access and data formatting. It allows users to build interactivity into reports and maintain reports and publish them in Business Objects Enterprise.

XIII. Cognos and Business Alignment

Cognos offers a range of integrated *BI* software that helps align users with the business information they need. Cognos ReportNet offers business and production reporting allowing users to create, modify and distribute reports. These could include weekly sales and inventory reports, invoices or statements with the ability to distribute them over the web. Cognos PowerPlay provides OLAP analysis for huge volumes of data. Cognos Visualizer is their dashboard product that serves up visual reports for complex data. It can display multiple measures simultaneously. Cognos DecisionStream is the ETL tool that builds, deploys and manages a series of linked, dimensional data marts. Cognos NoticeCast is the Cognos business activity monitoring (BAM) tool that delivers time-critical information to users via email and wireless devices.

ReportNet is designed for seamless integration and adaptive authoring. It presents critical data in user-friendly formats for complete reporting. The tool is based on service-oriented architecture and includes multilingual capabilities to deploy globally.

PowerPlay analyzes critical data from multiple angles using self-service capabilities through a web client. This OLAP software tool provides time trending and projection analysis. It leverages existing platforms and is data agnostic to read widely used OLAP data sources.

Visualizer dashboards unite data from all core departments supporting mission-critical strategic initiatives. This tool provides sophisticated chart types including histograms, thermometers, control limits and trends. Statistical charts represent standard deviations, percentiles, variations and frequency distribution. This includes multiple 2D and 3D chart types and maps.

DecisionStream ETL lets users unite disparate data into an integrated *BI* foundation that delivers reports and analysis. Dimensional data marts deliver data by conforming key business dimensions such as time, product and customer. This tool also provides an intuitive visual environment that lets users design their own data framework.

NoticeCast alerts decision-makers through its BAM functionality and three types of event monitoring. These include notification when a new *BI* is published, when a performance metric crosses a threshold and when a specific event occurs in operational data.

PowerPlay is probably the most well known of all Cognos products. All of these point solutions though provide the business user with the ability to extract, analyze and report information. Cognos has acquired and developed a wide range of tools to truly align the business user with the critical data needed to be successful.

XIV. Informatica's PowerCenter

In the last sections, the major players in *BI* emphasized reporting and analytic tools or a unified approach such as Oracle. Informatica has embraced their strength around ETL. PowerCenter provides a single enterprise data integration platform to help organizations access, transform and integrate data from a large variety of systems. PowerCenter delivers this data to other transactional systems and end users. The goal of this product is to enable organizations to create a single and consistent enterprise-wide information resource.

Informatica leverages standards, metadata and universal mainframe data access to unlock value from an organization's disparate data sources. It uses a single environment for transforming, profiling, integrating, cleaning and reconciling data and managed metadata. PowerCenter also incorporates periodic data updates to maintain accuracy of data delivery. PowerCenter provides security through user authentication, granular privacy management and secure data transport. This tool also uses open API's making it easier to add new data sources. It incorporates data-smart parallelism for processing options including partitioning and grids.

PowerCenter now comes in two editions. There's PowerCenter Standard Edition and PowerCenter Advanced Edition. The advanced edition offers metadata analysis and reporting. This product continues to emphasize Informatica's position on data integration rather than analytics.

XV. Business Intelligence Trends

Compared to the acquisition fury of 2003 and 2004, 2006 has been relatively quiet on the business intelligence front. In terms of recent trends, dashboards definitely came into their own. With the onset of compliance mandates came the need for organization's to get a tighter grip on their financial data. Wayne Eckerson of The Data Warehousing Institute has stated concerning dashboards, "...the business community has finally discovered the medium by which it wants to consume analytical information." Dashboards have given managers a way to get a quick glance on the information that matters to them as well as exception reports that keep them safe from risk.

Another trend has been the push by Oracle in the *BI* space. The major players like Cognos and Business Objects always viewed Oracle as the 800 lb. gorilla that would make waves in their market. According to Eckerson, "Rather than pursue acquisitions, ERP vendors seem to believe that the best defense is a good offense." Oracle continues to gain traction across the market with its unified approach selling against the point products that have been traditional in the *BI* market.

Data mining has reemerged in the recent months due mostly to the push of compliance mandates like Sarbanes-Oxley as well as the maturity of the products involved. Eckerson states, "We think the time is right for wholesale adoption of data mining because the market has matured and organizations are looking to extract more

value from their investments.” This process though can be expensive to execute and companies are still weighing their options.

Another trend has been the downturn in the ETL market. Informatica and Ascential both had less-than-favorable financial results. There’s just too much competition in the middleware and integration market. With their focus on infrastructure integration and the shrinking of the available market, ETL players are scrambling to turn things around positively in 2005.

XVI. Conclusion

Today, organizations have a number of options for *BI* solutions to meet the growing demand for data management and analytics. The biggest challenge for a company is choosing the best solution that fits their current needs and more importantly their needs for the future. Scalability is an important criteria in evaluating these solutions and in the coming months the front runners should become more apparent in the market.

An enterprise approach that combines the components detailed in this report such as OLAP, Data Warehousing, ETL, Dashboard, Reporting and Analytics is not only necessary but achievable. Companies can now bring together the best in *BI* solutions to match their every data need. This report as earlier stated is meant to be an educational document and is to be used as a reference point. It’s recommended to conduct a brief but thorough evaluation of the players in the market and take advantage of the current offerings.

Notes: