

# Business Intelligence: Information into Insight

by

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In his book, Information Anxiety, author Richard Saul Wurman points out that more information has been produced in the last 30 years than during the previous 5,000. Industry experts tell us the amount of information available today is doubling every five years, and that Corporate America is able to keep up with, and use, less than 7% of the information it produces.

I doubt that any of us who are using e-mail systems today would argue with that. If your e-mail in-basket is like mine, the volume is staggering. Add to that information we intentionally seek -- operational and sales data for example -- and the volume is even more overwhelming. But how much of it is truly useful information?

Businesses are asking the same question. And business intelligence technology increasingly is playing a key role in sorting it all out. Business intelligence in very simple terms is focused on the gathering, managing, analysis and distribution of vast amounts of data in order to gain insights that can be used to drive business decisions. It includes technologies like data warehouses and data marts, data mining, and Internet technologies.

The objective of business intelligence is to reduce volumes of data into useful information: customer profiles, buying habits, product profitability, competitive strategies. Sometimes that's accomplished by using advanced analytics to "mine" volumes of data for unsuspected but valuable associations and insight; sometimes it's streamlining data into useful reports and sharing that information with people inside and outside our organizations who need that information to perform their jobs successfully.

## **Business Intelligence and the Knowledge Economy**

Business intelligence today is focused largely on data about a company's customers, data about its services and products, data about marketing campaigns.

Knowledge of customers, the marketplace, and marketplace offerings is essential to success in what many have come to call today's new Knowledge Economy: an economy driven by information, and the application of insights into that information to secure competitive advantage, and increase market share and profitability.

Business Intelligence applications are at the heart of emerging Knowledge Economy systems -- business systems focused on capturing, analyzing, and sharing the information organization's learn about their critical business processes, and operational "best practices."

The Knowledge Economy rewards factors like *speed* to market; *flexibility* in adapting to changing customer needs; greater *choice* in the products available to customers, and finding innovative ways to manage *supply* and efficiently deliver products and services.

Thomas W. Malone, of MIT's Sloan School of Management, puts it this way:

"We are now at the threshold of a new era, driven this time not by the technologies of production and transportation, but by the technologies of information, communication and coordination. These technologies...hold the potential to completely transform the nature of work throughout the world."

Business Intelligence, then, is not a technology looking for a business need. Instead it is a *business imperative*, driven by business needs. Why has business intelligence become such a "hot topic?"

## **Factors Driving Business Intelligence**

Organizations of all kinds, worldwide, are facing enormous challenges from an increasingly turbulent and highly competitive environment: new types of competitors; deregulation; mergers and acquisitions; "co-opetition," global competition, Internet competition, and new partnerships and alliances.

There's been a revolution in the worldwide business landscape. Companies of all sizes are experiencing the rise of intense international competition and faster production cycles. These businesses are witnessing revolutionary new communications tools, like the Internet, and explosive growth in the service sector.

There's been an exponential growth of data. That includes transactional data from ATMs, checking accounts and points of sale, and data from reservations systems, telephone transactions and the Internet. Increasingly we will see data from the growth of what has been called "pervasive computing" -- chips embedded in sales tags to track purchases, in appliances to monitor and advise of service checkpoints, in automobiles and other products. Then there's operational data from business processes and operations, from sales and service transactions, and from surveys and direct marketing campaigns.

There are 600 million credit cards worldwide and 100 billion credit card transactions a year in the U.S. alone. Telephone companies in the U.S. collect 200 million call detail records every day. And Web site hits are generating mountains of market data.

New technologies -- like parallel processors and parallel data bases -- and the availability of low-cost storage -- have the power to deal with all that data. Advanced analytics and sophisticated data mining software that is widely in use today was not even available as recently as two years

ago. Increased computing power and lower processing cost makes it practical and affordable for businesses to apply the same kind of "Deep Computing" techniques previously reserved to research institutions and government laboratories -- intense and repetitive data mining of huge amounts of data using complex algorithms and analytics. The result is what many call "Deep Commerce," or the mining, segmentation, strategic analysis and management of vast amounts of customer demographics, product purchase histories, cross-sales, service calls, marketing campaigns, Internet experiences and other on-line transactions -- all focused on driving strategic business decisions.

Ten years ago the cost of a terabyte of data was some ten times what it is today. Businesses that as recently as a few years ago thought they might top out at 200 or 300 gigabytes of data are revising their estimates to terabytes and beyond.

The Gartner Group, Meta Group, and other analysts and consultants report that just about all their large customers either have, or will soon have, all their essential business information in a data warehouse. These same experts say that business intelligence is the second most asked about topic by their clients; right after the Internet. And a recent survey by InformationWeek magazine of 250 U.S. IT executives determined that business intelligence played in four of their top five business priorities.

For many organizations and businesses, effective use of information technology to manage knowledge in the organization will not only influence how fast they can grow, but *whether they can even survive!*

### **Business Intelligence: Key to Understanding Customers**

As organizations become involved with business intelligence, they tend to focus on a key set of applications. Primary among these are *relationship marketing*: what some sources refer to as "building customer intimacy," and *product and service usage*: how are my customers using my products and services? What channels do my customers prefer: in-store shopping, mail order, the Internet? How often and in which combinations do they buy? What other products and services are they likely to be interested in?

Today's businesses know that to compete successfully -- with all the choices today's consumers have in the marketplace -- they have to improve their customer service and add value that goes beyond delivering products and services.

### **Customer Need: Integrated Solutions**

Today's businesses are looking for new, innovative ways to differentiate themselves in the minds of their customers -- to build loyalty and allegiance. To do that, they need to understand their customers better; by measuring customer satisfaction and product profitability. They also need to find ways to reduce their operating costs and improve the supply chain: making the right products

available at the right time and at the right price. And some companies, like those in the credit and health management fields, need to find new and innovative ways to deliver quality services, and to control potential fraud and abuse within the system.

Until IBM announced its DecisionEdge solution, for example, building a business intelligence solution was anything but an easy decision. Companies had, and still have, dozens of hardware vendors, software vendors, specialized consultants, and database companies claiming that their "piece" of the solution is essential.

But IBM recognized that customers wanted something different. Customers wanted the entire solution -- hardware, software, consulting and services -- from a single supplier they could trust, without sacrificing "best of breed" components. And that's what IBM has delivered with its DecisionEdge family of solutions.

### **DecisionEdge Offers End-to-End BI Solution**

DecisionEdge is a complete, end-to-end business intelligence solution. Database, database servers, data mining, text mining, data analysis, industry data models, consulting, implementation services, and training are built-in. And because the solution is open and flexible, customers can choose the elements they require. DecisionEdge can be as intimate as a departmental data mart, or as far-reaching as a worldwide enterprise data warehouse.

Because no one company can provide everything a customer needs -- and still claim to be the best in every category -- IBM matches its industry-leading hardware, software and service with elements from respected Business Partners like Exchange Applications, Arbor, ETI, Vality and others.

The end result is "best of breed" relationship marketing solutions tailored to the unique requirements of specific industries -- such as Finance, Telecommunications, and Utilities. DecisionEdge is also available as a complete solution for fraud and abuse management, and for sales analysis in conjunction with J.D. Edwards and SAP.

Ideally, over the long term, a customer's business intelligence applications will evolve into "closed-loop" systems that apply information "learned" to direct decision making. For example, a "closed loop" airline business intelligence system could use a revenue "yield model" to optimize revenue per flight by tracking the number of seats available on a flight, days remaining to the flight, the number of competing airline flights available, and similar data -- to dynamically adjust ticket prices to help assure the flight left full, and generated optimum revenue -- all without direct airline personnel intervention.

## **Expanding Business Intelligence Population**

Today, as few as 400,000 specialists are accessing business intelligence systems, but Meta Group and others estimate that number will swell to over 10 million "knowledge workers" by the turn of the century. Executives and analytical workers of today will be joined by store managers, clerks, mobile salespeople, suppliers, business partners and even customers.

This boom in the number of users will naturally put additional stress on system resources, system bandwidth, and system security. But different users have different needs, and require different degrees of access to databases, as well as different tools for looking at and examining data. The system manager's objective will be to assure that the right information is available to the right people, at the right time, with the right level of security.

As information dissemination is increased, the value of the information grows exponentially. Knowledge *really is power*. Once an enterprise gains a knowledge-based competitive edge, it is *sustainable*. It becomes ever easier for the enterprise to maintain its lead, and *ever harder for competitors to catch up*.

Increasingly, when I meet with CEOs and CIOs, they tell me that regardless of the core business they are in, they consider themselves to be in the *knowledge business*. In fact, the strategic use of knowledge may be the *ultimate way to compete*.

## **Business Intelligence Disciplines**

When I look at business intelligence in the marketplace today, I see it in terms of six major disciplines. They include:

- The Data Warehouse or Data Mart, and basic data query;
- Standard statistical analysis;
- Multi-dimensional analysis;
- Data mining;
- Optimization analysis, and
- The analysis of non-structured data: for example the analysis of text, audio and video.

## **The Data Warehouse**

Much of this analysis depends on the integrity and validity of the data captured and analyzed. That's a bigger problem than it might seem to be on the surface; especially for large, established organizations with a legacy of overlapping databases and dozens of applications that are loosely connected -- or not connected at all.

As a first step to an effective business intelligence system, most organizations begin with the building of a traditional "data warehouse," or a smaller "data mart." The data warehouse is a repository of detailed data about the organization's customers, its products and services, and how these products are sold and used.

Data warehouses and data marts are the essential first steps in collecting and using heterogeneous organizational and transaction data. Relational database management systems, like IBM's DB2 Universal Data Base, provide the means of organizing and manipulating the data. Data cleansing and data extract tools assure data consistency and completeness.

Complex queries, multidimensional analysis and data mining are some of the techniques by which data can be transformed into knowledge and insight. Internet browsers, Intranets and similar software provide the means of accessing and sharing information *within* the enterprise, as well as with communities of customers, business partners and suppliers *outside* of the organization.

Companies that have invested in building enterprise-wide data warehouses have realized impressive returns on their investment.

According to an International Data Corporation case study of 65 companies representing a broad range of industries, the mean return on investment was an astounding 401 percent in just over two years. Now, not every data warehouse project is that successful. There are a number of factors that influence success. But by and large, the results are very impressive.

## **Transforming Information Into Insight**

Within the discipline of business intelligence, we identify two types of inquiries: those that are *verification driven*, and those that are *discovery driven*.

In the first instance we have an idea of what we are looking for and are searching for data that will support our assumption. In the second instance, we run analytics against the data in the expectation that we will uncover -- or discover -- patterns or trends in the data that were in no way apparent before, but which potentially have significant value.

In *verification-driven analysis*, for example, a bank might structure a complex data query that included (1) identifying all their clients that live in Florida, Georgia, and North Carolina, (2) and who also have checking and savings accounts and use credit services, and (3) who engage in more than 30 transactions per week. The bank's objective in developing such a list might be to target a marketing offer to these customers involving, for example, an on-line bill-paying and account management service.

In *discovery-driven analysis*, that same bank might run analytics against groups of customers to turn up characteristics or patterns of activity they had not anticipated, but can now draw valuable conclusions from. For example, they might run analytics against a group of customers who have

defected to a competitive bank to identify customer characteristics that are shared, or strongly correlated. They could then use these attributes to score the rest of the bank's customer population to see which other customers share these characteristics and may be at risk. Knowing which customers may be at risk to defect enables the bank to develop specific action plans to retain those customers.

In another example of the power of business intelligence, one customer, a large telephone company, ran data mining analytics against customer calling patterns and determined an unusual spike of activity for a number of its customers between 3:30 p.m. and 5:30 p.m.

Further analysis determined it was the result of teenagers returning home from school and calling their friends -- something you'd hardly think they needed to do after spending all day together -- but clearly here was an opportunity for the phone company. They developed a targeted direct marketing campaign that offered a second phone line at an attractive price to more affluent families, and a special call-waiting package to less affluent families. The result: happier customers; more business for the phone company.

### **The Future of Data Mining: Text Mining**

While most of today's business intelligence applications are focused on the capture and analysis of traditional data, it's simply not enough. As I mentioned earlier, industry experts say that today's businesses are able to analyze and use only about 7 per cent of the data within the organization. That's largely because much of it is unstructured data: text, audio, video and images. The next business intelligence frontier involves the analysis of text, or *Text Mining*.

We're already making great strides in this area and we have some innovative solutions that customers are testing. One of our European customers in the utility business is continually mining hundreds of technical reports and industry publications, looking for technology advances and proposed regulations that may impact their business -- all so they can get out in front of emerging issues and use them to advantage.

Another customer of ours, a fast-food chain, is mining written customer satisfaction surveys returned to the company commenting on product quality and service, so they can spot trends -- both positive and negative -- and act on them virtually in real time.

Voice recognition technology may be a key to taking recorded data, like call-center customer requests and responses, and converting those calls to transcripts that can then be mined for information. And as voice recognition technology improves in its ability to recognize the speech of random callers, we can expect to see more and more of this data mined and used to advantage.

## Industries that Benefit the Most

Generally speaking, the industries that stand to benefit the most from Business Intelligence applications are those that (1) *interact* with lots and lots of consumers; (2) *gather lots of information* in the course of selling products and providing services to their customers; and (3) are in *very competitive businesses*, where it is increasingly difficult to differentiate their products and services from those of their competition.

At IBM we have identified and are focusing much of our own business intelligence solutions on nine major industries: Retail/Distribution; Insurance; Telecommunications; Utilities & Energy Services; Airlines & Transportation; Banking & Finance; Consumer Packaged Goods; Healthcare, and Government.

Let me share with you just a few examples of where some of these industries are applying business intelligence solutions.

In *Banking and Finance*, "relationship marketing" is *the* key trend. Financial institutions are working to construct a total relationship view of customers: looking at a customer in terms of all the different services he or she may be using throughout the bank. These same institutions are asking: How can we increase cross-selling and at the same time increase loyalty? How effectively do we measure and respond to customer satisfaction indicators? And perhaps most importantly, just who are our most profitable customers? Who are least profitable?

One banking customer told us that without the data warehouse -- which makes possible a total customer view -- they would have returned a customer's overdrawn check, until they realized that same customer had a separate \$3 million trust fund with the bank!

The *Retail* industry deals with millions of customers and hundreds of millions of customer transactions. Their focus is also on knowing their customers better. Their goal is to be able to move from a mass merchandising base -- where they and their competitors all look the same -- to *marketing to a segment of one*. They are segmenting their customer databases to directly address individual customer preferences and needs; to differentiate themselves in the eyes of the customer, and to build loyalty.

One of our Retail customers was able to use data mining techniques to segment its customer database to such a degree that it was able to realize a phenomenal 40% response rate on one direct marketing offer. Retailers also capture and analyze millions of credit card transactions a year to identify which customers are shopping in which departments for which items, in order to construct life-stage profiles and build targeted marketing offers.

The *Utilities/Energy* industry finds itself in a whirlwind of deregulation. They also are analyzing their customers and transactions as never before to learn all they can. They want a better understanding of who their customers are, the current products and services they are using, and what their future needs may be.

The utility company that treated you as a meter number and a monthly bill is no more. Today's companies realize they are in the "transmission" business. The same wires that brought you electricity can also connect you to cable television, or the Internet. And they can offer the consumer "smart" appliances that wash clothes and rinse dishes in off-peak hours. In fact, some of the utility companies are considering leasing household appliances -- a practice that began early in the century but was later discontinued. When you think about it, having your electricity and connection services and appliances all from the same company makes it a lot harder to switch suppliers and certainly helps retain customer loyalty!

Of course, business intelligence is a major tool for the *Telecommunications* industry. Perhaps no other industry has experienced such change and turmoil and competition in recent years. The battle for local, long distance, wireless and Internet services is legendary; as wide open as the Wild West. Companies worldwide are building databases to segment their customers and increase cross-selling. They're finding ways to identify their most profitable and least profitable customers. The phone companies are working to offer new services, like Cable and interactive television; while the cable and satellite TV companies are offering direct Internet access. It's indeed a Brave New World!

## **Elements of Success**

I mentioned earlier that not every Data Warehouse project is successful. The fact is that over time, and through experience, I've learned that certain key elements need to be present to help insure the success of a project that's so inherently comprehensive and complex. I'd like to share those strategies with you.

The first is to *assure that you have appropriate executive sponsorship*, both on the IT level and on the business level. This is absolutely essential. If you cannot secure a sincere level of active executive commitment from both sides of the organization, stop right there. Success requires "bi-partisan" executive support.

Second, *link the business intelligence solution to your business' objectives* and needs. Your business needs to see a clear, practical benefit to building a data warehouse; a tie-in to the company's goals and objectives.

Third, the *end-user tools* you select to utilize and access the data warehouse are important, but *don't get consumed with their selection*. There are thousands of choices, all acceptable, and you can involve the end-users in choosing which tools are preferable.

Fourth, *combining data from multiple sources can be challenging*, particularly in multiple vendor systems with legacy applications and multiple sources of data. *Choose a partner that has the experience* and demonstrated track record needed to help you pull this off successfully.

Fifth, your *data must first be extracted, cleansed and transformed* before you store it in your data warehouse. In my experience *this is the most under-estimated part* of most data warehouse

projects. The time, effort and cost involved is usually several times the original estimate. And it is perhaps the most crucial stage. Meta Group reports that "Fully half of all data warehouses implemented currently provide 'dirty data' to end users, leading to business decisions based on bad information."

Sixth, *involve your company's end users throughout the entire process*. If this is to be a system they embrace and use, they must have input into describing what they need and how they will get data into and out of the system. If your end users have not developed a sense of ownership with the data warehouse; it simply will not be successful.

Seventh, *start small*. Begin with projects that are well-defined; where there is a clear and immediate need. *Plan for continued growth*, building on early projects as a model for those that will follow. Carefully plan the rollout phase within the enterprise.

Eighth, realize that proper and *adequate education and training are essential* to success. Involve a partner that can help provide these services if your staff is not equipped, or prepared, to do so.

Finally, *plan for flexibility and scalability*. Successful data warehouse implementations invariably result in even more data stored than was originally planned, more users than anyone anticipated, and more complex data analysis activities than anyone imagined. In fact, this is one very important measure that the data warehouse project is, indeed, a success! Planning from the beginning for scalability and expansion will enable you to deliver the level of resources and responsiveness that the organization will quickly come to expect.

## **The IBM Vision**

What will we see in the future? More and more data to be analyzed!

The small size -- and small price -- of today's microprocessors means they will be in more and more places: monitoring hours-of-use on household appliances to advise of service checkpoints; attached to garments to track sales and alterations; embedded with our medical records. This is what many have come to call "pervasive computing."

We'll see better management of, and access to, structured data -- like that found in data warehouses and data marts -- as well as unstructured data -- the free text found in publications, reports, and transcripts of customer service calls. We'll also see universal access to data, with the Internet and easy-to-use browsers the access methods of choice.

We'll see the custom broadcasting of data when and where it's needed: for investors to your cell phone or pager when a stock reaches a certain value; to physicians when a potentially dangerous drug interaction is discovered; to sales teams when one of their distributor's inventory drops below a pre-set level.

Expect more intensive analysis of vast amounts of data using processing power and software that would have been prohibitively expensive even a year ago; what we call "Deep Computing."

Look for extensive analysis of Web site usage, resulting in more customized information being "pushed" to interested parties based on their browsing patterns in the past.

And Knowledge Management -- capturing the most productive -- and least productive -- decisions, practices and experiences within an enterprise -- will flourish, fueled in part by the stream of insights delivered by pervasive business intelligence applications. This will lead to more effective operations and increased collaboration and productivity within the enterprise.

In short, I see a bright future; a transforming future. No shortage of challenges, mind you, or obstacles to be understood and overcome. But business intelligence technologies today -- right now -- are delivering an exciting set of analytics and techniques that are enabling us to get more out of the data we collect than anyone ever thought possible.

In a very real sense we are transforming terabytes of data into insight and action that is helping to revolutionize businesses and institutions worldwide.

This is a particularly exciting time in our businesses, and in our society. Like each of you, I'm excited to be a part of it, and look forward to all the changes that will be brought about in the next millennium.

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