DELIVERING BUSINESS INTELLIGENCE

How organizations can take advantage of an expanding BI toolset

Business intelligence has been a technology mainstay of many organizations for decades. Today, it is playing an ever larger role in the success of businesses of all sizes. From small operations to global enterprises, more organizations are recognizing BI as a powerful tool that can help them survive and thrive in a challenging and competitive business environment.

The need for BI — or the expansion of BI for those that already use it in some form — creates additional demands on IT teams, who frequently take a leadership role in BI initiatives. IT departments have faced numerous challenges in recent years. Budgets have grown tighter than ever, even as the IT group has been asked to deal with the security and governance challenges of bring-your-own-device (BYOD) programs and cloud computing.

This white paper provides an overview of BI building blocks and deployments — from classic data warehouses to Big Data and real-time analytics, as well as the demand for mobile solutions that can provide actionable intelligence from anywhere.

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The good news is that BI has a well-deserved reputation for providing insights based on the inherent power of bringing data together (often from disparate sources) into a central repository, or data warehouse, from which it can be queried, analyzed and explored to guide decision-making. Organizations can gain substantial benefits and clarity from using well-defined reporting and analytic tools that provide all decision-makers with deep insights that they previously would have been unable to find.

Expanding the power of BI to mobile, incorporating nonstructured data from the vast realm of Big Data or drawing upon cloud-based resources are all simply extensions of the core BI story. The IT team was there from the birth of BI, and it is the group best prepared to help an enterprise evaluate and deploy whatever BI toolsets and data sources it needs.

Today's BI

To appreciate where BI is today — and where it is headed — it is helpful to look back to its origins, which can be traced to the previous century and a German émigré named Hans Peter Luhn, who joined IBM as a research scientist in 1941. He is credited with creating the term business intelligence in a 1958 article he wrote for the *IBM Journal of Research and Development.* In defining what he meant by *business intelligence,* Luhn simply cited the definition of intelligence — straight from *Webster's Dictionary:* "the ability to apprehend the interrelationships of presented facts in such a way as to guide action toward a desired goal."

That search for "the interrelationships of presented facts" to "guide actions toward a desired goal" is, more than 50 years later, still the goal of all BI deployments — whether these facts are pulled from an organization's data warehouse or churned out from crunching terabytes of Big Data.

Expanded Tools

For the past 50 years, the quest for BI has been one of the drivers behind computer science, and BI has benefitted from a long series of breakthroughs in both hardware and software. Today, with the ability to purchase terabyte hard drives at commodity prices and the ubiquity of multicore processing, much of the focus is on the software that can be brought to bear on vast data stores.

In its most simple description, BI could be looked upon as a two-step process: Step 1, gather a lot of data. Step 2, pull actionable insights from that data.

The basic tools of BI, the reporting, analytical and predictive tools that make its actionable insights so valuable to an organization, include the following:

Reporting tools: Reporting tools are the bread and butter of BI. This functionality enables an IT department to define and run recurring reports against data imported from across an enterprise. Whether referred to as an *organizational data store,* a *data warehouse* or any number of other terms, the power of classic BI is seen in the gathering of data and then running reports against it.

Analytic tools: Analytic tools support the exploration of data. They go beyond fixed reports to seek out unusual insights that might otherwise go unseen. For example, a retailer might find that a hunting jacket popular in Maine isn't as popular in Texas and adjust its sales strategies in those states accordingly.

Predictive tools: In a way, predictive tools can be seen as a third step along the path of BI — from reporting to analytics to prediction. Of course, plenty of predictive value can be derived from solid analytics, but the emphasis on predictive tools is generally on real-time or near-real-time results.

Speaking of BI

The wealth of data and promise of BI have inspired thinkers for centuries. Here are some classic thoughts on the matter:

"Data! Data! Data!" he cried impatiently. "I can't make bricks without clay!"

— *Sherlock Holmes in Sir Arthur Conan Doyle's The Adventure of the Copper Beeches*

"Without Big Data analytics, companies are blind and deaf, wandering out onto the web like deer on a freeway."

— *Geoffrey Moore, Author, Crossing the Chasm: Marketing and Selling Disruptive Products to Mainstream Customers*

"Data is a precious thing and will last longer than the systems themselves."

— *Tim Berners-Lee, Inventor of the World Wide Web*

"Numbers have an important story to tell. They rely on you to give them a clear and convincing voice."

— *Stephen Few, Author, Show Me the Numbers*

"Hiding within those mounds of data is knowledge that could change the life of a patient, or change the world."

— *Atul Butte, Associate Professor of Pediatrics, Stanford University School of Medicine*

Predictive analytics is based on feeding data into an algorithm to generate what's predicted to be the most effective response. To an extent, the need for predictive analytics has been driven by the world's move to mobile devices, as well as the demands of the mobile ad space.

Vendors have invested heavily in finding out who will respond best to which ad or, given what is known about certain visitors, which offers should be presented upon their landing on a website.

Contextual tools: Contextual tools are focused on the interaction between data and context. The context can be as simple as matching ZIP code demographics to sales, or as subtle as evaluating the brand of smartphone a person is using, the time of day and even his or her location (from the smartphone's GPS) to determine how to analyze data points or how to fine-tune real-time predictions.

Cognitive tools: Cognitive tools incorporate models that attempt to replicate the weighing of facts and context that goes into human decision-making. The quest for cognitive tools goes back to the birth of BI, and later, the emergence of artificial intelligence.

A cognitive element is seen in predictive analytic tools that incorporate machine learning. Machine learning simply means that once a system makes a prediction (such as whether a user will click on a proffered link) the results are monitored and fed back into the system, with the goal of enabling it to make smarter choices in the future.

Social media tools: Social media tools are used to import and analyze nonstructured data from the vast realm of social media. For a business, this could involve gaining a feel for customer sentiment by analyzing how the company is perceived through automated searches of blogs, Twitter feeds, Facebook posts and other social media. The same information can be analyzed to predict trends and patterns that could better inform an organization's BI efforts.

The Growth of Self-service BI

For as long as BI has existed, enterprises have held a strong desire for self-service BI. With classic BI, the IT team works with business groups to design and run a set of recurring reports, while specialized analysts use complex tools to run their own searches and ad hoc queries against the same data store.

Of course, it wasn't long before knowledge workers started making requests for custom reports. Traditionally, such requests were submitted to an IT group or analyst group, where the report would be created. Such requests demanded resources from the IT and analyst groups, especially when the person requesting the report — perhaps after having waited days or longer to get it — later added other variables to the request.

Now available user-friendly tools can create ad hoc reports and let regular business users design, test and modify their own queries. These tools have become very popular and have boosted bottom-line productivity. Tools designed with a user-friendly dashboard interface allow users to explore data and drill down into exacting detail whenever needed. Today, regular users can create their own reports and define their own key performance indicators — without having to go to night school to learn a sequential query language.

Mobile Trends

The adoption of smartphones and other mobile devices has been so strong that researchers at Stanford University reported that most people are more likely to leave the house without their wallet than forget their smartphone. Similar studies have found that the majority of people take their smartphones to bed with them, and that we come to view them as extensions of ourselves.

Against that backdrop, it isn't surprising that decision-makers throughout an organization want to be able to use mobile devices to access the same kinds of BI tools that they have come to depend on when using desktop or notebook computers.

Mobile applications also help workers for whom mobile work is a requirement — field technicians, delivery drivers, plant workers and a world of others who can do their job better by tapping into BI and analytics (whether to determine an optimized delivery route or to project mean time to failure for a piece of equipment) from wherever they may be working.

The mobile trend extends the path on which business analytics has been growing. A generation of desktop BI and analytics tools has freed BI from the back office and pushed it to the edges of the enterprise so that everyone can make better decisions. Mobile is a powerful tool for extending this practice.

The challenge for IT departments is to find the best mobile self-service tools. Trends such as the consumerization of IT and BYOD have sometimes forced the IT department into a reactive position of accommodating multiple apps that have been downloaded onto users' mobile devices. Some organizations have taken a pre-emptive position by creating their own internal app stores where employees can download apps that have been vetted and integrated into back-end BI systems.

Most new BI solutions support the mobile workforces that organizations employ. Many of these solutions let mobile workers use a smartphone or tablet to make queries, extract data, run analyses and conduct other BI-related tasks.

Cloud Trends

Cloud computing represents an interesting challenge for IT groups. The cloud can look enticing: It offers all of the computing and storage power an organization may need, without the capital expenditures of deploying its own servers. The cloud certainly makes for easier capacity planning too. An enterprise can spin up instances as needed, and spin them down (and stop paying for the resources) when not needed.

But IT teams must maintain careful oversight and control of cloud resources. Storing an organization's data on devices that are controlled and owned by another entity, perhaps located in another country, raises a number of questions with regard to security and governance.

Many organizations are taking a cautious approach to the cloud. But the basic value proposition is strong enough that small enterprises wishing to deploy or expand BI platforms, or groups seeking to capture and explore immense volumes of Big Data, may be drawn toward cloud-based resources.

This is an area where the IT department can provide guidance in assessing security and governance concerns. IT may also be able to help with the architectural design of hybrid solutions that incorporate cloud resources while maintaining local control of data to meet industry compliance or internal governance restrictions.

The consumerization of IT, again, can be a complicating factor. In the same way that workers want BYOD, many are also launching their own clouds, which can be accomplished in minutes. Launching cloud-based resources in such an ad hoc manner can make it difficult for the IT staff to maintain control of enterprise information.

When considering cloud resources, an organization is well served to remember that its BI platform, to a great extent, constitutes its crown jewels. Wherever the infrastructure is deployed — whether in the back office or in the cloud — it must be carefully secured and protected, which provides good arguments for IT involvement.

50%: The percentage of business leaders that say they base at least half of their business decisions on data and analytics

SOURCE: "Analytics: A blueprint for value" (IBM, October 2013)

Determining Business Drivers

Determining the business drivers for a BI implementation should be a first step for all projects — whether planning to introduce BI for the first time, or expanding an existing BI solution to serve new groups or purposes. This means walking stakeholders through a discussion of what they need and why they need it. Analysts and someone with systems integration experience would add value to this process.

The purpose of this discussion is to define needs and propose solutions — while identifying a set of metrics that can be measured both before and after deployment to gauge the success of the project.

If an organization already has a data warehouse, the project could be as simple as defining a set of reports for a specific group and providing it with easy-to-use tools to enable self-service ad hoc reporting and analytics. For groups with heavier analytical needs, the IT team can provide a separate data mart (a subset of the entire data warehouse) with data structured (using a dimensional model) to more directly meet their needs. Because a data mart is essentially structured to answer common questions, a sales department might be best served by one data mart, finance by another, customer service or manufacturing by another.

The IT group should ensure that all data marts are plugged into the same central repository, or data warehouse, and that a common set of data structures, or dimensions, is established so that every data mart uses the same definition of time, product, customer, supplier, branch, etc. It can be surprisingly difficult to get different groups within the same enterprise to agree on what constitutes basic metrics. But without uniform definitions, the organization can't get to a single view of the truth, which should be a common goal of all BI deployments.

When launching a new BI platform, it is perhaps even more important to identify the business drivers and the metrics that will determine success. To maximize the chance for success, a BI project should begin small and then grow as users and IT staff gain experience and expertise. Rather than rolling out a BI solution for the entire organization, the IT team should find the group that could most benefit from BI and work with it to create a pilot project with a set of predeployment metrics that can be used to measure success.

Success breeds attention. Once a successful BI platform is provided to one group, others will want the same. So whatever is deployed should have a scalable infrastructure, one that can be built out on an as-needed basis.

Lines of Business Needs

Once an organization has identified its business drivers, the IT department must work closely with each line of business that will be drawing from the BI solution. Different LOBs use BI in different ways. Some groups use the data store to guide long-range planning, such as facilities expansion, product development or entering new markets. Others work with a shorter time frame, making decisions to guide

Data Warehouse vs. Data Mart

The stores of data that power a BI solution are critical to its success.

A *data warehouse* draws information from sources across the enterprise, providing a central repository for all data. A *data mart* contains just a subset of this data — for example, departmental budget information — and can be structured for fast query responses and analytics.

Traditionally, a data mart is dependent on the data warehouse, meaning that it pulls its data from the data warehouse. An independent data mart pulls its data directly from departmental line-of-business (LOB) applications and data stores.

A data mart is much easier to create than a full data warehouse, so many independent data marts have long existed within organizations. But the danger of having multiple independent data marts (especially those that use different data structures and definitions) is that they can become functional silos, defeating the value of the data warehouse as a central repository.

Sometimes, especially in smaller enterprises, the birth of a data warehouse is traced to an early data mart that other departments wanted for their own use. Generally, the sooner an enterprise can move from data mart to data warehouse, the better. Once a central repository is created, the organization can create as many dependent data marts as needed, without fear of creating the disparate silos.

weekly, monthly and quarterly goals. Still others require real-time analytics and predictive tools to make fast-paced workday decisions.

Delivering Information That Is Relevant and Actionable

Once the IT department has a good sense of what a group needs, the next step is determining the best solution to meet these needs. In many cases, a line of business can be served by an organization's existing BI infrastructure, by creating a set of custom reports and giving the LOB access to self-service reporting and analytic tools. If an enterprise can't use a solution that's already in-house, it should consider third-party products specifically designed to meet its needs.

The discussion of which solution an enterprise decides to implement should be guided by the goal of providing relevant, actionable information. Several questions can help determine what information is truly relevant: What information does the organization have? What information does it really need? What kind of actions will the information guide? Will a proposed report or analytic capability meet that need?

As the IT team asks these questions, it shouldn't be afraid to follow up with more detailed queries. The goal is to get as clear a picture as possible of the business intelligence the enterprise seeks. To achieve this goal, IT staff must understand what information is needed and why.

Packaged & Process- or Industry-specific Analytics Apps

Sometimes it makes sense to take advantage of the entrepreneurial efforts of third parties. Whatever challenges a group may face, someone else has likely already faced the same challenge and devised a solution. Such custom solutions can draw on deep industry-specific knowledge that makes it useful for similar organizations.

An enterprise considering such a solution must exercise due diligence, including ensuring that it is easily customizable to meet its specific needs, and that it will seamlessly integrate with the existing infrastructure. The organization must make a concerted effort to prevent the creation of silos of data that can't be easily shared and that don't employ data definitions used elsewhere within the enterprise.

Even when an outside systems integrator is used for the deployment, the IT department can add value by guiding architectural and data modeling decisions. Once a project is implemented, the solution should be fine-tuned on an ongoing basis to help ensure that the organization derives maximum value from the investment.

Determining Where Predictive Analytics Fits In

Predictive analytics is a popular topic among organizations that are considering BI, often in association with Big Data. In one sense, predictive analytics has been around for a long time. It's how insurance companies determine how much to charge a 57-year-old smoker for life insurance, or a 16-year-old boy with a sports car for auto insurance.

Many enterprises use predictive analytics for real-time or near-real-time decision-making. Within the retail sector, predictive analytics can be used to link point-of-sale devices with back-office BI infrastructure to make split-second offers to customers while they are still at the cash register. Financial service organizations can use predictive analytics to make swift recommendations on financial instruments or other services a specific customer might be interested in. And within the fast-paced world of the web, predictive analytics can use customer account data to make product recommendations.

An organization that is considering a predictive analytics solution should explore the intended use and expectations

to determine what will provide the best fit. Basic questions include: What is the user's identity? What actions does the enterprise want to predict? What are the data points? Do these data points need to be captured and stored?

If the identity of the user isn't known, then much of the effort will go into crunching contextual data to create a best-guess model of who the user is and what his or her interests may be. Classic examples include: If geospatial data indicates that a smartphone user is in the restaurant area of a city at 7 p.m. on a Friday, the user may be interested in special offers from nearby restaurants. Whereas, if the same phone is being used at 7 a.m. on Saturday morning to watch cartoons, it may be in the hands of kids whose parents are hoping for a few more hours of sleep.

The Typical BI Stack

Generally, the heart of a BI stack is the data warehouse, the central repository for information. A data warehouse simply brings together all relevant information from across an enterprise. Before organizations established data warehouses, information tended to be trapped in silos — different departments within an enterprise deploying point solutions designed to meet specific needs, but that may not have been designed to integrate easily with others.

Once data has been compiled in a centralized data warehouse, all kinds of value can be extracted. Here's a look at some of the basic elements of the BI stack:

Central repository: Usually called a data warehouse, this is where an organization collects data from a variety of applications and data stores from across the enterprise.

Data integration services: This layer serves as the integration point for importing data from multiple sources into a unified data warehouse. The power of data integration is that it can take information from an Oracle database in sales and combine it with feeds from a SQL Server database in customer support, as well as mainframe files from operations. This layer serves to extract, transform and load data from any source so that it is seamlessly available from the data warehouse.

Master data services: These provide synchronization and deduplication to protect the integrity of the central data repository, helping to ensure that, among other things, insertions, updates and deletions from source locations are posted to the central repository.

Reporting services: Once data from throughout an organization has been fed into a data warehouse, reporting services are used to extract its value. Reporting tools, whether created internally or purchased from a vendor,

should support the creation of recurring reports — such as weekly or monthly sales figures or operational expenses. The tools should also support self-service reporting so that users can create their own reports.

Analytics services: Analytics tools can be used to create analytical databases that make it faster and easier to run custom queries or perform data mining. Enterprises can use analytics tools to create the multidimensional cubes of a data mart specifically designed to meet the needs of a particular group or function.

Predictive analytics services: Predictive analytics uses techniques such as statistical, regression, correlation and cluster analysis. By leveraging these measures, along with text mining, data mining and social media analytics, organizations can learn what to expect in a given area. They can use the models and patterns created, along with real-time data, to improve decision-making in situations such as loan approvals or product development.

The Pilot Program

Creating a successful pilot program is as much about people as it is about technology. A successful pilot should include a cross-functional team that can work together to identify a strong business need that is well served by BI. Along the way, the team should also determine benchmark metrics that can be used to measure success.

A pilot team can pull valuable insights from the LOB workers who use the BI, helping to ensure that relevant data is captured and actionable intelligence is produced. An executive sponsor with sufficient clout to remove any roadblocks that might arise can be essential to the success of a BI pilot. Most important, the sponsoring executive should be able to understand the value that BI can bring to the organization.

The hallmark of a successful pilot program is to start small with a well-defined project that will produce high-value data. In addition to the cross-functional team, the IT group should seek input from others who will be involved in day-to-day use of the information. This pays a double dividend.

First, it provides real-world insight into how the data will be gathered and the BI used. Also, allowing users to have a hand in crafting the solution promotes buy-in that increases the chances of success. Users who feel empowered in planning the solution are more likely to share lessons learned and seek ways to make improvements as the project matures.

Once the pilot has been successful, stakeholders should work with the IT department on ways to enhance its usability and output.

Obtaining Executive Buy-in & Support

In general, as the cost and complexity of an IT project increases, the greater the need for high-level support within the enterprise. A large project ideally will garner the backing of a C-level executive other than the CIO, who should be expected to support deployment of new IT solutions.

A good strategy for obtaining high-level sponsorship is to use metrics identified by the pilot team to create a compelling case to present to the executive. Projected metrics can be powerful allies. Executives are more likely to be swayed in favor of a project from which they can expect results such as reduced time to insights, increased sales or a greater return on the organization's investment.

When proposing the project, the IT team should explicitly draw connections between the enterprise's strategic goals and the intelligence delivered by the BI solution. A value-based business case will explain how the investment will pay off and maximize the likelihood that it does so.

The organization should develop a roadmap for BI implementation that explains the analytics and how they will affect each facet of the enterprise. In addition to reducing the risk of redundant BI investments, the roadmap also will foster data sharing among different departments.

Once the pilot has gone live, IT staff should determine whether the metrics demonstrate the anticipated results. If they do, the organization should begin the process for scaling the pilot into full production.

Follow Up for Success

With the right teamwork leading up to the launch, many users will be eager to get their hands on the BI solution. Users who participate in the process of defining the requirements of and planning for a BI project will be far more invested in its success. Once in production,

project leaders should gather success stories and share them widely. The IT group should hold training events to make sure users are comfortable with the solution and understand the capabilities it offers.

Trust is another key element to a successful BI implementation. Users who trust the BI solution and the data it relies on will make the best use of it. This demands human interaction. Organizations should invest the necessary time in building trust between all the parties involved in planning, implementing and using a BI solution — from executives to IT personnel to analysts to end users.

Once the initial rollout is successful, the enterprise should market its BI solution to other departments. This is another area where executive support is essential. Senior leaders who use BI transparently establish a top-down culture that engrains such behaviors throughout the organization.

Automation is another helpful tool for fostering BI adoption throughout an enterprise. By streamlining the data cycle through automation, an organization can deliver more timely and relevant insights to end users and decision-makers. Automating parts of the analytics cycle also increases the productivity of analysts by giving them more time to focus on driving insights from the data, rather than performing routine maintenance tasks.

As an enterprise plans to expand its BI projects, it should duplicate the process that delivered a successful pilot. IT and project stakeholders should define the benefits, establish metrics, garner executive support and assemble an implementation team that takes user input into account. As an organization's BI success widens, these steps should become easier to replicate.

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