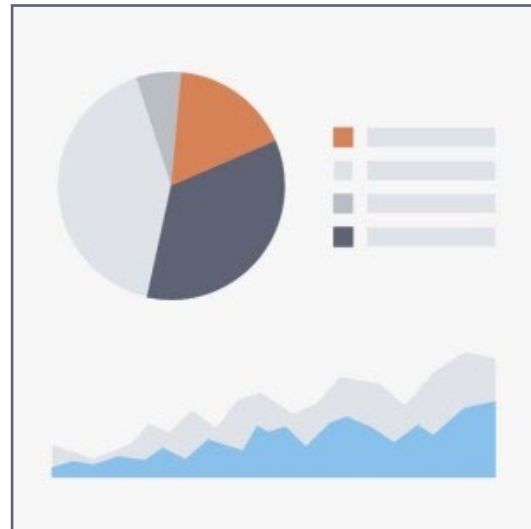



The Definitive Guide to Business Intelligence

Business leaders have access to more data than ever before. But data by itself doesn't generate insights.

Business Intelligence Tools have become the go-to resource for helping companies harness the power of big data and analytics and make **smarter, data-driven decisions**.



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Future

What is Business Intelligence?

The specific definition of BI can vary depending on who you ask.

Here are a few examples of some of the ways business intelligence is defined:

“ *A variety of software applications used to analyze an organization’s raw data.*



“ *A broad category of computer software solutions that enables a company or organization to gain insight into its critical operations through reporting applications and analysis tools.*



“ *A set of methodologies, processes, architectures, and technologies that leverage the output of information management processes for analysis, reporting, performance management, and information delivery.*



“ *Technologies, applications and practices for the collection, integration, analysis, and presentation of business information.*



“ *The use of computing technologies for the identification, discovery and analysis of business data – like sales revenue, products, costs and incomes.*



In our view, each of those definitions is incomplete.

Many of them are focused only on the software used for business intelligence. While the term is often heard in relation to software vendors, there’s more to BI than just software tools.

In addition, many of the common definitions of BI neglect to include the primary goal of business intelligence.

Our definition of BI is as follows:

Business Intelligence helps derive meaningful insights from raw data. It’s an umbrella term that includes the software, infrastructure, policies, and procedures that can lead to smarter, data-driven decision making.

History of Business Intelligence

The term “business intelligence” has been around for decades, but it was first used as it is today by Howard Dresner in 1988.

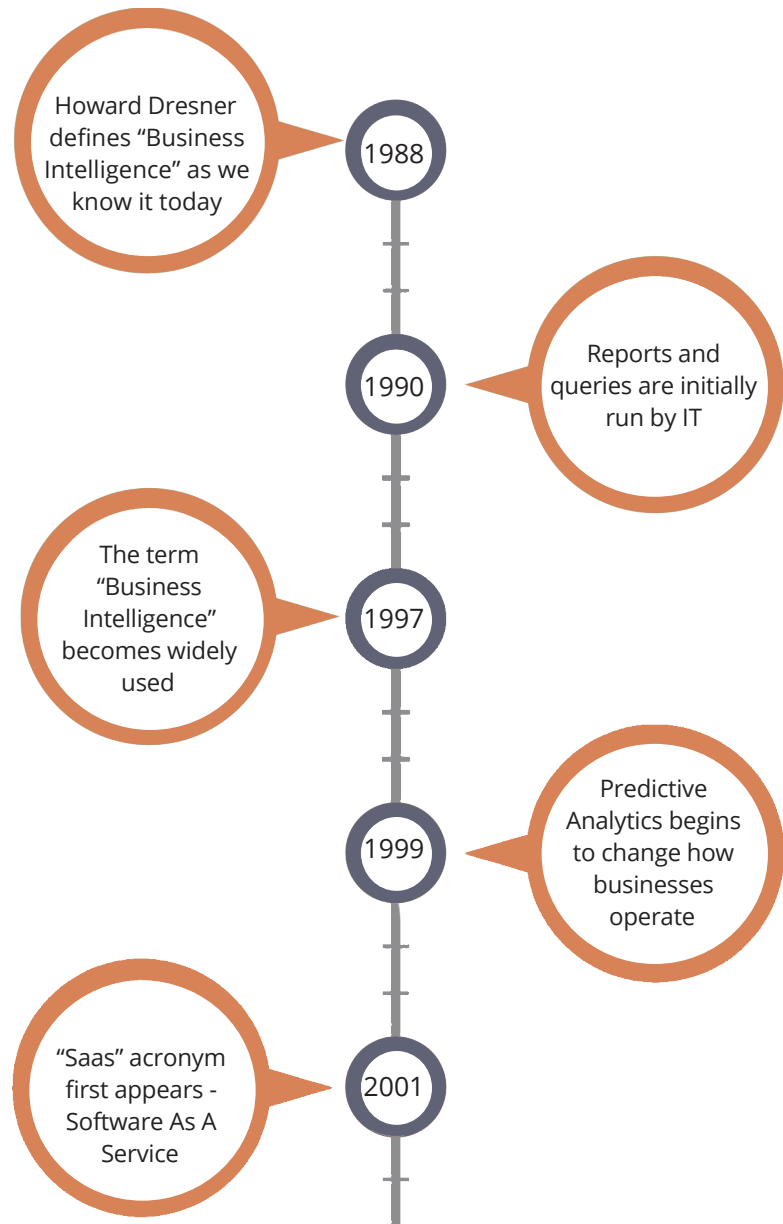
Dresner defined business intelligence as the “concepts and methods to improve business decision making by using fact-based support systems.”

Today, business intelligence is defined by Forrester as “a set of methodologies, processes, architectures, and technologies that transform raw data into meaningful and useful information used to enable more effective strategic, tactical, and operational insights and decision-making.”

In the first stages of business intelligence, IT teams ran reports and queries for the business side, though today's systems are focused more on enabling self-service intelligence for business users.

As with any technology, the offerings from vendors have evolved over time and continue to do so. As core features like reporting and analytics are becoming commoditized, vendors are looking at other features to differentiate themselves. Likewise, as the business environment changes, so do the requirements organizations have for their business intelligence applications.

These are a few of the biggest trends and developments in business intelligence right now:



- **The blending of software and consulting services**

- Vendors are beginning to offer "information as a service" and presenting intelligence to clients, as opposed to selling the software and infrastructure businesses need to access intelligence on their own.

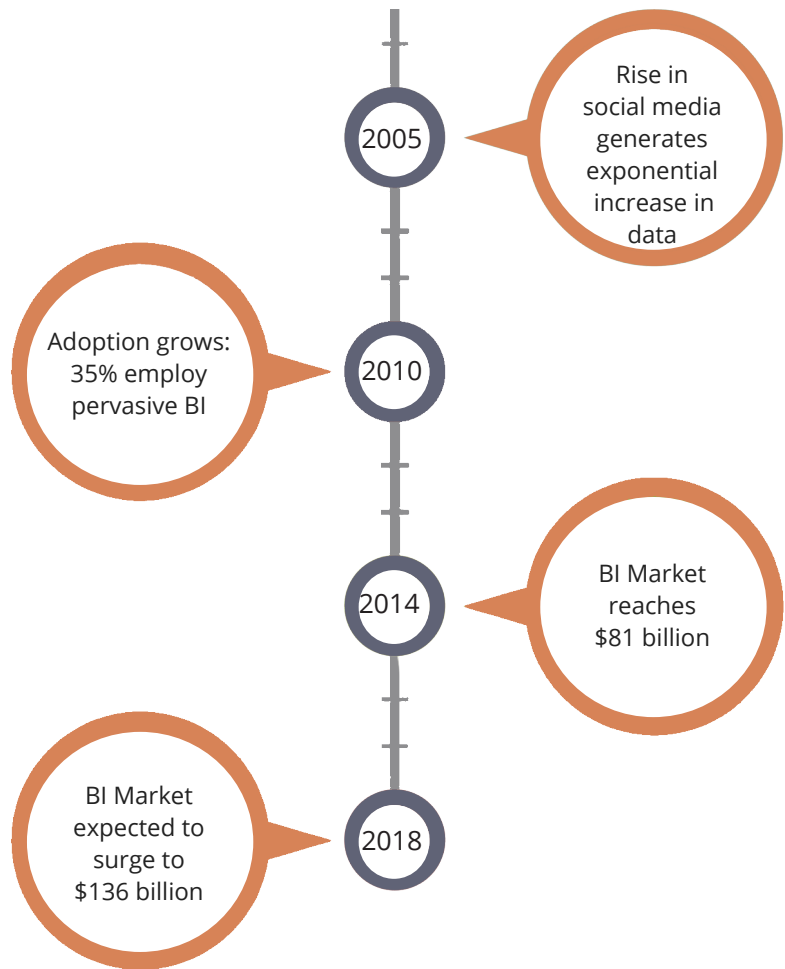
- **Increasing Self-service** - Software is increasingly focused on increasing the functions that are performed without having to involve IT staff or data scientists.

- **Cloud-based business intelligence**

- While cloud computing has taken hold in other areas, it's beginning to catch on in business intelligence, too. As this progresses, it will allow businesses to use intelligence without dedicating internal resources to manage infrastructure and perform software upgrades.

- **Mobile intelligence** - Mobile is becoming a key part of day-to-day business and it's no different in business intelligence. Mobile tools allow decision makers to access intelligence wherever they need it, not just when they're at their desks.

- **Big Data** - Businesses have access to more data than ever, and a lot of it comes from outside the organization in non-structured form. Business intelligence is increasingly being combined with Big Data analytics, so businesses can make decisions using all the information they have at their disposal, regardless of what form it takes.



Components of Business Intelligence

While ideally the end result of business intelligence is not complex, there is a lot of complex technology involved in turning raw data into actionable information. Here are a few of the core components of a typical business intelligence deployment:



Source Data

Business intelligence all starts with the data.

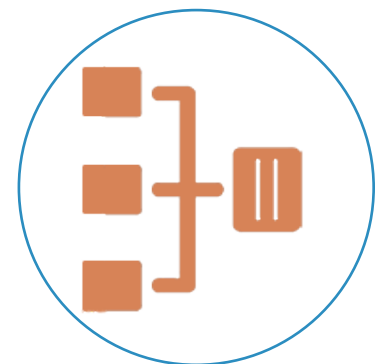
As we mention above, businesses have access to more data than ever. Much of that comes from transactional systems, such as CRM systems, ERP systems, inventory databases, HR and payroll systems, and many others.

Data used in BI also comes from external sources. One common source is social media, which organizations use to capture statements in which users mention the company. Other sources can vary greatly depending on what questions the organization is trying to answer, but may include public data from government reports, weather information and industry news reports.

Extract, Transform, Load (ETL)

Simply having access to the data doesn't mean it's ready to be used for intelligence.

A key part of BI is the tools and processes used to prepare data for analysis. When data is created by different applications, it's not likely all in the same format, and data from one application can't necessarily be looked at in relation to data from another. In addition, if business intelligence is relied on to make critical decisions, businesses must make sure the data they're using is accurate.



The process of getting data ready for analysis is known as Extract, Transform, Load (ETL). The data is extracted from internal and external sources, transformed into a common format, and loaded into a data warehouse. This process also typically includes data integrity checks to make sure the data being used is accurate and consistent.



Data Warehouse

A data warehouse is a repository containing information from all the business's applications and systems, as well as external sources, so it can be analyzed together.

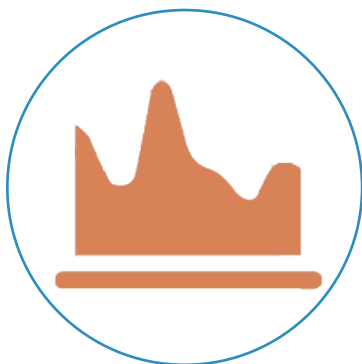
The ETL process ends with data being loaded into the warehouse, because when the data is contained within the separate sources, it's not much use for intelligence. That's for two primary reasons. First, those sources are typically applications that are designed for processing transactions, not for performing analysis. Analyzing the data in that state would take too long and disrupt critical business operations.

Second, the point of business intelligence is to gain more insight about the organization as a whole, so the data from all of those systems must be combined in order to understand a single, holistic view of what's happening in the company.

Online Analytical Processing (OLAP)

The data warehouse and ETL process represent the back end of business intelligence, while Online Analytical Processing (OLAP) represents the front end. OLAP tools present data to users and allow them to group, aggregate and sort the data based on various criteria.

This is the function that allows users to pull out the data they want and make the comparisons they need in order to have their questions answered.



Visualizations

As mentioned above, one of the goals of business intelligence is to make data accessible and useful to non-technical business users. As such, data must often be transformed into something beyond spreadsheets and lists of numbers so that it can be properly understood.

Visualization tools present data using charts, graphs and other formats to aid understanding. Traditional formats include bar graphs, pie charts and

scorecards, while advanced data visualization can create interactive and dynamic content, automatically choosing the best type of representation and personalizing content for the user.

Dashboards

The dashboard is the primary graphical interface used when working with a business intelligence system. Typically the first thing the user sees when logging on, the dashboard presents the most important reports and data visualizations for the user, customized based on the person's role.



The dashboard is a simple way to organize information in one place and allow the user to dig deeper for more.

Goals of Business Intelligence

Why do companies use business intelligence? The primary goal is stay ahead of the competition and make the right decision at the right time. Those decisions can be made around pretty much any aspect of running a business, such as:

- Figuring out how to increase the effectiveness of marketing campaigns
- Deciding whether and when to enter new markets
- Improving products and services to better meet customers' needs

One of the key aspects of business intelligence is that it's designed to put information in the hands of business users. Organizations are required to make decisions at an increasingly faster pace, so today's business intelligence tools help decision makers access the information they need without having to first go through the IT department or specifically designated data scientists.

Rather than request a report and then wait for it to be created, the user can log into the business intelligence application and view all the critical information presented in way that doesn't take a specialist to understand.

Since the goal is to help business leaders use intelligence to make better decisions, BI tools must be easy for those users to understand

Best Practices for Business Intelligence

As mentioned above, business intelligence is more than just software. For a successful implementation, businesses need to have the right processes and infrastructure in place in addition to the right business intelligence applications.

Unfortunately, a lot of implementations aren't successful. According to a 2011 report from Gartner, [70%-80% of business intelligence projects fail](#).

In order to prevent that, here are some of the best practices organizations should follow when they formulate their business intelligence strategy:

① Decide whether you need business intelligence

There's a lot of hype around business intelligence, and many companies may make the mistake of investing a lot of money into the technology just because they think they need to. Instead, the organization must first be clear on what it wants to accomplish and identify a specific business need business intelligence can help solve.

According to Gartner, one of the top reasons for such a high failure rate is that many organizations assume that business intelligence is a requirement, rather than fully understanding the needs of the business.

Figuring out what those needs are should be the first step in any business intelligence strategy. The key is for IT and the business units to work together to list the needs and determine how and if they can be met using business intelligence, and whether business intelligence or some other solution is needed.

② Standardize systems and processes

Even when a business intelligence project is completed and all the necessary components are installed and deployed, that doesn't mean the organization is getting the most out of its investment.

One reason businesses run into challenges is because they rely on many different systems and applications used throughout the organization. That makes it hard to get a holistic view of the company and the "single version of the truth" that is critical to business intelligence success.

Only 35% percent of organizations have standardized on one or a few business intelligence products throughout the company, according to InformationWeek's [2014 Analytics, BI, and Information Management Survey](#). The rest use different software and systems in different business units. However, a successful business intelligence should come from the top down, with standardized tools and process that work for all departments. It helps to have the entire organization involved from the beginning so that everyone's input is taken into account.

③ Focus on usability

When evaluating software options, it's especially important to pay attention to how easy the systems are for the people who will use them on a regular basis. Executives, managers and others from the business side are increasingly using business intelligence tools without the help of IT, analysts and others.

Software should have self-service functionality and the ability to display information and reports in a way that the average business person can understand. Again, this is one area in which it helps to have input from everyone during the planning stages.

In addition, the business also needs to give people the right training so they can get the most of the tools that are selected. If the company simply hands access to people who are used to getting all of their information from spreadsheets, they likely won't get much out of it.

④ Get the data ready

Good intelligence starts with good data. When asked what was their biggest barrier to successful business intelligence initiative, 59% of respondents in InformationWeek's survey answered data quality issues.

Coming up with a plan for a business intelligence deployment takes more than just deciding what software to use. A key piece is figuring out a strategy to ensure data quality. Businesses must look at what data they have or will be able to capture, and decide what they need and how they ensure its integrity.

According to Aberdeen research, [data quality must be addressed first](#), before any other action is taken. Companies with the most success in business intelligence are those that invest in tools and processes to make sure records are complete and accurate. Governance processes must also be used to avoid data duplication and make sure old, outdated, or no-longer-relevant data is deleted.

Big Data

It's been one of the most talked about and hyped tech concepts of the past few years.

In fact, it's almost impossible to read any information about analytics – especially information from software companies – without hearing about Big Data.

But what does it really mean?



What is Big Data?

Companies have a lot of data.

Much of it is structured, meaning it can be organized in a database or Excel spreadsheet and sorted using simple criteria.

For example, a spreadsheet listing purchases would include columns for customer name, amount invoiced, product name, date, etc. All of those fields are standardized and can be filtered or sorted alphabetically or numerically.

However, a lot of the data companies have is unstructured, and the amount of unstructured data at organizations' disposal is quickly increasing. This includes anything that doesn't fit neatly into rows and columns, such as:

- Collections of statements people are making about the company on social media
- Audio recordings and transcriptions of calls with customer service agents
- Website search indexes
- Videos, images and data from various types of sensors

Big Data is any data that can't be managed using conventional database tools.

In addition to just the type of information it contains, there are also other factors that make Big Data big.


According to [IBM's "4 V" definition](#), those factors include the data's:


- **Velocity** – The interconnectivity of people and things via technology is generating data continuously, and businesses are attempting to capture and analyze it in real time.
- **Variety** – Big Data comes from many different sources and includes many different types of information. Sets of data typically can't be simply compared to one another using traditional tools.
- **Volume** – As the phrase implies, Big Data includes, simply, a lot of data. Individual companies have access to a lot of it, with terabytes, petabytes, and soon zetabytes being stored and collected.
- **Veracity** – With so much data from different sources being collected, there can be a lot of doubt about the accuracy and consistency of that data. However, in order to get actual value from Big Data, it's important to have tools and processes in place to verify and clean up the data.


As with business intelligence, there are many varied definitions of Big Data floating around.


One issue is that many of the definitions are driven by software vendors and tend to drive up the hype of the technology, rather than focus on what Big Data actually means for businesses.

Some examples of existing definitions of Big Data include:

“ *Big data is high-volume, high-velocity and high-variety information assets that demand cost-effective, innovative forms of information processing for enhanced insight and decision making.* 

“ *Big Data is a collection of data from traditional and digital sources inside and outside your company that represents a source for ongoing discovery and analysis.* 

“ *Big Data is used to refer not just to specific types of data, but also the technologies used to manage them.* 

“ *Big Data is an evolving term that describes any voluminous amount of structured, semi-structured and unstructured data that has the potential to be mined for information.* 

For our definition, we wanted to highlight what sets Big Data apart from other types of data, as well as touch on why it's important for businesses:

Big Data is any data that can't be managed using conventional database tools but can still be analyzed to create valuable insight for the organization.

Big Data: Challenges and Opportunities

The volume of Big Data is a critical point that's creating a lot of new challenges for companies. As business and other aspects of life become more digital, there's a lot of both structured and unstructured data being created all the time.

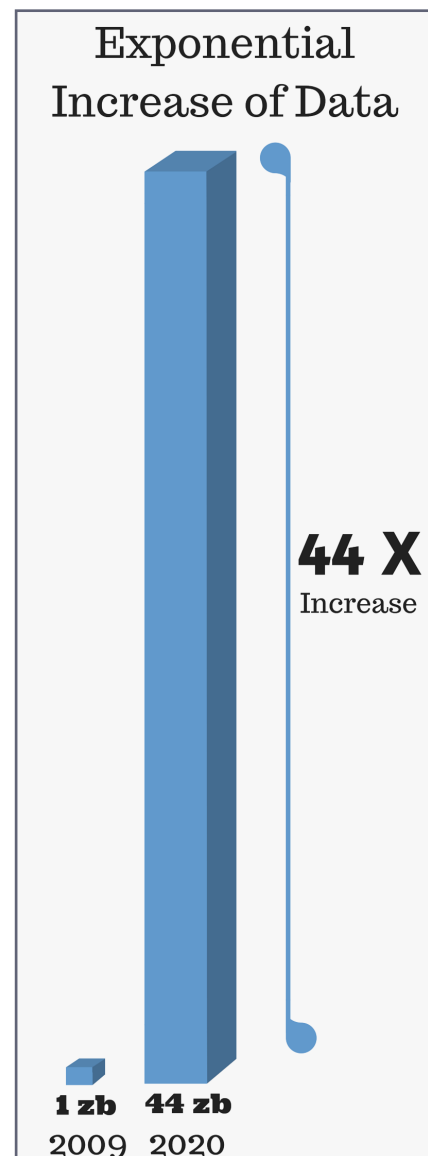
As companies try to mine intelligence from that data, that means they've got a lot of information to store, and that volume is growing exponentially.

According to predictions from IDC, the total amount of data stored in the digital universe will grow from 4.4 zettabytes in 2013 to 44 zettabytes in 2020. A zettabyte, for your reference, is one trillion gigabytes. Total data is doubling in size every year, and businesses are expected to create 44 times and much data in 2020 as they did in 2009.

Data with value – if you know how to capture it

Businesses will have a lot of opportunities to utilize and benefit from that data. Despite the fast growth, IDC estimates that, thanks to new tools and techniques, 37% of all the data a business has access to in 2020 will be useful if properly analyzed, compared to 22% in 2013.

Despite the challenges associated with storing and managing all of that data, the vast majority (89%) of database professionals consider Big Data to be a great opportunity to improve business results, rather than a costly data management problem, according to a [2013 TWDI survey](#).



Specifically, business leaders [polled by Harris Interactive](#) on behalf of SAP said they expect these benefits from Big Data analytics:

- More efficient business operations (cited by 59% of respondents)
- Increased sales (54%)
- Lower IT costs (50%)
- More agile operations (48%)
- Increased ability to attract and retain customers (46%)

Challenges remain

However, there are a lot of challenges still in the way before organizations realize all of Big Data's potential benefits.

Businesses must adapt and deploy the right tools to be able to store, analyze and secure Big Data.

As mentioned above, traditional tools aren't equipped to process this new data; new software and systems such as Hadoop are required. Also, specialized storage tools are needed, along with tools to extract and integrate Big Data from various sources.

As with the Extract, Transform and Load (ETL) tools used for business intelligence, there's a lot of work to be done to gather Big Data, ensure its quality and get it ready for analysis.

Some of the other challenges standing in the way of Big Data benefits include:

1. **Lack of skilled staff** – Big Data has taken off fairly recently, and as such many companies report difficulty in finding staff with the skills necessary to manage this new data. In fact, that was the top challenge listed in TDWI's report, cited by 40% of respondents. One strategy to combat that could be to offer employees Big Data training in order to grow the talent pool internally.
2. **Data governance issues** – With so much data available, it becomes even more critical to have a framework in place for deciding what data belongs in the system. However, just 30% of the companies surveyed by TDWI said that data governance teams were heavily involved in Big Data management.
3. **Organizational readiness** – As with business intelligence, successfully analyzing Big Data takes more than just installing software and other tools. The entire organization needs to be on the same page, and there must be a clearly articulated strategy built around actual business goals.

Big Data Use Cases

So why do companies use Big Data?

For the same reasons they use other forms of analytics and business intelligence. The goal is to analyze these new types of data and use the knowledge gained to make better decisions for the business.

Some of the most common use cases for Big Data analytics include:

① Getting a more complete view of the customer

In order to better serve current customers and find ways to attract new ones, businesses try to know as much about customers as possible. According to [InformationWeek](#), one of the most common uses of Big Data is to use it to help augment traditional data sources like purchase history with clickstream data showing what customers have done on the company's website, as well as data gathered from social media sites.

② Using external data for decision making

Big Data doesn't just include the data generated by the company and its customers. There's also a lot of information from a lot of other sources that can be valuable for making decisions or developing strategies. For example, [crmsearch.com](#) cites one hotel chain that analyzes weather data and information about flight cancellations to deliver mobile ads targeted to stranded travellers who need to book a room for the night. In a similar strategy, a pizza chain also uses weather and power outage data to target ads to customers who have lost power and are unable to cook.

③ Spotting trends that may have gone unnoticed

Big Data can also be used to help organizations predict future trends and plan for the long term. [CIO.com](#) cites the example of a university health system analyzing health data in municipalities to spot trends in factors such as population growth and chronic disease diagnoses to gauge whether those regions are being adequately served by local healthcare facilities.

Big Data can help companies know more about their customers, their industry, and anything else they want to learn more about.

Big Data vs. Business Intelligence

Big Data and business intelligence are related and are often used in conjunction, but they're not exactly the same.

They each have the same purpose and goal: to use available data in order to learn more about a business, its markets and its customers in order to make better, more successful decisions.

The difference lies in the types of data being analyzed, which affects the kinds of questions a business can ask.

"Business intelligence helps find answers to the questions you know. Big Data helps find the questions you don't know you want to ask." – IT Consultant & Blogger [Eric Brown](#)

When analyzing only structured data using business intelligence, you ask the system to run a report around certain parameters. You can dig into the report to get more detail, but you still need to request the specific information you're looking for. Big Data analysis, on the other hand, is more about allowing the system to sift through the data to find new patterns and insights.

The tools and infrastructure used for Big Data and business intelligence also vary.

Business intelligence requires loading structured data from transactional systems and other sources into a traditional data warehouse, where it's used to run queries and produce analytics. In Big Data, specialized applications such as Hadoop are required. Unstructured data is fed from various sources into that system where it's accessed by Big Data applications.

Of course, business leaders don't care very much about the specific differences between Big Data and business intelligence.

Different investments will be made depending on what the organization needs, but in the end, if the goal is to use the data available to make the best decisions possible for the business, it doesn't matter whether that data is structured or unstructured, where it comes from, or what software is performing the analysis.

That's why today, business intelligence and Big Data are often combined. That puts all the valuable information in the same place so users can get a complete look at their business with full, accurate insights.

Many vendors are now beginning to add Big Data capabilities to their business intelligence offerings, and many businesses use a data warehouse filled with both structured and unstructured data.

Big Data Skepticism

As with any widely hyped technology or product, companies need to ask themselves a really important question about Big Data: Do businesses really need it?

Despite the hype, the answer, of course, is that it depends. That's not to say that Big Data is good or bad or valuable or not, just that organizations need to be careful in deciding if Big Data is right for them.

Here are a few questions businesses can ask when trying to make that decision:

① Is our data big enough?

As with traditional business intelligence, the point of Big Data is to use data to answer questions. So when making a decision, companies need to start by figuring out what questions they want answered, or at least in which specific areas they would like more insight, as well as what data they have or are able to access.

For example if all you want to know is who is buying what and where, you probably don't need Big Data to find the answers. Structured data in a traditional database will do the trick. Also, remember that volume isn't the only key attribute in the definition of Big Data. Having a lot of structured data doesn't make it big.

② Is your data relevant to your business?

It's important to tie the questions you have in mind and the data you will analyze to actual business results. Business leaders may ask questions out of curiosity, and data from new sources can certainly reveal information about an organization that is interesting, but implementing a Big Data solution is a complex, resource-intensive process, so it should deliver a real, measurable impact.

③ Is your organization ready?

As with business intelligence, getting ready to use Big Data takes more than just installing software. Organizations need to be ready for their implementations to be successful. That includes both hardware as well as other considerations.

One aspect companies may struggle with is the sheer amount of information being

collected and stored. That may require an upgrade in hardware or the purchase of additional servers. Hadoop is known for being able to run on “industry-standard” hardware; however, as [InformationWeek](#) points out, companies may find their own goals require different hardware configurations.

Organizations must also make sure they have the right processes in place for collecting the right data, ensuring its integrity and maintaining data governance. And perhaps more importantly, effectively using Big Data or any other kind of analytics may require a significant culture change.

However, according to the [report from the Economist and Terradata](#), organizations tend to focus on the necessary cultural changes last, and technology and tools first. The report listed two key success factors necessary for building a culture ready to tackle Big Data and advanced analytics:

- **Top-down leadership** – It’s critical that decision makers at the top make it clear that analytics will form the basis for decision-making. Tying Big Data initiatives to organization-wide decision making will help keep those initiatives on track and show the rest of the business that the analytics work is valuable.
- **Bottom-up engagement** – Strong leadership will help bring employees throughout the organization on board. Other keys are making analytics tools easy to use, offering training and support, and aligning the work with day-to-day business goals and tasks.

Big Data represents the potential for new kinds of decision making, according to [McKinsey & Company](#). Organizations and people used to making decisions based on assumptions must learn how to change course when their pre-established ideas are challenged by the data. Otherwise, there’s no point in investing in the technology to deliver those insights.

Talent is also a key consideration. Over the past few years, the number of people out there with Big Data skills and experience has grown, but it can still be tough to find the right talent. More than 80% of IT leaders believe there’s a significant shortage of employees with the skills need to plan and execute Big Data projects, according to a 2013 survey from [TEKsystems](#). Companies will need to find out how to recruit those people, or offering training opportunities to grow those skills among the people they already have.

④ Are your expectations realistic?

Companies should also have the right expectations regarding how long a Big Data project will take and how much it will cost. That's often one of the biggest challenges. Most (85%) of business leaders believe Big Data can help make better, more-informed decisions, according to a [survey from IDG Research](#). However, only 23% of respondents say their Big Data projects have been fully successful, while 52% say they've been somewhat successful.

One way to help have the right expectations is to ensure close communication between IT and the business side from the very beginning. The business should be able to list clear goals, and IT should be able to explain what it will take to get there.

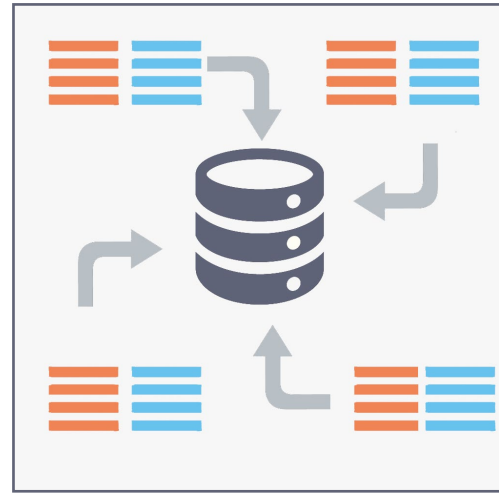
Given all the hype, the most important question business need to ask about Big Data is: Do we really need it?

Data Warehouse

Big Data Though most companies have plenty of data, a lot of work needs to be done to get it ready.

The data must be collected, cleaned and formatted properly, and stored in one place for analysis.

This process is known as data warehousing.



What is a Data Warehouse?

As the name implies, a data warehouse takes a lot of different data from various sources and stores it in one place. That data can come from transactional systems, such as marketing, sales, CRM and ERP systems, as well as external sources such as the web. The warehouse then holds the data so it can be used for analytical processing and generating reports.

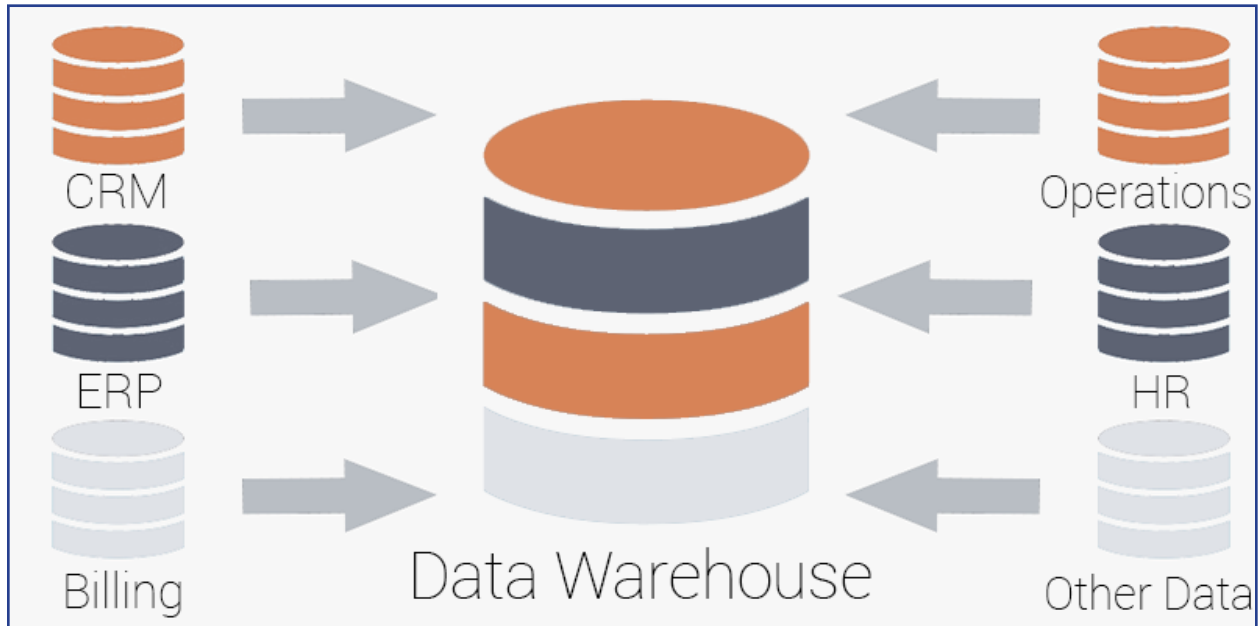
Data warehouses are a single source repository for everything you would need to know about your company.

Storing data this way is critical for running business intelligence.

While the data held in a data warehouse is typically available in other locations, it's not really usable for analysis until warehousing is done.

The data sources are usually transactional systems, meaning they're designed and built to use data when performing specific functions. Running reports and analysis from data held in those transactional systems would likely interrupt their normal operations, making it impossible to perform business intelligence and actually run the business at the same time.

Data warehouses, on the other hand, are designed specifically for analysis, making it possible to use all records from all sources at the same time to answer questions.



Types of Databases

Another reason databases are necessary is that data must often be stored in different ways for analytics than for processing transactions.

One key distinction in the ways data can be stored is the difference between a relational and multidimensional database:

- **A relational database** can be thought of as using a two-dimensional structure. Imagine a simple database such as an Excel spreadsheet. The data is organized using rows and columns. One key is that the data must be normalized so each attribute can be put in the proper place and the entries can be sorted.
- **A multidimensional database**, as the name implies, stores data based on more than two dimensions. Rather than an entry being defined by its row and column like in a spreadsheet, each entity in a multidimensional database can contain a number of different attributes and can exist independently of the other entries.

One example of a relational database could be a table listing different products and the number of units sold in each state in a given calendar year. In this table, the rows could be labeled with the products, with the columns assigned to the states and the numerical values filled in accordingly. The table could then be sorted for each state based on the number of sales.

In this example, if you want to look at any other attributes – for example, the number of sales in each month – that would require a separate relational database. That could be a table for each product, with the columns representing each state and the rows representing each month.

In comparison, a multidimensional database could hold all of that information in the same database. Each product could be thought of as its own entity in the database, with values stored for sales in each state, sales per month, etc.

Analytical vs Transactional

Data warehouses are most often built around multidimensional databases.

The reason is that relational databases are typically optimal for transactional systems – i.e., the systems involved in processing day-to-day business operations – whereas multidimensional databases better support analytical systems – i.e., those that are used for business intelligence.

Transactional and analytical systems have very different requirements. When processing transactions, the goal is to do so as quickly as possible, so the simple structure of a relational database is beneficial.

In analytics however, the important thing is to have all relevant information stored together, so multidimensional databases come in handy.

History of the Data Warehouse

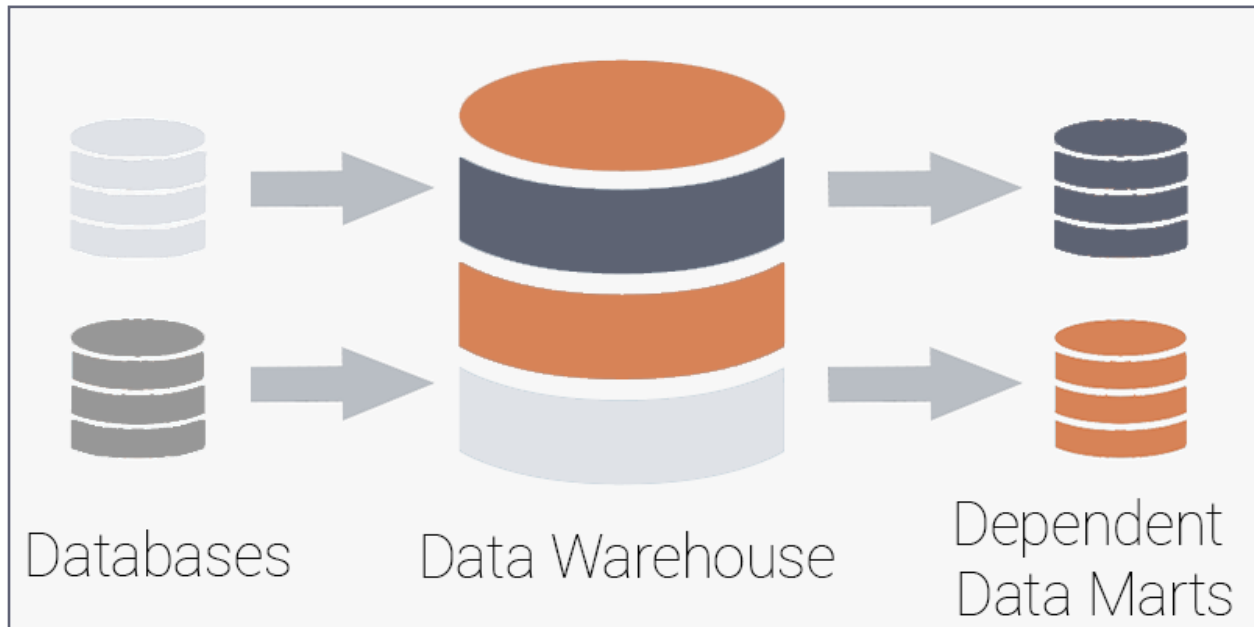
In fact, the concept of the data warehouse was developed largely in response to the limitations of using databases optimized for transaction processing in order to perform analytics. The term “data warehouse” was coined in a 1988 IBM Systems Journal article, [an architecture for a business information system](#), which explained the problem:

“The transaction-processing environment in which companies maintain their operational databases was the original target for computerization and is now well understood. On the other hand, access to company information on a large scale by an end user for reporting and data analysis is relatively new.”

This idea was developed further by [Bill Inmon](#), who created the concept of a “Corporate Information Factory” – essentially a central repository creating an enterprise-level view of all an organization’s data.

Database vs. Data Warehouse vs. Data Mart

Using the concepts laid out by Inmon, IBM and others, a data warehouse can be defined as a top-down of the entire collection of data that can be used for analysis, whereas a database is a smaller set of data used for a specific purpose, often for transaction processing.



Another concept relevant to business intelligence is the data mart.

Essentially, a data mart is a smaller, more focused version of a data warehouse. Whereas the warehouse holds all of the data from the entire organization necessary to perform business intelligence, a data mart holds all of the data about one particular area.

For example, data marts may be broken up according to different operational areas, in which case the company would have a dedicated sales data mart, a dedicated finance data mart, etc. As with a data warehouse, the information would still come from multiple sources and be transformed into a common format, but the data mart would strictly contain sales or finance or another group of data.

This concept comes in part from the work of Ralph Kimball, one of the “fathers of data warehousing,” along with Inmon. Rather than Inmon’s top-down approach, Kimball advocated for building individual data marts for each section of an enterprise and then integrating them.

Data Marts Within a Data Warehouse

In some cases, data marts are used as a subset of a data warehouse.

The purpose of using data marts is typically to give different groups access to the data they need to make their own particular decisions without being able to see or change the rest of the data in the organization. Otherwise, those groups would need to work with all of the data in the warehouse, most of which isn't relevant to them.

Data marts can be specifically tailored to different business units, which makes it much easier for business users to access only the data they need in the warehouse.

Data marts that exist as part of a larger data warehouse are called dependent data marts. It's also possible to use standalone data marts, in which the different data marts are not connected.

However, for companies that want to do enterprise-wide business intelligence, dependent data marts are usually the way to go because the complete data warehouse can hold all the necessary information, while the individual data marts can still be used to address specific needs within the organization.

In addition, using dependent data marts makes it easier to manage the data and keep it secure, since it's all being held in the same place.

Extract, Transform and Load

Populating a data warehouse isn't as simple as just copying out of other systems. Data normally isn't ready for analysis when it's taken straight out of those transactional systems. Different applications may create data in different formats, or the data may be organized based on different criteria. In order to get a full picture of the entire business, it's necessary to do some work to the data so different sets can be analyzed in relation to each other.

The quality of the data must also be checked before performing any business intelligence. Errors and other problems can lead to inaccurate data that ultimately impairs decision making. Data warehousing allows records to be verified before they're used for analysis, making sure the organization has one "single version of the truth" to use for business intelligence.

Getting data ready for analysis

Gathering, preparing and storing data in the data warehouse is done through a process called Extract, Transform and Load (ETL). ETL tools:

- **Extract** data from internal and external sources
- **Transform** it into a standard format – for example, converting dates to the same format, splitting customer names into first and last, etc.
- **Load** data into the data warehouse

The transform stage is especially important when it comes to business intelligence. In order to get complete, accurate information about the organization as a whole, businesses must look at data from a variety of sources at the same time.

However, those sources usually include systems that come from different vendors, running on different types of hardware, and managed by different employees. That means a lot of work likely must be done in order for all of the data to make sense together.

Extract, Load, Transform

In addition to ETL, **ELT (Extract, Load and Transform)** is also becoming a more viable option for businesses. In this process, data is pulled from the sources and then transferred to a Staging Database, where integrity and business rule checks are performed. The data is then moved into the warehouse, where it's transformed into the necessary formats.

Previously, ETL was the only option because earlier data warehouses didn't have the capacity to perform the transformation. Therefore, other tools were needed in between the data sources and the warehouse.

However, as technology advances and data volumes grow, ELT is becoming more attractive due to how long ETL can take. If sets of data don't make it to the warehouse until after they are transformed, that means there could be a significant delay before it becomes usable for the business. Transforming the data within the warehouse provides faster access to that data.

In addition, ETL is less flexible. If data is transformed before it gets to the warehouse, that usually means only the transformed version of the data is available for analysis. On the other hand, if data is loaded and then transformed, the raw data will still be available. That means if the company's needs change while analysis is performed, it will be more likely to still have access to the data it needs.

Data Governance

Success in business intelligence depends in large part on what data the company has access to and how it's used. Therefore, proper implementation of the data warehouse is critical.

Effectively using a data warehouse requires not just installing the right software and hardware, but also plenty of planning, research and change management in the organization. Most importantly, businesses need to make sure the right data is going into the warehouse. That means ensuring that all data that will be relevant for business intelligence is captured and stored, as well as using tools to check the quality of that data and remove irrelevant data.

Before implementing a data warehouse, companies should have a data governance framework in place. Data governance refers to the rules, policies and procedures organizations use for deciding which data should be kept, for how long, in what format, etc.

The strategy should cover not just BI and analytics, but the organization's overall approach to data. Several attributes of the organization's data must be properly checked, including, most importantly:

- **Privacy and compliance** – Certain data created or stored by the business may be subject to very strict regulations and standards. It's important that those are upheld when the data is moved from an operational database to a data warehouse.
- **Data quality** – Data must be trusted before it's relied upon for decision making. Therefore, processes and tools must be in place to check for data consistency and integrity.
- **Business relevance** – With the large amounts of data already required for business intelligence, it's important to avoid complexity by storing and hanging on to irrelevant data.
- **Metadata** – Metadata is what helps data be identified, so properly managing metadata is critical for good data governance long term.

For effective data governance, business leaders should work closely with IT to create policies and standards defining the company's data strategy and determine what tools may exist to help enforce those policies. To ensure consistency, policies must also be clearly communicated to all stakeholders throughout the organization.

Big Data and the Data Warehouse

As we mentioned in our previous section, Big Data and BI are becoming increasingly intertwined. Many data warehouses are now being complimented by technology capable of storing and processing Big Data.

Perhaps the most important Big Data tools today is an open source technology called Hadoop.

Hadoop, according to the [Smart Data Collective](#), is a set of procedures and programs companies can use as the backbone for their Big Data operations. In order to hold massive amounts of Big Data in a way that is useful for analytics, Hadoop relies on a distributed file-systems that stores data in an accessible across a large number of linked storage devices.

Then, in order for data to be used, a model called MapReduce performs two important functions:

- Pulling data from the storage and putting it into a useable format (map)
- Performing mathematical summary operations for the user (reduce)

When Hadoop first appeared, some observers wondered if the technology may replace data warehousing. However, most experts agree that [Hadoop must be used in conjunction with a traditional traditional warehouse](#), such as by preparing unstructured data so that it can be loaded into the warehouse, or for working with data the traditional warehouse can't handle.

Reasons for that include the fact that Hadoop does not perform real-time analytics as well as a traditional warehouse, and the technology is still too complicated to rely on it when it's not necessary.

Hadoop competitors such as GooData, Pentaho, and Datawatch continue to emerge as BI technology rapidly evolves. In this highly competitive software space, new vendors and new products are always offering improved solutions.

Best Practices

In addition to establishing data governance, here are some other steps companies can take to make data warehousing a success:

① Decide whether to build or buy

There are plenty of data warehousing and ETL/ELT tools on the market; however, some companies choose to build their own customized tools. The disadvantage of that approach, of course, is that it takes a lot of internal resources and expertise that many organizations don't have. However, some find that building in-house is the best way to make sure the organization's unique needs are fully met.

② Consider whether you need Big Data capabilities

As we discussed before, Big Data is becoming increasingly intertwined with business intelligence. When businesses make decisions based on information, they want to look at all relevant data that is available. That may include Big Data from sources such as social media, websites and others. If you need to analyze Big Data, it may be worth investing in systems that can handle both Big Data and large amounts of traditional, structured data.

③ Decide how many warehouses you need

Since a data warehouse is supposed to contain all of the data necessary to perform business intelligence, typically a company will use one data warehouse for the entire organization. However, in some organizations, different groups might only need access to certain data. Data marts may be a solution, but in some cases, it may be worth it to have multiple data warehouses.

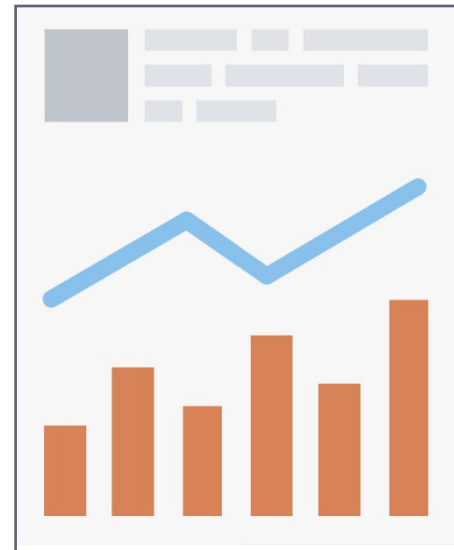
[IBM recommends](#) some companies use a strategy involving an enterprise data warehouse, containing all data from the entire organization, along with several customized data warehouses designed for specific business units. This multi-tiered structure can allow companies to best meet the individual needs of different stakeholders while still offering one complete source of all enterprise data.

Analysis

Once data is in the data warehouse and converted into usable formats, it's ready to be analyzed.

Analysis is fundamental to deriving value from data and enabling information-driven decision making.

Here's what you need to know about this.



Online Analytical Processing (OLAP)

Day-to-day business relies on Online Transaction Processing, or the creation and use of data to support operations. Online Analytical Processing (OLAP), on the other hand, refers to the use of data for analysis and intelligence.

If the data warehouse is the back end of business intelligence, OLAP represents the front end.

OLAP tools allow users to access, run queries against, and report on data stored in their data warehouse.

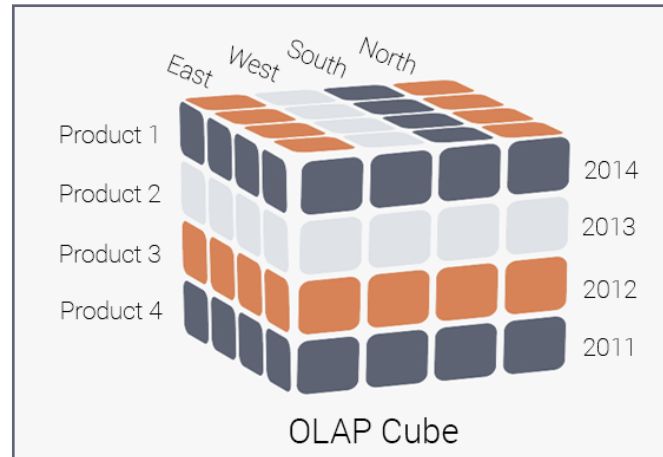
OLAP tools allow users to access the data in the warehouse and use it to run queries and generate reports. For example, if a user wants to see a comparison of products that were sold in California in September versus those that were sold in New York at the same time, OLAP can perform the processes necessary to retrieve and display that information.

As the foundation for many types of business intelligence applications, OLAP offers the capabilities for complex analysis and trend modelling. A key aspect of OLAP tools is that they store data in multidimensional, rather than relational, databases.

A relational database stores data in two dimensions – think of a spreadsheet, which groups data based on static rows and columns.

With a multidimensional database, however, each attribute of a record is stored as its own dimension in the database.

That allows for much greater flexibility in making comparisons, tracking trends and looking at data from different points of view. In other words, OLAP is what allows data to be used to answer any questions decision makers may have about their business.



OLAP Cubes

These multidimensional databases are often referred to as OLAP cubes.

OLAP cubes are designed to allow for business to make queries using plain English, and the data is organized to allow for minimal processing time.

Different methods of manipulating data in an OLAP cube include:

- **Slicing** – Pulling out one subset of a cube (think of it as a rectangle) and using it to create a new cube with one fewer dimension. This is used to isolate only the criteria necessary for a given query. For example, if you have data about the sales of products in every state for each month in the last year, you may not need to look at the monthly data.
- **Dicing** – Producing a smaller cube by pulling out specific values from multiple dimensions. For example, you may only need data about specific product categories.
- **Drilling up/down** – Moving among levels of data, ranging from the most detailed sets to more summarized sets of data. For example, one level may be about total sales in each state over time, while the user can drill down to see more detail for each product.
- **Rolling up** – Summarizing data by combining attributes based on a hierarchy. For example, data about sales in each state could be rolled up into data about larger geographic areas.

Business Analytics

The goal of business intelligence is to use data to answer questions and drive decision making.

Analytics, in a broad sense, can be defined as the conversion of data into useful information and intelligence. That's done by using data to answer questions or to spot patterns and trends that the initial questions may not have asked about.

Analytics is all about finding meaningful patterns in data.

It can be performed by both people and technology. Technology is used to perform analysis and spot patterns that a person may not be able to see – for example, by analyzing lots and lots of Big Data – as well to organize and report data in ways that make it easier for people to spot patterns.

Analytics performed using technology is often based around statistical modeling.

Statistical models use historical data to determine the probability of events occurring based on certain criteria. For example, data about customers who have jumped ship for competitors can be used to create a model to predict which current customers are at the greatest risk of leaving.

Businesses typically use three types of analytics depending on what kinds of questions they're asking:

- **Descriptive Analytics** – This is about learning more detail about historical facts. The basic questions answered are: What happened in my business? Why, when and how did it happen?
- **Predictive Analytics** – This is used to ask questions looking ahead. For example: What is likely to happen to my business or in my industry in the future?
- **Prescriptive Analytics** – Analytics can also recommend actions based what was discovered using descriptive and predictive analytics. Basically, prescriptive analytics answers the question: What should my business do in response to what has happened or what is likely to happen?

Data Mining

The specific process of getting from raw data to useful analysis is often referred to as data mining.

Despite what the term may sound like, this step doesn't involve mining or extracting data – that's already been done during the ETL process. Rather, data mining refers to the extraction of patterns and knowledge from that data. Data mining is also known as knowledge discovery and data discovery.

Analytics and data mining are essentially what turn raw data into information and then actionable intelligence. When we say data, we mean any facts, numbers or text that can be processed by a computer. Through data mining and analytics, data is turned into information about patterns and trends within the data and intelligence, which is knowledge about historical trends and future patterns that can aid in decision making.

Knowledge discovery refers to the process of finding useful patterns in the data that can be used for intelligence. How does knowledge discovery work? Essentially, it's based around looking at relationships within and among sets of data.

Generally, four types of relationships are sought, according to a [paper by UCLA's Bill Palace](#):

- **Classes** – This is data that's already contained in predetermined groups. For example, a restaurant might want to know at what times customers visit and what they order at those times.
- **Clusters** – This refers to data grouped according to logical relationships. For example, a business may separate data based on customer segments or geographic areas.
- **Associations** – This is when data is mined in order to identify unexpected relationships. For example, a supermarket may perform data mining and find out based on associations that when men buy diapers they also tend to buy beer at the same time.
- **Sequential patterns** – This is used to anticipate future trends and behaviors. For example, Netflix and other content providers often use sequential patterns to predict what content users will like based on what they've accessed previously.

Reporting

For business intelligence to work, the intelligence needs to get into the hands of business users and decision makers. That's where reporting comes in.

While the processes and tools described earlier are involved in turning data into intelligence, reporting is the way intelligence is accessed and distributed. Basically, business users have questions, and the business intelligence software generates reports that answer those questions.

That doesn't mean the system simply spits out a spreadsheet listing all of the relevant data. Beyond those simple operational reports, analytical reports contain information specifically targeted to aid in strategic decision making, presented in ways that the user can easily understand.

Since the end goal of business intelligence is to get information to business decision makers and have them act on it, reporting is a critical aspect of any business intelligence system. Here are some of the reporting features organizations should look for:

- **Self-service** – Business users are able to the reports they need to answer their questions quickly, without having to go through someone in IT. Self-service is becoming a more integral aspect of all business intelligence tools.
- **Flexible reporting** - Different types of reports can be presented to different groups. For example, some people may want to view information in different ways. Also, your organization may need to run reports in different languages, so be aware of those requirements, too.
- **Drillable reports** – Many reporting tools are interactive and allow users to see additional information by clicking on part of the main report. Often, the answers to questions will lead to more questions, so it's important that users have an easy way of accessing additional data when they need it.
- **Interactive and customizable reports** – Business intelligence users should also be able to view their reports in different ways. Interactive and customizable reports allow users to change the data they're viewing on the fly so they can more easily have their questions answered. For example, if you're looking at the performance of different product lines in various contexts, you may want to compare just the top and bottom performers. An interactive report would allow you to remove all the other data that you don't need to see.

- **Sharing and collaboration** – One of the benefits of using business intelligence is that it can help companies take a more holistic approach to making decisions about the organization. Therefore, it's important that reports can be shared with stakeholders throughout the organization, so they can offer their input and understand the reasoning behind decisions. Those decisions are never made in a vacuum, so report sharing is an important way to aid collaboration.
- **Mobile reports**, so users can access their intelligence when and where they want. In all aspects of running a business, a lot of work is done when people aren't sitting at their desks. Mobile reporting offers greater flexibility so users never have to wait to get their questions answered.

Visualizations

A key aspect of intelligence reporting is how the data is presented to the user.

The goal is to show the data in ways that are accurate, yet easy for the user to understand. Lists of numbers are rarely the best way to do that. Instead, visualizations are used to present data in a digestible format.

Common types of visualization include charts, graphs and maps, as well as more advanced types such as infographics. Some visualization tools also offer animated and dynamic visualizations that users can interact with.

Seeing information visually is a good way to spot trends or notice warning signs and potential opportunities without the expertise of a data scientist. While different types of reports will require different kinds of visualization, what good visualizations all have in common is that they enhance the viewer's understanding of the data.

However, it's important to keep in mind that visualization can sometimes distort the truth. For example, a chart can be set up to make certain trends seem more significant than they really are. When evaluating data visualization tools and coming up with visualization strategies and techniques, it's important to keep some keys in mind:

- **Aim for visualizations** that are both accurate and easy to use and understand.
- **Consistency is also important**; the same design principles should be used for data visualizations throughout the organization.

- **Go beyond basic tables and charts.** Organizing data into a table isn't really a visualization; it's just a different way of listing statistics. For example, if your goal is to compare the sizes of numbers in different categories, use a visualization that uses different-sized objects to make the comparison obvious.
- **Make them interactive.** Today's visualization tools use interactive capabilities to pack a lot of information into each visualization without cluttering up the presentation – for example, allowing users to click on a section of a graph in order to see additional information in text.

Many business intelligence and analytics systems come with their own visualization tools. However, external tools are also available if additional functionality is needed beyond what's offered in the company's current or preferred business intelligence software.

Dashboards

As self-service becomes a larger aspect of business intelligence, the business intelligence dashboard is becoming a critical tool.

The dashboard is typically the first thing a user sees after logging into the system. Customized for each user or user group, the page displays a collection of the most pertinent information, using various visualizations, for that person's role.

The dashboard shows snippets of information the user can review quickly, with the option to choose different items for more detailed reports and visualizations. For example, a head of sales or marketing may log in to see a dashboard that includes a map of where leads are located geographically, a chart showing the source of leads, graphs showing the average cost per lead for each channel, etc.

The goal of a dashboard is to quickly give each user access to the information that they need to see.

A good dashboard will be critical to getting user buy-in for a business intelligence initiative, and for allowing BI to have an actual impact on company decision making. Here are a few dashboard best practices to keep in mind:

- **Only show what's relevant** – The goal of a dashboard is to provide the easiest possible link from intelligence to action. Therefore, the focus must be on relevancy – i.e., giving the user all of the relevant information, and only what is relevant.
- **Offer some customizability** – Users should be given some control over what information they see, either by allowing them to customize the dashboard on their own or by getting their input when dashboards are designed.
- **Incorporate strong visualizations** – It's also important to look for dashboards that are well designed and present information clearly, without any clutter, and using effective and accurate visualizations. To add greater accessibility, many dashboards are web-based, meaning that users can log into their dashboards from anywhere they have an Internet connection. Some systems also offer mobile dashboards that can be accessed from smartphones and tablets.

As with visualization tools, dashboard software is available bundled with larger business intelligence systems or as a standalone product. Businesses will need to evaluate their dashboard needs and capabilities and choose the right tools accordingly.

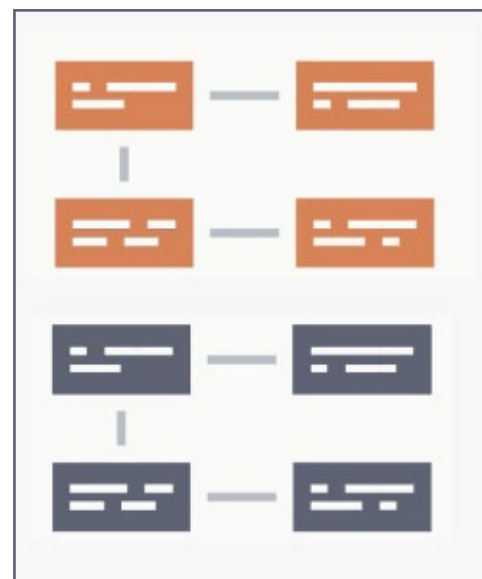
Business Intelligence Use Cases

Business Intelligence Use Cases
Business Intelligence helps companies turn data into insights.

But some have trouble getting started.

Customer stories show how BI has influenced other companies through real world dilemmas.

Check out these BI use cases to identify your own pain points and the solutions to fix them.



Marketing Use Cases

Accurately predicting a return on investment is key to running a successful marketing campaign.

Business Intelligence helps marketing professionals analyze campaign performance to identify opportunities for optimization.

Vendor: 	Client: 	Industry: Technology
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AllRecipes, a popular cooking site with 1.5 billion visits annually, needed the BI to understand customer's behaviors while they navigate the site.

Thanks to Tableau, AllRecipes was able to [develop content according to real time metrics](#) for observing users as they move around the site.

Web developers can quickly visualize user's habits, and create reports on the fly for targeting their products. The program allows AllRecipes to view what device the visitor is using, what features and tools they prefer to use, and which pages they spend the most time on.

AllRecipes now offers an improved consumer experience, allowing users to quickly find content they're interested in.

“*Tableau Software helps us understand the way our customers navigate our website on all of our platforms in a way that we can visualize and optimize on the fly. Our data, crunched and presented in a visually appealing way, allows us to build the best possible consumer experience that ultimately results in audience development and revenue. We're stirring, chopping and even pureeing data every single day.*

*Grace Preyapongpisan
VP of Business Intelligence
AllRecipes*

Vendor:  sas[®]

Client:  INVESTMENTS
CORPORATION

Industry: Retail

SM Marketing Convergence, Inc. (SM-MCI) is a retail affiliated marketing company in the Philippines with a very large customer database. But when faced with analyzing over a billion transactions, SM-MCI was at a loss.

The company decided it was time to use BI for creating a built-to-last marketing strategy aimed at retaining its customers.

Thanks to SAS Visual Analytics, SM-MCI was able to create analytic reports for processing the 200 million customer transactions collected within a year across 500+ store locations. The software's speed, friendly interface, and scalability led SM-MCI to adopt the solution for processing their full database.

As a result, SM-MCI was able to better target marketing emails for higher conversion rates, identify which products its team should upsell, reduce its churn rate, and increase customer satisfaction.

“ When SAS demoed Visual Analytics to us, I said, ‘This is something we need.’ It reduces the workload of IT in generating reports, which to me is a total waste of time. The best people to create and design reports are the business users because they know the business. Merchandising knows merchandising better. Operations knows operations better. Marketing knows promotional campaign measurement better than IT. Most importantly, Visual Analytics improves insight-seeking opportunities for business users.

Baldwin C. Golangco
President & CEO
SM-MCI

Sales Use Cases

When the sales team is given a new lead, BI can make the difference between a closed deal and a lost customer.

Analyzing historical data on past transactions helps sales teams identify which prospects have the highest propensity to convert.

Vendor:  Strategy
Companion

Client:  **mamas
& papas**[®]

Industry: Retail

Mama's & Papa's, a baby clothing and accessory retailer in Great Britain, developed a dependable brand for parents around the world. As the company began to grow, management developed issues with data accuracy and quality.

Thanks to Strategy Companion's Analyzer, Mama's & Papa's [was able to centralize sales data for daily and weekly performance tracking](#), keeping corporate management in line with the company's overall performance.

Strategy Companion was chosen due to its familiar reporting features, simple interface, and fast projections. The solution is frequently used by the company's Chief Executive from his iPad, staying on top of all sales from anywhere in the world.

Since implementation, Mama's & Papa's has been able to closely analyze sales by product, category, and store to carefully balance the stock within each store. They're even looking ahead at geographical locations to expand based on sales per capita per postcode.

“ We have now rolled out to all of our retail outlets who have completely embraced the solution. Whilst it does not replace the need for published reports, its key feature that has sets it apart from other similar tools is that it allows easy, rapid distributable creation of queries.

-Chris Greenwood
Director of IT
Mama's & Papa's

Vendor:  **birst** Client: **jive** Industry: Technology

Jive, a software vendor, uses applications throughout the company for daily operations, including Salesforce for the sales team.

With the help of Birst, Jive was able to integrate multiple data sources into one and provide broader user access.

Jive started using Birst's solution with its sales team. Combined with Salesforce, **Birst allowed Jive's sales team to better evaluate prospects** and divide their resources based on lead quality.

“ *When we added up the enormous amount of time we spent on reporting and considered the costs of having incomplete information, we realized we needed a solution that could quickly and easily analyze information within and across applications. To support our business goals, we needed nothing less than an across-the-board, comprehensive business intelligence platform for our entire organization.*

*-Monique Herman
VP Business Operations
Jive Software*

Finance Use Cases

Finance teams often spend the majority of their time combing through expenses just to create accurate reports. This takes time away from effectively analyzing their data.

BI tools help with streamlining data collection and creating simplified reports to forecast future expenses or analyze past costs.

Vendor:**Client:****Industry:** Government

The [Ministry of Sport and Tourism](#) of the Republic of Poland is responsible for allocating resources to support the creation of sports stadiums, halls and events throughout the country. In order to fund projects, Ministry administrators review formally submitted applications.

The Ministry needed a solution for processing the applications that matched both the applicants' needs and administrators' workflows. They also wanted a BI solution for verifying metrics supporting each proposal's success.

The solution the Ministry found is a combination of three software platforms: MS Windows Azure, AMODIT, and Panorama's Necto. Azure provides the cloud computing platform and infrastructure, AMODIT organizes the application process between client and administrator, and Necto serves as the front end BI tool for analyzing project metrics.

Necto is a social business intelligence platform for communicating data to people within the organization. The solution [helps Ministry leaders identify rising issues within complex reports](#), and address those issues with the appropriate resources.

All three solutions integrate with each other for making accurate financial decisions.

“ *Using Necto, decision makers in the Ministry can locate key performance indicators, analyze and recognize trends and data anomalies and proactively allocate the needed attention and resources for issue resolution.*

*-Ministry of Sport & Tourism
Poland*

Vendor:  Client:  Industry: Construction

Akfen Holding is a leading infrastructure investor in Turkey, funding many of the country's major developments such as seaports, airports, hotels, and more. The company decided it was time to deploy BI for sustaining growth in a competitive market.

QlikView helped Akfen Holding with its solution's rapid processing power. As financial data is transmitted from multiple companies to Akfen Holding, the information is translated through a single reporting source. This information is shared with stakeholders, shareholders, and the media for transparency with reliable figures.

Before Akfen Holding decides to invest, it can analyze growth trends across industries and run performance analyses on companies. The software also helps optimize operational efficiencies to improve management and support a sustainable structure.

All of Akfen Holding's financial and operational information can be accessed from a single portal, giving management real time metrics for following performance trends.

“ At Akfen, our challenge is complex. We need to adeptly execute in a variety of industries – spanning airport management, water supply, energy and even real estate – and achieve the operational excellence needed to deliver strong results for our shareholders. QlikView has been critical to our success as it allows us to rapidly identify newly developing trends, closely monitor performance of our subsidiaries and compare key performance indicators against industry and macroeconomic standards. Our ability to turn raw data into an executive analysis format in a quick and effective manner provides our leadership with valuable insight for what is really taking place on the ground on a real-time basis.

-Çağlar Aydıntepe
Project Reporting Manager
Akfen

Operations Use Cases

Internal performance gaps can be identified and eliminated with the right business intelligence tool. Where other BI solutions focus on strategic forecasting, operational BI solutions focus on real time metrics for keeping processes running smoothly.

Vendor:		Client:		Queensland Government	Industry: Healthcare
PANORAMA					

Queensland Health is responsible for managing over 30,000 patients per day with 70,000 staff members. After generating and storing a high volume of data, Queensland Health decided it was time to start utilizing it to make operational improvements across the company.

Thanks to Panorama’s Necto, Queensland Health was [able to streamline and analyze all of its data through a single source](#), where it previously needed multiple inefficient platforms. Through in-memory and OLAP operations, the solution helped relieve IT of many heavy data modeling tasks while adding depth to the reports generated.

The solution gives insight into both internal operations such as staffing levels and compensation benchmarks, and patient operations such as their nurse-to-bed ratio and analyses comparing pathology reports.

“ We revamped our BI solution in order to manage and most importantly extract value from the massive amounts of data we generate every month. By presenting management across many departments with timely data we enable more informed decision making with the ultimate goal of being more efficient, reducing costs, and still maintaining quality patient care.

-John Kelly
 Director of Development
 Queensland Health

Vendor:  Client:  Industry: Technology

Wix is a website creation software company that enables users to design and manage their own websites without complex coding. With 42 million websites created through Wix.com, the company needed the right BI tools to react quickly while keeping up with user engagement.

Thanks to Sisense, Wix [was able to simplify reporting processes](#), and drastically cut administrative time for analyzing data. The solution includes a columnar database schema and in-memory technology for fast data handling when taxed with a high volume of information.

Non-IT employees are able to access the solution for analysis, and Wix has a greater understanding of its clients' behaviors for creating the right tools to meet their needs.

“ I know that if we're making better, more well-informed decisions, with better sets of data that everyone in the room can actually see and have insight on, the natural outcome of that is a better-run organization and is going to affect your bottom line.

-Eric Mason
Marketing Director
Wix

HR Use Cases

Historically, HR has been labeled as an inefficient department. With the help of BI software, HR leaders can recruit, hire, and develop talent more effectively.

Vendor: 	Client: 	Industry: Healthcare
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Intermountain Healthcare staffs 33,000 employees, and wanted to better utilize its HR department for enhancing its workforce. Rather than treating HR as a “cost center,” the company wanted to empower HR with the data needed to make smarter, more impactful decisions.

Thanks to Tableau, Intermountain Healthcare [was able to compile HR’s workforce data and analyze operations down to each expense](#). When it’s time to start a new HR project, Intermountain Healthcare can analyze Tableau reports to better project an ROI.

For the healthcare facility’s recruiters, this means better handling of the company’s talent. When reviewing applications, setting up interviews, and making hiring decisions, its hiring team carefully organizes each step for optimal retention. Information on each recruiter’s history can break down to their individual effectiveness within the company’s greater recruitment strategy. Other initiatives, such as holiday parties, are strategically planned for employee engagement with the bottom line in mind.

“After four years of using Tableau, their software is an integrated part of our business. We are now able to drill into detailed facets of our business on a daily basis, such as wellness participation, performance of business units, and financial goals, that we were previously examining monthly or even quarterly. The simple interface and color scheme allow all Intermountain Healthcare employees to play with our data, regardless of their title.

-Michael Thurston
HR Research Analyst Consultant
Intermountain Healthcare

Vendor: 

Client:



Industry: Government

Austin Fire Department had several challenges to overcome. There were operational considerations to take into account in order to better manage taxpayer resources, along with frustration from Human Resources at not being able to access data to make changes in response to trends.

Austin Fire Department had saved tons of performance data, but needed BI for streamlining analyses. With QlikView, HR can now [better manage the organization's talent](#).

Administrators can now analyze attendance and payroll trends, as well as staff demographics to better understand their workforce. With historical data analyses, HR can organize succession planning to enhance internal leadership. Compensation is more carefully negotiated based on skills and talents such as education, certifications, bilingual abilities, and more.

Austin Fire Department uses 40 different BI applications across 11 lines of business for a variety of tasks including tracking 911 calls by multiple factors, allocating equipment (such as fire trucks to new stations), estimating its cost of services, and other financial analyses for reducing taxpayer costs.

End users agree BI has had a powerful impact on the organization.

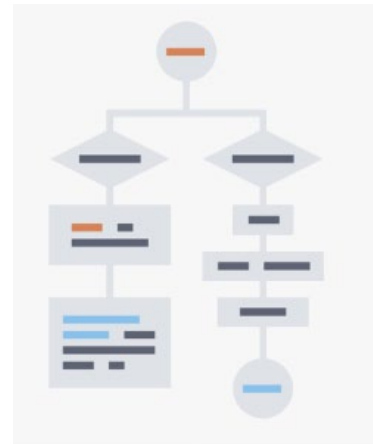
“ You can change the presentation of your data as quickly as your manager changes her mind on what she wants.” -Kathy Burke

*HR Manager
Austin Fire Department*

Business Intelligence Challenges

Though BI has helped countless companies make smarter, data-driven decisions, it has yet to gain universal adoption.

We'll explore the challenges businesses face while embracing, implementing, and getting the most out of a Business Intelligence solution.



Finding the Right Solution

Too often companies skip the all important step of conducting a thorough internal needs analysis. This is an essential part of the process in finding the right solution for your organization.

Up to 70% of BI implementations end up failing to meet all the business goals, [according to Gartner](#).

But when done correctly, BI can generate an [ROI of \\$10.66 for every dollar spent](#).

Before reaching out to potential vendors or even beginning your research, you'll want to develop a set of business requirements and goals.

Consult with key stakeholders, including:

- IT
- Finance
- Marketing
- Sales
- Operations

It's essential to gain buy-in from all stakeholders early in the process to get everyone on the same page.

Identify the key problems they'd like to have solved. Have them develop a set of use-cases, the more specific the better.

Once formulated, categorize your list of requirements into three buckets:

1. Must Haves
2. Want to Haves
3. Nice to Haves

Let these guide your research process. Present potential vendors with a list of use-cases to find out how and if their solution could solve them.

These use-cases will help you better evaluate potential vendors.

The more work that's put in upfront, the greater your chance of a successful BI implementation.

Justifying the Investment

Companies turn to business intelligence to improve operational efficiency and save money, but it has to be able to generate a true ROI.

Business leaders looking to justify the cost of an analytics system have to answer several questions:

- What are the evidence-based benefits of business intelligence, and can it be quantitatively measured?
- How can upper management be convinced that it is a worthwhile investment?
- When will the company begin to see ROI?

These questions can be challenging because BI's true value cannot be completely measured until it's implemented.

“

“You can't know the ROI, or pinpoint where it is, even though it's there,” says Tim Biskup, Director, CRM, at [Progressive Business Publications](#). “So it's hard to sell at the outset.”

Generating an ROI

For example, data may reveal that warehouse shipments go out more efficiently when two workers take their breaks at the exact same time. Data will also reveal how much money can be saved by such a simple fix. But oftentimes, companies will be unaware such simple fixes exist until they implement BI. And that's where data champions come in.

“We don't always know up front where the benefits will be,” says Biskup. “Companies need ‘data champions’ that can explain and really sell the upside of what BI can do.”

To clarify the specific value of BI for a company, such data champions need the technical knowledge to understand analytics but also the ability to clearly communicate the benefits to non-IT users.

- Key responsibilities of the data champion include:
- Building and fostering relationships between IT, executives, business users, and outside vendors
- Helping the company develop a strategic vision for the future
- Pinpointing the where and when of ROI
- Analyze a company from the inside-out and pinpoint where BI can help

Lack of Expertise

There's no question that in order to get the most out of a BI solution, you need the right personnel.

One survey stated that [60% of companies](#) think their employees need to develop new data-related skills to turn information into actionable insights.

Across industries, executives are striving to make their company culture more data-driven. This means empowering everyday business users with new skills.

“Companies are doing a comprehensive job collecting massive amounts of data with today's modern data infrastructures, but the total value of this data remains elusive,” says [Looker CEO Frank Bien](#).

The Harvard Business Review has identified several traits which must define individuals working with successful data-driven organizations:

- Able to scientifically experiment to solve business problems
- Competent at mathematical analysis
- Data “literacy” skills; able to see value in data where it exists

Businesses looking to maximize their BI should create talent management strategies for relevant personnel to develop the skills needed for success.

Working With & Without IT

Since the modern origins of BI, the industry has suffered from a lack of technical experts.

And despite the increasing availability of simpler tools and greater educational opportunities for advanced experts in the field, masters of the trade are still in great demand. Many projects still require an expert touch.

Some vendors are responding to this challenge by changing the nature of the partnership between IT and the end user.

“There is a new emphasis on simplifying access to personal data, simplified authoring, rich visualization, and in memory technology for big data sets,” Dave Marmer, Senior VP of Information & Analytics at IBM says.

Two different types of technologies that have evolved in response are business user-led analytics that are independent from IT, and IT-managed self-service analytics.

“We see customers using both of these offerings depending on persona, use case and preferred access, and driving a partnership between business users and IT to address the spectrum of analytic needs.” says Marmer.

Data Quality

The insights companies gain from data are only as good as the quality of the data analyzed.

It's simple: bad data in equals bad data out.

Bad data lingers for a few reasons:

- Multiple data sources which need to be integrated
- Enormous growth in the raw volume of total data
- Companies not maintaining proper data hygiene practices

And because companies use insights from BI to make important business decisions, bad data can cost millions of dollars.

Source Systems

Source systems are the main cause of data quality issues.

Companies can draw their information from any number of different data sources. Each source may format their information in a distinctive way. For example, one source might store phone numbers with hyphens, and the other without.

The most common example is personal information inputted incorrectly into the system. If the system is unable to check and correct the error, then faulty data is feeding the insights that your company is paying for.

BI Processes

Executing business intelligence projects often requires the creation of data categories that didn't exist when the information came from its source.

“70% of the risk and effort in the DW/BI project comes from this,” says data warehousing analyst Ralph Kimball in his book *The Data Warehouse Lifecycle Toolkit*.

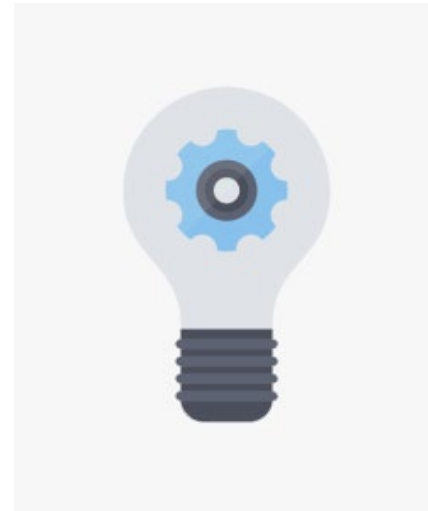
BI architects are charged with resolving data quality issues through data exploration and deeper analysis of data sources. Managers should discover where these problems come from and ensure that all users are aware of their sources.

Future of Business Intelligence

Future of Business Intelligence Business Intelligence solutions have become an important tool, enabling companies to make smart, data-driven decisions.

But what's next for BI?

How will the technology evolve and continue to drive value in a rapidly changing big data world?



Leveraging Unstructured Data

eWeek's Chris Preimesberger reports at least [80% of all data is unstructured](#) according to IDC and Forrester findings.

Unstructured data includes any information that is not easily categorized, like emails, documents, images, videos, and sounds.

And that can create problems. Most BI tools struggle to handle unstructured data. That means that an overwhelming percentage of data out there remains unanalyzed.

In the near future, technologies will grow to make this information available and actionable. Ideas in development include:

- **Hardware architecture** consists of groups of community servers which provide the speed needed for parallel processing of massive amounts of unstructured data.
- **Analytics applications** architecture that can organize and analyze the data where it exists, rather than moving it into a central location.
- **A data architecture** that is "nonrelational," or easily scalable, only partly structured, and is not heavily populated. NoSQL databases are one example.

A future where BI can analyze emails for advanced insights is not that distant.

Rise of Prescriptive Analytics

That sci-fi inspired future where machines do all the work and humans watch from the sidelines? It's not that far off.

In fact, it's already here. It's called prescriptive analytics.

It's the natural progression of predictive analytic tools, which use data from the past to identify trends and make guesses about the future.

Prescriptive analytics take predictive tools a step further by recommending actionable steps for business users based on insights. More than just providing information, prescriptive analytics will tell you what to do with that information.

The term "prescriptive analytics" was [first coined in 2003](#). The product already has use cases in various markets, including healthcare, oil and gas, and retail. And it's an impact that going to continue to grow.

“*Prescriptive analytic solutions that apply BI and Predictive capabilities to such areas as customer intelligence, fraud and asset optimization will become prominent in the future,*” says David Marmer, VP Products, BI & Growth Initiatives, IBM Software Group.

Prescriptive tools are being called the next evolution of analytics. Categories include:

- Data mining
- Machine learning
- Game theory
- Simulation
- Decision-analysis methods

One thing that currently limits the scope of prescriptive analytics is unstructured data.

As vendors find more ways to analyze texts, images, and videos – that 80% chunk – prescriptive recommendations will become more accurate and widespread.

Simplifying the User Experience

Simplicity, speed, and ease of access.

Each of these three traits will define the growth of business intelligence into the foreseeable future.

“2015 will see significant progress toward making all data more accessible to the business people who need it, and an empowerment of data teams with new tools to provide these experiences, the result of which will provide the last mile of value out of their data,” Looker CEO Frank Bien says.

Increasingly, BI will give average end-users the capability to achieve what only advanced data scientists could achieve until recently.

Do it Yourself

[Software AG](#) Vice President John Crupi calls this the “Do Everything Yourself” incarnation of BI.

“As we know DIY is the mantra of dashboard building thanks to Tableau, being able to do soup-to-nuts yourself is really the wave of the future. Especially, when it comes to the millennials.”

Crupi sees the user interface being completely innovated. Soon, users may be building real-time dashboards based on Spark analytics without ever know or caring where the data is actually being processed.

And they'll be doing it from their iPad.

Agile BI

An improvement in technology, and the passage of time, have made advanced data visualization and data discovery products widely available for the first time.

“Agile” BI, especially platforms relying on in-memory processing, will attain a commanding presence in the marketplace. Platforms which focus on developing speedy insights will soon outstrip their competitors.

Cloud and Mobile

Finally, cloud and mobile BI products are letting end-users access their information on-the-go. The cloud BI market is [expected to grow to \\$2.94 billion by 2018](#).

"This combination has spurred BI's departure from the backrooms of IT departments and placed its capabilities in the front offices and pockets of end users, providing an unmatched potential to access insights on-demand from anywhere," writes [Jelani Harper](#), industry analyst with Dataversity.

Future Use Cases

New technologies and trends will spawn increased adoption in given sectors of the market.

But what exactly will these changes look like? What are some real life examples of how companies – and business – will be changed by BI and big data in the coming years?

Below are four key use cases identified by the industry experts and thought leaders at the helm of the next generation of business intelligence.

Seamless User Experience

“ *Analytics solutions must integrate with other tools in order to become the standard.*

Use case: Many companies use Salesforce for CRM, for instance. But while they live inside Salesforce, a lot of their data and metrics do not. As analytics gets more integrated, though, you can use Salesforce for CRM, use a tool like Tableau for analytics, bring the Salesforce data into Tableau, then also use the links in the analytics to jump right back into Salesforce.

For a salesperson or any end user, the experience will be seamless.

Ellie Fields
VP of Product Marketing
[Tableau](#)



Start of Big Data Cultures

“With early adopters of Big Data solutions already seeing real ROI on their investments, 2015 is the year that Big Data moves beyond hype and becomes an established facet of company operations. As a result, technology buyers will be more selective regarding the vendors they engage with. Businesses will look to those vendors that have an actual track record of delivering measurable results with Big Data. The time for vendors making promises of potential future returns is over.

Sandy Steier
CEO
1010data



Fundamentally Changing Healthcare

“In regards to the health care industry opportunity, if done correctly, the wellness and health care industry can totally reinvent itself into a real-time people health sensor network. I'm not talking about fitness monitors, but rather wearable sensors that monitor glucose, blood pressure, hydration, temperature, pulse, electrocardiography (EKG) and anything else that can provide a picture of a person's health trend.

The word “trend” is used to emphasize that we are analyzing a series of human telemetry over time to identify and predict outcomes. Imagine being able to predict and alert you to an upcoming heart arrhythmia based on your behavior. The behavior that triggers your heart arrhythmia may be based solely on your history, or based on analyzing millions of others with your condition to create the most accurate predictions; or a combination of both. Just like we don't like the “break-fix” pattern of machines, we especially don't like the “break-fix” pattern of people.

John Crupi
VP & CTO of Visual Analytics
Software AG



BI Creating Centers of Excellence

As more data becomes more easily available we will continue to see a shift from BI being used just to interpret and represent data and more towards BI also acting as a “center of excellence” – a way to keep relevant and powerful data quickly accessible and shareable.

We are reaching the point where companies can no longer allow different data streams to be sent in different directions where the majority of the insight is lost in the shuffle. Interactive Edge has had phenomenal success in using XP3 to create Insight Libraries and dynamic presentations and reports – tripling their client’s productivity and effectiveness.

Zel Bianco
Founder & CEO
Interactive Edge

