



BUSINESS INTELLIGENCE

# Smart analytics: The era of A.I.-powered BI

The business intelligence (BI) and analytics industry has undergone tremendous change over the last 30 years. A multi-billion-dollar industry has developed, involving hundreds of vendors and millions of users. While every BI vendor claims their product offers significant advantages over the competition, do any of these solutions truly deliver on the promise of improved business performance through the integration and analysis of data made available to a broad end user audience? This paper explores the current business intelligence paradigm and offers suggestions on how, through the harnessing of artificial intelligence (A.I.) technologies, the realization of increased operational performance through the analysis of data may be achieved on a much more significant scale.

## Business intelligence technology and workflow: Has it really changed?

Since the advent of database technology in the 1960s, there has been a need to better understand the information stored in these platforms. The fundamental premise is that greater insight into business transaction data would improve business performance. In those early years, IT teams with specialized technical skills were responsible for:

- Gathering end-user business requirements
- Creating queries to generate reports
- Distributing reports to users

While the technologies, vendors, and user skill sets have evolved, the BI and analytics paradigm to this day has fundamentally remained the same as it was 30 years ago. Reports with tables and data visualizations continue to be the method we use to **describe** business performance. Yet, what organizations really desire is to **improve** business performance. As for this goal, BI solutions have fallen short.

To better understand this shortfall, let's look at another industry that has used technology to deliver value to millions of users: Financial services and individual investors.

## The financial services industry: How technology made individual investing smarter

The financial services industry provides a very relevant example of how technology has fundamentally changed the experience of individual investors. The timeline of innovation is illustrated in the table below.

The BI and analytics industry is in the early years of a similar journey. The variety and volume of data has dramatically increased. There is also a greater understanding of the competitive advantage gained by the use of data to improve business outcomes. And yet, the prevailing paradigm in the industry has not changed. BI tools are still primarily designed around the concept of building reports, an activity that requires a minimum level of expertise that most business people simply do not have.

Fortunately for organizations, emerging technologies like artificial intelligence (A.I.)—specifically capabilities like machine learning automation and natural language—are fundamentally changing all aspects of the BI and analytics paradigm. As with individual investing, new technology will soon make BI more accessible to a larger number of people. Technology will increase both the reach and quality of available solutions.

Timeline	Key innovation	Details
>80 years ago	Stock markets and brokerages	Individual investors wishing to purchase stocks and bonds sought a stock broker to perform transactions.
40 years ago	Discount brokerages	Through discount brokerages, individual investors gained the ability to make their own stock purchases.
30 years ago	Mutual funds	Through mutual funds, individual investors could both diversify and reduce stock picking effort.
10 years ago	Exchange traded funds (ETFs)	With ETFs, individual investors further reduced their investment costs, yet maintained portfolio diversification.
Today	Robo-advisors	Robo-advisors, aided by A.I., have automated the entire process of creating and managing a diverse investment portfolio.

## BI and analytics today: All about reports

To better understand the future of the industry, let's examine the current state of the BI and analytics paradigm. Today, dashboards and reports are generally synonymous with BI. Why is this?

- Reports are today, with nearly any product in the market, relatively easy for knowledge workers to create, share, and distribute.
- The report paradigm (summarized rows and columns) generally resembles the data storage paradigm (detailed rows and columns). The technical leap between the two paradigms is very small.
- Reports make it simple for executives to compare: One measure vs. another (i.e., actual vs. budget, etc.); one measure over a historical time period (sales history, etc.); and a single metric across multiple dimensions (top customer list, ranked by sales).

Where does the report paradigm fall short?

- Reports requires a knowledge worker to integrate the data and create the report.
- The current paradigm requires a person to have an “analytic interest” to use the report.
- The current paradigm requires a knowledge worker or executive to interpret the report.
- What if you have no interest in any this? How do you or your organization benefit from BI?

The shortcomings in the report paradigm fundamentally limit the reach and impact that BI can have on an organization. Reports and dashboards, while useful to knowledge workers and executives, do not broadly deliver on the promise of improved business performance. They simply deliver a subset of information to a fraction of the total potential users. The current approach leaves most organizations short of what they are fundamentally seeking:

**Data-based guidance, provided to every single person in an organization, to benefit and improve each person's decision-making processes.**

## The emergence of artificial intelligence: Breaking through the BI adoption barrier

The mainstream arrival of A.I.-enabled capabilities has profound implications for individuals and companies using BI and analytics applications. It will make BI and analytics available to more people than ever before, and it will make organizations smarter thanks to unimaginable amounts of low-cost computing power, and the ability for a BI solution to self-discover insights.

These capabilities include:

- Automated insights
- Natural language
- Intelligent predictions
- Intelligent recommendations

Automated Insights are visualizations, reports, and dashboards generated by a BI solution without human intervention. These insights are typically powered by machine learning (ML). The most common application of A.I., ML is the ability of computers to learn from and make predictions on data without explicit programming. ML uses statistical algorithms to learn from data rather than relying on hard-coded rules alone. By contrast, the older approach to artificial intelligence involved programmers interviewing human domain experts to learn the rules and criteria used to make decisions and translate those rules into software code.

Natural language processing (NLP) is ability to interpret or produce human-readable text or spoken audio. Within NLP, there are different processes. Natural language understanding (NLU) involves the machine interpretation of spoken or written data. Natural language generation (NLG) is machine-produced readable text or spoken output. Natural language processing is being implemented in multiple different ways within analytic solutions. One NLP usage is formation of queries. In this NLU usage, text or spoken language replaces the drag and drop query generation interfaces used by many analytics solutions today. An emerging NLG usage is the narrative interpretation of the results delivered by analytic queries. The replacement of traditional reports with smart narratives has the potential to dramatically expand the use of analytics.

Intelligent predictions require either machine learning or mathematical optimization and simulation. The selected approach depends on the volatility of the business process. The more stable the business process, the more representative historical data is for the future, and hence the more applicable machine learning would be. With a more dynamic business process, mathematical optimization and simulation should be considered.

Intelligent recommendations typically are generated in order to optimize certain goals. Recommendations are therefore, in the realm of mathematical optimization. Once mathematical optimization or simulation is required, humans are needed to develop an optimization model for the specific business process. This human is often a data scientist. Because of the complex nuances in each process, a dedicated optimization model is generally required. This specialization often moves the problem from the realm of horizontal BI tools to the world of vertical solutions.

These capabilities have the potential to dramatically expand the reach and value that data can bring to organizations, but it is still early, and vendors have yet to exploit their full potential. Those BI and analytics products that deliver A.I.-enabled capabilities do so in a way that still serves the same knowledge worker that builds reports and dashboards. The broader business audience—the non-analyst, non-data scientist—remains underserved. For them, a new paradigm is emerging. One that will fundamentally transform the way we think about working with data.

## The future: Smart analytics

Since the dawn of BI, vendors have focused on knowledge workers. This audience exhibits one or more of the following attributes:

1. Has an analytic interest in using data to make better decisions
2. Has knowledge of where to find the data needed to make decisions
3. Has knowledge of how to integrate multiple related data sources together, to derive value
4. Knows how to ask business questions of the assembled data

5. Knows how to interpret the results of the business question they've posed to the data
6. Knows how to make a decision, using the results, to positively impact their organization

Vendors have optimized their technologies and workflows for this knowledge worker audience. Unfortunately, most individuals in organizations are not knowledge workers. The vast majority of employees in most companies do not necessarily have the expertise or understanding of fundamental analytics concepts to prepare data and assemble reports. Most individuals in organizations simply want to do their jobs, not build reports. It's not that BI and analytics technology couldn't positively impact these individual's performances. It's more that these individuals simply don't have the analytic interest required to benefit from existing BI technologies nor the time to invest in learning and using any current technologies. As a result of vendors focusing on the knowledge worker, the information needs of the broader end user audience is simply ignored.

Smart analytics is the next evolution of BI and analytics technology. It aims to be a more inclusive approach, such that all employees in an organization can benefit from data.

## Smart analytics require different approaches for different user personas

Smart analytics maximize the value of how data is used in an organization by understanding these key points:

1. Different user personas exist in organizations
2. Each user persona has different analytic skills, abilities and interests
3. Different personas require different approaches to BI content and delivery

While the needs of knowledge workers have generally been satisfied by existing technologies, what approaches are needed to move BI beyond this skilled audience? What changes in technology might be required to make BI more inclusive and accessible to every persona in an organization?

Below are some examples of how smart analytics can expand the reach of BI:

### Predictive intelligence

Instead of simply reporting on historical activity, by using A.I., a prediction of some future business activity or trend is made. To expand the reach of this prediction, a data visualization or spoken language prediction could be sent to a user's mobile device. An example of this would be the automated distribution to each store manager, via personalized text or visualization, the predicted foot traffic in their store. This valuable insight would allow them to staff and stock shelves appropriately.

### Recommended actions

To expand the reach of BI and to provide actual guidance to business decision makers, AI is used to determine the action to be taken to optimize performance. Further, natural language or data visualization is used to communicate personalized recommendations to each user. An example of this would be a text message or infographic, sent to each store manager, to begin the process of hiring two store clerks, in anticipation of holiday sales volume increases.

### Automated actions

In this advanced scenario, no human intervention is required. The action to be taken, derived from A.I.-enabled insights, is communicated directly to the system or machine, which takes the action. An example of this is the business intelligence solution communicating with an enterprise resource planning (ERP) solution to transfer additional units from one warehouse to another, when inventory on a particular item is low.

### Optimizing the delivery format to the user and use case

Just as different modes and vehicles are required to meet the needs of the traveling public, so must the delivery format vary for the analytic consumers and their business problems. In some cases, a data visualization is the best and fastest way to communicate the information to the target consumer. In other cases, with different information and with different user personas, a grid of tabular data might best meet the business requirements. Finally, natural language, using the written or spoken word could be the best analytic delivery vehicle for a specific use case.

The grid below illustrates how, through the careful pairing of the user persona with the appropriate smart analytics technology, pervasive BI can be achieved.

BI paradigm	Content	Delivery format	Persona requirement	Availability
Reports and dashboards	Rows and columns of information	Printed, emailed, or viewed online	Has analytic interest, ability to assemble and interpret data, and ability to make a decision using data	Today, mainstream
Data discovery tools	Visual images or rows and columns of information	Interactive tool	Has analytic interest, ability to assemble and interpret data, and ability to make a decision using data	Today, mainstream
Predictions	Information regarding what may happen, based on data	Data visualization or natural language message, via SMS, email, or voice	Ability to make a decision	Today, not mainstream
Recommendations	Information regarding what actions should be taken, based on data	Data visualization or natural language message, via SMS, email, or voice	Anyone	Future
Automated actions	Instructions sent from BI technology to systems/robotics, for actions to be taken	Electronic, system to system	None	Future

## In summary

Artificial Intelligence is the next wave of disruption in BI and analytics. A.I. makes it possible to fulfill the promise of delivering significant ROI to organizations by empowering every worker to tap into the power of data. Advanced algorithms and techniques that were previously the domain of highly skilled experts will now be available to non-technical business users. Data analysts and data scientists will be able to work on harder problems that deliver greater value to the business. Smart analytics will become the new BI and analytics paradigm, moving from building reports to personalized, data-driven predictions and actionable insights. The predictions and recommendations will be delivered to every employee in an organization, on mobile devices in their native language or as a relevant data visualization. Smart analytics represent a unique opportunity for organizations to leverage data in a way that will make them smarter, more productive, and reshape their market landscape.

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