Becoming a Cognitive Business with IBM Analytics

Using data and analytics to fuel a thinking business

IBM

For the past several years, the IT industry has been re-ordered, driven by simultaneous developments in data, analytics, cloud, mobile, social media, and the Internet of Things. At the same time, business leaders have shifted their reliance upon gut instinct for decision making to new forms of business value by becoming data-driven, which is enabling them to reinvent professions and transform their industry with data. Together, these shifts, underpinned by a foundation on data-driven insights are propelling companies into the next business era, where they interact with data to reason, adapt and continuously learn.

Once again, IBM is leading the world to this new era of computing: the cognitive era. An era where all data is turned from obstacle to opportunity, and where we can tackle some of the most enduring systemic issues facing our planet in an iterative and rapid fashion. These issues range from cancer and climate change to an increasingly interconnected global economy.

This white paper explains the value of putting data and insight to work to accelerate an organization's journey to becoming a Cognitive Business, by enhancing their investments in data and analytics and realizing new opportunities from cognitive systems that understand, reason and learn.

What's changing in the world today?

We are witnessing marketplace disruption across multiple industries fueled by the convergence of four massive shifts at the intersection of technology and business:

1. **A world awash in data.** Data is flowing from mobile devices, social networks, and every digitized and connected product, machine and infrastructure. And all this data has potential for insight. Data is replacing guessing, approximations, and averages. We can know with greater precision what customers will want, where traffic will flow, how disease will progress, and where the risk is greatest. This is a vast and abundant opportunity that is far out-stripping the capacity of organizations and experts to take advantage of it, leaving much of this potential untapped. With the advent of cloud, plentiful compute resources and new analytics platforms, we can now turn any volume and complexity of data into actionable insight.
2. **The re-invention of the world in code.** The world is being "rewritten" in software code by developers who are reimagining on the cloud, everything from banking, retail and healthcare to education, supply chains and public safety. Specifically, they are reimagining how people and systems interact digitally to accelerate and optimize the world using new agile mobile apps and systems. They are embedding machine-learning algorithms to capitalize on data and exposing new capabilities via application programming interfaces (APIs). This requires leveraging the latest open source software, and hybrid data and cloud architectures to deliver a resilient and elastic service to consumers, customers and employees.
3. **The advent of cognitive computing.** IBM Watson's landmark victory over the TV quiz show Jeopardy!'s most successful champions in 2011 introduced cognitive systems to the world. Since that time, IBM has expanded access to Watson and cognitive systems across 17 industries, four languages, 36 countries, 100 universities, 400 partners, and more than 75,000 developers. IBM is also infusing Watson's cognitive capabilities across its software and systems portfolio.

Watson creates a new partnership between people and computers that enhances, scales, and accelerates human expertise. Cognitive systems can ingest unstructured data in all its forms in the same manner that humans do, so Watson understands natural language, generates hypotheses based on evidence, and learns as it goes. Watson "gets smarter" in three ways: by being taught by its users, by learning from prior interactions, and by being presented with new information.

Watson enhances the cognitive process of professionals by putting their knowledge, and insight gleaned from all available data, to work to accelerate the development of expertise in others at a scale previously unimagined. It uses cognitive capabilities to:

- **Understand** unstructured data, through sensing and interaction
- **Reason** by generating hypotheses, considering arguments, and making recommendations
- **Learn** from training by experts, from every interaction, and from continually ingesting data. In fact, Watson never stops learning

4. **Marketplace Disruption.** At the same time, businesses are encountering another shift in the form of marketplace disruption from a new breed of competitors who are:
- Reimaging solutions to age-old problems with a fresh perspective for business model costs and new forms of engagement. For example, Airbnb disrupting the hotel industry
- Emerging through industry convergence to reshape a market. For example, defense contractor Lockheed Martin partnering to develop personalized health and wellness solutions, and insurance companies offering tailored automotive coverage based on mobile device telematics
- Delivering more value to consumers using new data-enabled products and services. For example, Whirlpool building connected appliances that improve their customers' experience and proactively address maintenance issues

We believe the convergence of these major technology shifts and the disruptive moves by organizations will fundamentally change industries, professions and global society itself.

Cognitive Business: How and why now?

Data is transforming industries and professions:

Data — including language from textbooks to conversations, sight, sound and motion — has been unstructured "dark data" that until now has been inaccessible.

- 88 percent of healthcare data will be unstructured, including patient sensor data and electronic medical records
- Media data will be comprised of 82 percent unstructured information, including video, images and audio

Capitalizing on code:

Developers are writing code and connecting to pipelines of data through APIs. This is the core of the API economy, powering a business renaissance.

- By 2017, the typical software project will integrate 19.1 APIs
- Cars are software platforms containing 1,000,000 lines of code

Computing is entering a new cognitive era:

Cognitive systems can ingest unstructured data in all its forms and business leaders are integrating cognition into their operations.

- 89 percent of telecommunications executives believe cognition will have critical impact on their future business
- 96 percent in insurance intend to invest in cognitive capabilities

A Cognitive Business is a thinking business

IBM Analytics has been focused on helping organizations ignite their own data revolution for years. Many have invested in a robust foundation of data and analytics capabilities as the launching pad for competitive advantage and, in some instances, it's enabling them to disrupt their own industry.

Analytics enables anyone to engage with data to answer the toughest business questions, uncover patterns and pursue breakthrough ideas. IBM has a comprehensive portfolio of data and analytics capabilities available as a platform and solutions that help enterprises extract new insights from the explosion of available data to drive competitive advantage. IBM delivers a full spectrum of capabilities—from descriptive, predictive and prescriptive analytics to cognitive systems—to turn diverse data sets into actionable, game-changing insights and reinvent how decisions are made.

IBM recently introduced the concept of the "Cognitive Business" to the world.

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A Cognitive Business uses every opportunity to interact with data to reason, adapt and continuously learn. Essentially, cognitive businesses place a premium on making probabilistic-based decisions with a high degree of confidence. They systematically empower their employees to discover insights, and above all, put those insights to work, every day, leveraging all available data to solve problems, make better decisions, innovate faster and predict the future.

From our 50,000 data and analytics consulting engagements, we've seen that well-informed, timely decisions become increasingly critical to success. Led by data strategists such as Chief Data Officers and Data Scientists, we've seen organizations shift from using data operationally by a few skilled people to using analytics across multiple departments in an organization. In fact, winners and losers in any market can be defined by their systematic ability (or lack thereof) to empower everyone from the road warrior to the shop floor and across the C-suite within their organization to engage with relevant data and make sense of it.

Simply put, becoming a Cognitive Business enables everyone in an organization to answer questions fundamental to driving the business forward–questions such as "what has happened?", "what is happening now?", "what is likely to happen?", and "what should we do next?".

A Cognitive Business is a thinking business that has:

- Clarity about their business and their mission and have confidence in every decision they make
- The ability to spot new revenue opportunities, offer new services and reach new audiences
- A disruptive DNA that is data-driven and a culture that puts data and insight to work
- Employees who are empowered to challenge assumptions using facts based on analysis
- The tools to continuously outthink their competitors and overcome challengers
- Infused insight into every action, interaction, decision, application and business process

In the cognitive era, the use of cognitive capabilities across the analytics portfolio augments the fundamental use of data with advanced analytics and machine learning techniques to fuel deeper data-led innovation by:

- **Tapping into "dark data"**—accessing data that's previously been inaccessible to advanced analytics such as medical images, audio, device, sensor and text data, and also, the vast corpus of business content that has yet to be digitized

- **Making sense of the world**—by combining the right internal and external data to separate clear signals from a world of noise using the science of data to forge relevant connections between data elements that tell you about the people, things, events and places that matter
- **Capturing expertise and continuously learning**—using reasoning and learning techniques found in artificial intelligence to capture expertise, make it available to more people in new ways, generating hypotheses, considering arguments and making recommendations
- **Using natural language processing to engage in a dialog**—in plain English to interactively explore data and ask questions to form analytical analysis. Through these interactions, systems are able to make predictions and prescribe actions to help people solve problems faster
- **Providing machine learning and artificial intelligence capabilities**—such as knowledge graphs, ontologies, deep learning algorithms, and dialog systems as APIs that can be trained with industry and domain expertise to augment any new solution or make an application smarter

How IBM Analytics enables a cognitive business

Putting data & expertise to work	Enabling intelligent discovery	Reinventing business with code and data science
Industry Analytics Solutions with built-in industry expertise and data science		Open-standards based, Analytics Platform
Insight Cloud Services delivers actionable insight from curated, open and business data	Over 1 million registered Watson Analytics users	Cloud Data Services and over 20 data and analytic services
		Watson Developer Cloud with over 770K developers and 1.3B API calls

Cognitive Business
IBM Analytics fuels a Cognitive Business by enabling Cognitive Solutions that make sense of all available data, extend analytics to everyone and supply Watson with curated, trusted and protected data.

How IBM Analytics fuel Cognitive Business

To enable every organization on their journey to become a cognitive business, IBM continues to innovate and invest in the IBM Analytics portfolio to enable cognitive solutions that bring together the best of cognitive and advanced analytics with key data to:

- Create an analytics and data foundation to make sense of data even when facing ever growing and complex data from social to sensors, from weather to wearables, from transactions to interactions

- Provide analytics that give everyone insight into the factors that drive business performance, and place those analytics at the center of business applications so everything can be driven by insight—from operations and risk, to customer, employee and citizen engagement, to new products and services and business models

- Fuel cognitive systems like IBM Watson with curated, trusted and protected data and advanced analytics like predictive so that these solutions are integrated into the fabric of a business. This includes embedding cognitive capabilities into our portfolio and creating entirely new solutions

Here are three ways IBM Analytics helps organizations on their journey to cognitive.

1) We capture and put data and expertise to work

One of the ways to accelerate putting data to work is to embed industry and data science expertise within a solution. IBM's Industry Solutions provide targeted decision-makers with the relevant data and insight to make better decisions and take confident action. They embed the language and expertise of the industry and make extensive use of the science of data to make predictions that result in confident actions. For example, retail merchandisers who have better visibility into product affinities can make better merchandising and promotional decisions.

These custom or pre-built analytic solutions combine predictive, behavioral and cognitive analytical techniques on diverse data sets without the need for a large data science or IT team. It's this combination that delivers the highest value and insight to businesses compared to a single analytical approach.

Using IBM Insight Cloud Services' cognitive capabilities to understand the world, each solution has access to combined business data with valuable external sources of data to uncover clear demand signals and make high-quality predictions more easily using curated data from Twitter, The Weather Company, and more than 150 open data sources. While many companies have tried to leverage external data, it's the ability to combine and make sense of multiple sets of external data that deliver confidence and clarity about the behavior of people, things and businesses. It's easy to imagine how these solutions will be able to leverage 'dark data' to gain greater understanding of the world and look for new demand signals and a new realm of opportunities.

Here are some example solutions by industry that combine key capabilities from IBM Analytics powered by IBM Watson to solve key business challenges:

- **Customer Service**—We are working with a provider of comprehensive insurance services to the United States military and their families, who use advanced analytics to help them understand their clients' propensity to unlist from military service. A pilot project with IBM Watson Engagement Advisor enabled their members thinking of leaving the military to seek answers to their questions by tapping into their corporate data with confidence
- **Banking**—IBM is working with banks across the world to transform how organizations engage with clients, and streamline their risk and compliance management practices using IBM Analytics and Watson. They are extending IBM's predictive customer intelligence risk and compliance solutions with the ability to harness dark data powered by Watson
- **Mining Operations and Exploration**—Mining companies can benefit from predictive maintenance and optimization of their infrastructure assets used for mineral extraction. Also organizations can apply analytics to published industry expertise to uncover new exploration opportunities, breakthrough exploration techniques and predictive analysis of market futures
- **Automotive Safety**—IBM is working with a major manufacturer to provide a solution that enables faster safety issue recognition and resolution using IBM Analytics and Watson technologies. Proactive issue identification can minimize brand erosion, and facilitate product quality feedback and resolution sooner by engineering departments

- **Energy and Utilities**—Electric utilities are working with IBM to protect both their infrastructure assets and help improve their services to their consumers. Using data science, the latest analytics and cognitive techniques with granular, local weather forecasts, IBM is helping organizations predict when and where costly outages are likely to occur enabling faster response after bad weather strikes
- **Wealth Management**—An Asian financial institution provides personalized investment advice to their high net-worth customers by analyzing the questions that their clients are asking Watson. Then this information is used to create individually targeted next best actions to reduce the amount of money held on account by moving funds into active investments using IBM's predictive customer intelligence solution
- **Supply Chain**—A large retailer is reducing demand-forecasting errors by 50 percent by applying predictive analytics to both in-house structured data and eight categories of dark, unstructured data including Twitter sentiment, local events and weather patterns. Behavior that previously seemed random can now be predicted, and the right inventory can be located much closer to the right stores

2) We enable intelligent data discovery

Over a million business and industry professionals are already registered users of IBM Watson Analytics, an easy-to-use cloud service that uses machine learning, natural language processing, compelling visualizations and data integration capabilities to allow anyone to engage with data to ask questions, uncover patterns and pursue breakthrough ideas. Watson Analytics gives all users the ability to put their data through complex, unbiased analysis to arrive at clear and actionable insights previously reliant upon months of project time and (often unattainable) data and analytics expertise. It provides an easy on-ramp for organizations on their journey to become a Cognitive Business in a matter of minutes.

- **Distribution**—Benco Dental, the largest privately owned, full-service distributor of dental supplies, equipment and services, is using the cognitive, natural language query facility and predictive analytics built into Watson Analytics to uncover and answer key questions about volume discounts and predict certain aspects of customer behavior to create more efficient pricing models
- **Manufacturing**—Mueller makes metal roofing and steel building products in a town of fewer than 4,000 inhabitants. With such a small talent pool available locally, the company has learned to rely on technology to plug the skills gap. An enhanced cognitive analytics solution helps line-of-business leaders analyze new datasets for trends and patterns that Mueller could not have recognized otherwise, providing unprecedented insight and answering questions the company had not yet considered. By accelerating analysis by a factor of 10, Mueller unlocked new marketing opportunities, enhanced safety protocols and improved their supply chain

It's easy to imagine how you could extend the cognitive capabilities in Watson Analytics to deliver new value such as automatically selecting visualizations, analysis types and additional potential data sources based on the questions you are asking of your data.

3) We enable code and data science to reinvent business

Organizations are looking to build engaging operational and analytical mobile and web apps, and create smarter systems and business processes fueled by insight. Organizations are using the combination of services on the IBM Watson Developer Cloud and the world's most popular open source projects, such as Cloudant, Apache Hadoop, Apache Spark, graph and time series databases and more than 100 additional IBM data services (including Twitter and The Weather Company) on the IBM Bluemix cloud platform to build, run, and scale a new generation of apps.

With IBM Analytics Platform and Cloud Data Services, organizations can focus on using their expertise to build solutions using often free to start capabilities and without the complexity of configuration management. Coupled with advances in hybrid data and cloud architectures, IBM ensures developers, data professionals and data scientists using the services can unlock the full value of data wherever it resides—on premises, on public clouds or in any combination. Modern, loosely coupled, and hybrid cloud approaches to application development ensure new solutions are more resilient and can be truly responsive to the elastic demands of app usage and massive amounts of data.

IBM has been partnering with the Apache Foundation and Open Source community to contribute to the advancement of core technologies such as Apache Hadoop and Spark, and foster the growth of skills and the size of the data science community eager to discover new patterns of insight using external data, machine learning and cognitive capabilities.

For example, the following are examples of solutions being built using IBM Analytics and Watson APIs.

- **City Operations**—Findability Sciences, an IBM business partner, recently launched an innovation platform that uses Apache Spark and Watson capabilities to analyze streaming device data from smart parking meters to help city managers improve safety and maximize revenue
- **Automotive Insurance**—Octo Telematics, a telematics services provider, is using real-time weather data as a critical input to its driver behavior scoring app, OctoU. Their free app uses proprietary algorithms to offer personalized pay-as-you-drive or usage-based-insurance quotes based on driver behavior. By adding The Weather Company data, they are able to further optimize their algorithm based on the precise weather conditions at the place and time of the driver's trip
- **Media Planning**—RSG Media, a provider of specialized enterprise software for media companies, uses a variety of Cloud Data Services as well as IBM's Twitter data integrations to analyze viewer demographic, advertising, and public sentiment data to help media entertainment companies (broadcasters, cable firms, video on demand sites) schedule video content and advertising to increase viewership and profitability

It's easy to imagine how the IBM Analytics Platform and Cloud Data Services can be extended to enable new classes of applications to be built and new business problems to be solved with data science using the assembly of new data, analytical and cognitive services in new and interesting ways.

How to get started

So far you've read about the value of solutions that combine cognitive and advanced analytics capabilities with key data to gain clarity and take action. However, how do you get started? IBM recommends the following practical steps:

Step One: Determine what business problem needs to be solved:

Before you introduce any solutions or capabilities to your department or company, bring together appropriate company stakeholders to identify a "getting started" project. In this stage, the team will think through the most pressing challenges in the business. What are the desired outcomes? How will new insights, or faster decision-making, and better data discovery and exploration, address your problem solving challenge? Which of the following questions do you want to solve?

- What has happened? (Descriptive Analytics)
- What is likely to happen? (Predictive Analytics)
- What should I do next? (Prescriptive Analytics)
- What can I learn from what happened? (Cognitive)

Step Two: Define the data, tools and platforms you will need or need to extend:

How will the use of cognitive capabilities, extending your analytics investments and employing new sources of extraneous data deliver the desired outcome? Specifically consider:

- What capabilities are needed for the project?
- Where does the needed data reside, and what form is it in? (e.g., structured, unstructured, in-house, licensed/procured or publicly available)
- What type of infrastructure is desired? Hybrid cloud, on premise or off-premise?
- What data security considerations have to be taken in to account?
- How will you best align resources to collect, ingest, curate, annotate and build out taxonomies and ontologies?

In addition to evaluating your technological readiness, you also need to evaluate the organization's cultural readiness and the best way to empower every employee with insight and the ability to take action. In the case of Watson Analytics, that might take a matter of minutes. Make sure the use case concept is shared with appropriate stakeholders. Are the right people informed and on-board? Can they help in thinking through the scope of work as it develops?

Step Three: Build the prototype, seek and incorporate feedback:

In this phase, you will bring together the right data from internal and external sources, and determine the right combination of data, analytics and cognitive capabilities. Depending on what cognitive capabilities are used, i.e., whether they are transparent or not, make sure processes are in place to train your cognitive solution so it learns and improves over time.

Step Four: Ensure future expansion and modifications are based on what you've learned:

One of the most compelling advantages of a cognitive solution that combines cognitive and analytics capabilities is its ability to ingest and accumulate data and new insight from every interaction continuously in real-time and at scale. Make sure your team is continuing to apply lessons learned from project and implementation findings to evolve current projects and inform future projects.

IBM Analytics Platform and Cloud Data Services can be extended to enable new classes of applications to be built and new business problems to be solved with data science using the assembly of new data, analytical and cognitive services in new and interesting ways.

Succeeding with analytics in the cognitive era

It's quite simple—individuals, organizations and industries thrive on insights, it helps them improve how they experience, learn and operate in the world. By putting a cognitive lens on the use of advanced analytics and access to all available sources of data, IBM is enabling businesses to become data-driven and deliver insights not previously imagined with cognitive solutions.

As IBM leads in helping organizations transform their industry and professions with data, the cognitive era represents a tremendous opportunity to enable game-changing value creation.

Now that you've read this paper, here are some additional resources for understanding the value of analytics and how to get started on a journey to become a Cognitive Business:

- IBM Analytics
- IBM Watson Analytics
- IBM Cloud Data Services
- IBM GBS C-Suite Study 2015
- IBM Institute for Business Value studies
    - Analytics: The upside of disruption
    - Cloudy with a chance of mishap: How weather insights can help insurers manage risk and drive client value
    - Beyond listening: Shifting focus to the business of social

To learn more about becoming a Cognitive Business with IBM Analytics, visit **ibm.com**/analytics/us/en/contact-us.html to contact an IBM representative or IBM Business Partner.

About IBM Analytics

IBM Analytics offers one of the world's deepest and broadest analytics platforms, and domain and industry solutions that deliver new value to businesses, governments and individuals. For more information about how IBM Analytics helps to transform industries and professions with data, visit **ibm.com**/analytics. Follow us on Twitter at @IBMAnalytics, on our blog at ibmbigdatahub.com and join the conversation #IBMAnalytics.

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