Cognitive Analytics:

Building on Your Legacy IT Foundation

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ABSTRACT

Cognitive analytical computing describes technology systems that are based on a cognitive computing platform with a primary focus on the interpretation of data. Cognitive analytics systems are self-learning, keen observers, possess a vast, nonerasable memory, and can interact directly with humans. This is and will continue to be a disruptive technology promising to bring significant change to businesses who embrace it.

The challenge for organizations is to define an approach for cognitive analytics through the integration and inclusion of existing teams rather than creating a new isolated organization unit. This article discusses what cognitive analytics is and how organizations can benefit from this next level of analytics.

INTRODUCTION

Businesses have always wanted to predict the future while learning from the past. These complementary objectives have greatly enhanced the growth of both data and analytics affecting and influencing human behaviors. With improved analytics, data is now recognized as the most important human-made commodity. Exploring this commodity provides the means for enterprises to grow through differentiated offerings and services in the marketplace. Data and value derived through analytics can make enterprises smarter.

Cognitive analytical computing describes technology systems based on a cognitive computing platform that focuses on the interpretation of data. Cognitive analytics systems are self-learning, keen observers, possess a vast, non-erasable memory, and can interact directly with humans. This is and will continue to be a disruptive technology promising to bring significant change to businesses that embrace it.

To break it down, cognitive analytics is both cognitive and analytics.

Several years ago, one of us collaborated with other notable experts to coauthor a book on analytics (Boyer, et al., 2012). In the preface, we noted that the preferred terminology had recently shifted from "business intelligence" to "business analytics." We wrote that the "change in terminology demonstrates the rapidly evolving landscape of business analytics." We used the term *business analytics* to refer to "the groups of analytical capabilities that are used to help organizations make better decisions. This includes business intelligence (reporting, analysis, scorecard, and dashboard capabilities), performance management (budgeting, planning, forecasting, and what-if scenario analysis), and predictive and advanced analytics (predictive and statistical analysis), as well as risk management solutions." Although it may still be true that information management solutions—such as data warehousing, ETL, data quality, and others—are the foundation of analytics and critical to the conversation, the next level of analytics maturity is cognitive.

Traditional analytics maturity levels demonstrate a progression within the enterprise—using Gartner's terminology—as Unaware, Opportunistic, Standards, Enterprise, Transformative (Howson and Duncan, 2015). Similarly, IBM literature, again based on Gartner's model, describes a progression of increasing business value from descriptive (What has happened?), diagnostic (Why did it happen?), and predictive (What will happen?) to prescriptive analytics (What is the best action?) (Puget, 2014). TDWI's Business Intelligence Maturity Model describes a progression across five dimensions in terms of an organization's Adoption, Control, Usage, Insights, and ROI (Abdul-Rahman 2009).

Cognitive analytics, unlike previous levels of analytics maturity, can be used in each of the existing analytics levels. To break it down, cognitive analytics is both cognitive and analytics. The term *cognitive* implies thought or intelligence, but it is not equivalent to artificial intelligence (AI). We are using the term in the sense of learning. Cognitive computing refers to systems that learn at scale, reason with purpose, interact with humans naturally, and help to improve our decision making.

CAPABILITIES

Several recent papers (Chen, 2016; Maymir-Ducharme, 2014; Sarma, 2016) describe cognitive analytics as requiring four major capabilities:

1. **Collect Data:** the ability to locate and ingest appropriate information from a variety of sources, both structured and unstructured
2. **Establish Context:** the ability to extract from diverse data sources and create metadata defined by purpose and location
3. **Generate Cognition:** the ability to analyze data in a variety of contexts, delivering insights about the information driven by judgment, reasoning, and learning
4. **Derive Value:** the application of the previous three capabilities in making business decisions

Cognitive capabilities are offered by many vendors using a set of application programming interfaces (APIs). These APIs generally enable:

- Face and image recognition
- Voice and language interpretation
- Behavior and sentiment analysis
- Ranking and relating data
- Polling and opinion building
- Judgment and decision

Each of these APIs is an extension to normal computing. These APIs drive the new capabilities across leading platforms and integrate human interaction with machines.

Face and Image Recognition. Google is leading the marketplace with one of the largest collections of faces and images from around the world. Its search engine can now link a face to a name or use other common criteria—similar to a human recognizing an animal as a cat. Google uses pattern search to match millions of images to confirm the identification.

Voice and Language Interpretation. Apple's Siri, Amazon's Alexa, and Google Home can interact with humans, understand their requests in many accents, and respond to their queries promptly.

Behavior and Sentiment Analysis. This is most commonly used to evaluate the attitude of users via social media content, thereby constructing a 360-degree view of consumers and tying group profiles to purchasing actions. Its early applications include marketing and clinical medicine. Further, IBM's Watson can detect emotion through text or speech and react in real time with appropriate context.

Ranking and Relating. APIs can return a list of ranked answers with their ranked scores and confidence values (IBM, 2017). This type of service is becoming popular for self-service knowledge seekers and customer service. The user or customer can find the information quickly and know the confidence level in the given information.

Polling and Opinion Building. The next level of automation for capturing human sentiment, it is used in marketing, during election season, and to track changing market trends or public opinion on major issues (Programmable Web, 2017).

Judgment and Decision. These APIs can remove human emotion and biases from the comparison of multiple options to ensure verifiable results. They also can support or improve the decision-making ability of humans in particularly complex or ambiguous situations.

DATA SECURITY AND PRIVACY

With Russia and Wikileaks giving the world access to confidential information, it has become a challenge to safeguard organizational information assets. In fact, according to a recent article, "breaches are being planned and executed from all quarters—nation-states, hacktivists, bored teenagers, domestic criminals, corporate spies, nearly every group imaginable has thrown its hat into the data breach ring." (Robinson, 2015) Cognitive analytics, on the other hand, requires free and easy access to internal data and external public data to effectively analyze and drive accurate interpretation.

Most people do not even realize Google and Facebook are watching and recording each action they take online. What you search, what you buy, what you like, and whom you interact with are all recorded. Bill Gates has even said privacy in the age of modern computing is a myth.

Still, misuse and taking advantage of someone else's personal information have become an emerging field for legal battles. Recent examples in the news of the collection and misuse of personal data include:

- In 2017, because of legal challenges, Google stopped its practice of scanning all inbound and outbound messages in its Gmail service. (Jones, 2017)
- A magazine publisher settled a class action lawsuit alleging it sold personal information it collected about its customers. (Abbas, 2017)
- A leading manufacturer of headphones is accused of violating the WireTap Act and other privacy laws because it used an app to collect its customers' listening habits without their permission. (Roberts, 2017)
- A sex toy manufacturing company settled a suit saying it was using a smart phone app to collect data about how its customers used Bluetooth-connected personal vibrators. (Roberts, 2017)

Both cognitive security and targeting an organization with a security threat are becoming harder and more expensive. On both sides of the equation—the hackers and defenders—the growth in this area is exponential. Cisco is one of the leading companies that have managed to automate detection as well as responses to attempted security breaches.

Internal security in cognitive analytics is equally important. Companies are gearing up the methods of authentication, authorization, and scanning and monitoring services. Preventing a security breach is more important than detecting one. Cognitive methods have started to leverage fingerprint and other biometrics to enhance security as well.

THE COGNITIVE ANALYTICS ORGANIZATION

As we have mentioned, cognitive analytics is still a nascent field. We are seeing early adopters in two areas.

Most early adopters appear to be more mature in their use of existing analytics. Spreadsheets are no longer their primary method of making decisions. Data is no longer in organizational silos, limited to specific lines of business. Data processes and support for enterprisewide

analytics and reporting tools are in place. The organization has implemented an enterprise data warehouse or possibly even a data lake. The data is accessible and well secured. Most important, executive sponsors have a vision and support the initiative to move toward cognitive analytics. It is organizations such as these which naturally pursue cognitive analytics as the next step in efficiency and business decision making.

Obviously, not all organizations follow the same path. The second area in which we see organizations pursue cognitive analytics is when there is significant market pressure, specific business drivers, or a strong executive vision. These organizations may opt to implement cognitive analytics earlier in the analytics maturity cycle—before or in parallel with other analytics and reporting initiatives.

Industries in which we are seeing this market pressure include healthcare, financial services, retail, and telecom. We see these sectors as pioneers. They each have a built-in need and recognize the value and market differentiation that cognitive analytics can bring to their industry.

Healthcare: the data volume is enormous and 80 percent of the data is estimated to be nontraditional, unstructured data. This industry lags behind other industries in data and analytics maturity, providing an opportunity to use cognitive technologies to help cleanse, normalize, and analyze the vast amount of data in their ecosystem.

Financial services: data is available, budget is available, and solid decisions need to be made to maintain the health and competitive position of the organization.

Retail: the volume of data from multiple streams is unmanageable with traditional tools; enterprises desire to leverage data for more targeted marketing, and consumers demand a more personal experience.

Telecommunications: with its need to know its customer, automate customer service, and analyze reams of logs, the telecom industry is a natural fit to leverage cognitive analytics.

ORGANIZATIONAL STRUCTURE

What does a cognitive analytics organization look like? It is a common misconception that to implement cognitive analytics, an organization will require a totally new organizational vision, structure, and mix of personnel.

However, a cognitive analytics team in an organization just starting to develop its competency may not appear dramatically different from a human resources team or a group of business users. The main difference in organizations which have successfully transitioned to cognitive analytics will be that it has a group of professionals with both business knowledge and technical competency working together. If one cognitive subject matter expert is added to a conventional analytics team, will it become a cognitive analytics team?

What tends to make the team successful is the in-depth expertise of these professionals in the cognitive subject area and business acumen combined with the ability to drive data analysis.

The right amount of governance and sensitivity to rapid change management are critical to cognitive analytics success. Tolerating and managing disruption becomes a healthy dose of tonic for team productivity. Data governance needs to be enforced to ensure the veracity or truthfulness of both the data and ultimately the decisions being made based on it.

Some companies are dramatically differentiating themselves by creating a large cognitive group internally. Organic growth with a concentrated team is a solid way to start leveraging cognitive analytics. Other organizations, including Deloitte and PricewaterhouseCoopers, are trying to extend their existing analytics teams with cognitive capabilities while they create partnerships with other vendors to accelerate their capabilities to meet the demands of the marketplace.

Regardless of the analytics maturity level or industry, certain prerequisites must be in place for the organization to successfully begin implementing cognitive analytics.

Some organizations have leveraged cognitive analytics more successfully than others. How did these successful organizations get to this level of cognitive maturity? Often, they've gone through the earlier stages of analytics maturity described previously. They have the vision, executive sponsorship, champions, experts, and a solid IT infrastructure framework in place. They have gained experience around what works within their organization. Even though you can use cognitive analytics at any level, the technical and organizational maturity and support need to exist.

Why is this important? Organizations which have invested in cognitive analytics are more successful, do more with fewer people, extend human capabilities, manage large data sets, and leverage novel use cases more effectively (IBM Institute for Business Value, 2014).

Regardless of the analytics maturity level or industry, certain prerequisites must be in place for the organization to successfully begin implementing cognitive analytics. Effective cognitive analytics organizations have three key qualities in common: the vision, the people, and the foundational technology.

Vision. Most important, they are forward-thinking, understand their own business, and envision how technology can support their success. Executive sponsors own, fund, and support the pursuit of cognitive analytics. Typically they start from a business-driven use case with clear business value and expand to other parts of their organization.

People. Organizations which are early adopters of cognitive analytics have both executive-level sponsorship and technical competence (in-house or external). Furthermore, they have well-defined roles and individuals in those roles. Traditional roles supporting analytics within an organization include project managers, business analysts, developers, architects, and administrators supporting the tools.

These traditional roles will continue to work together, but participation in projects may continue over a longer term to support the evolving cognitive learning process. No longer will business analysts simply capture requirements and turn them over to developers to build; the team must work more closely with the new roles of cognitive developers, data stewards, data curators, and data scientists.

In successful organizations, the end users or business users share the vision of cognitive analytics. They don't see machines as a threat to their livelihood. They understand that human decisions begin where analytics leaves off. In an organization that does not use cognitive analytics, humans simply intervene earlier in the decision-making process. They understand that cognitive analytics can help them be more effective in their job.

Several years ago, there was a big push to define and hire chief analytics officers or, more recently, chief cognitive officers. Although these may be appropriate or even necessary to drive the vision within a large organization, it is more important that the vision exists. Like the chief data officer, we have seen the creation of these roles as a response to a crisis or initiative. Without a sustaining vision, these new roles may serve a short-term purpose but their usefulness will expire.

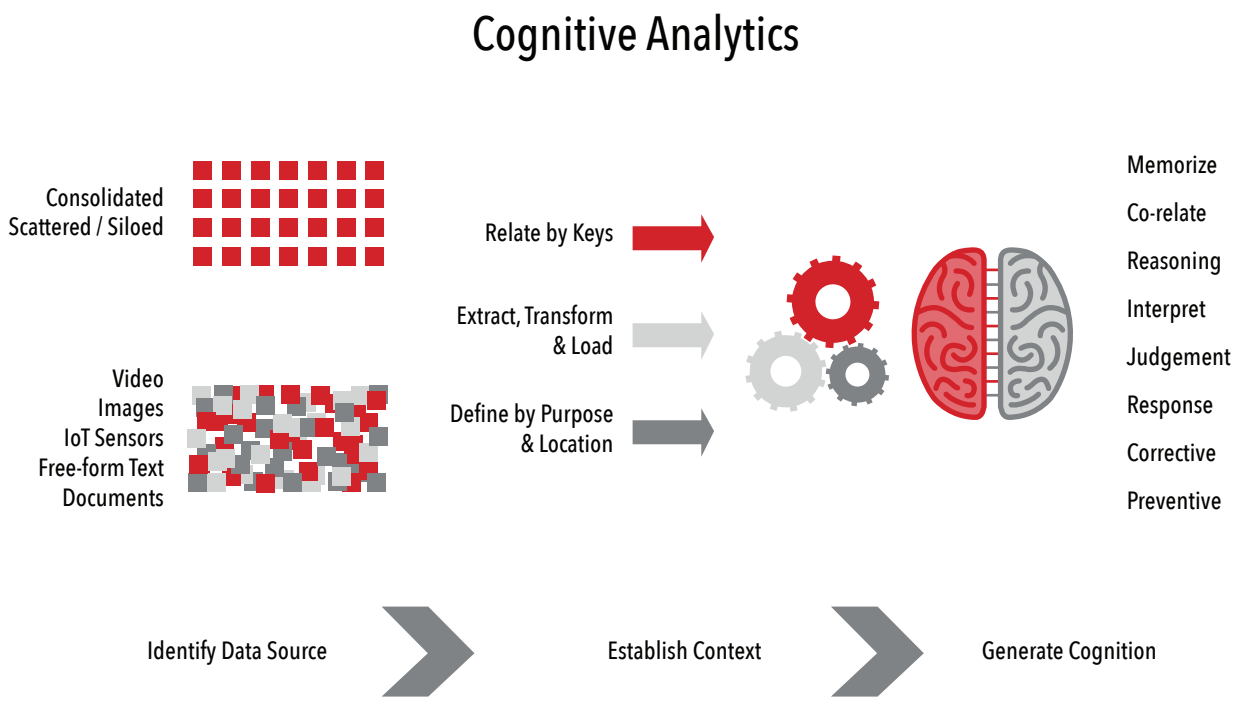

Figure 1. A typical cognitive analytics architecture.

Technology: Organizations that can benefit from cognitive analytics either have the plumbing or have an agreed-upon and funded plan to put it in place. The technical foundation and data architecture are critical for the implementation and scalability of cognitive analytics. In addition to the technical framework, the policies and processes to support it must also be in place.

Although an organization at any point along the analytics maturity road map can leverage cognitive analytics, organizations which have crossed certain bridges will have an easier time and obtain the most benefit. This is, at least in part, because data is accessible, managed, curated, and cleansed.

Less mature organizations could conceivably implement cognitive analytics, but if a solid information management plan is not in place, the numbers cannot be relied upon and will not be readily adopted.

COGNITIVE ANALYTICS ARCHITECTURE

The architecture and design of cognitive analytics systems have a common pattern: 1) Identify the Data Source, 2) Establish Context, and 3) Generate Cognition.

Looked at another way, the key components of a cognitive system include:

- Building the corpus: identifying appropriate data and its location
- Bringing data into the cognitive system and establishing its context
- Enacting system learning through data mining and system training
- Hypothesis generation, ranking, and scoring
- Presentation of a recommendation or decision to the user

COGNITIVE ANALYTICS DESIGN PRINCIPLES

Cognitive design is driven by concepts close to human thinking, memory, and responses, but computerized cognitive design needs to

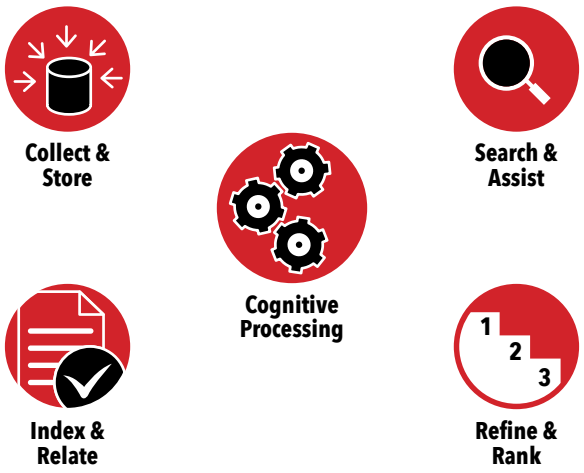

Figure 2. Elements of cognitive analytics design.

be simpler and more predictable than human thinking to help reduce errors. Certain patterns of decision making with large numbers of variables and potential outcomes need a sequence of steps to follow.

A hybrid approach of integrating cognitive computing with an existing framework and collaborating on a specific use case is a good start. One such project is help desk automation, which covers a combination of self-service, self-correction, and self-healing capabilities using cognitive methods to automate repeat incidents. It typically contains three main components: an information repository to capture, categorize, and index every incident for sharing with the community; a voice-activated or text-driven search engine to assist the next caller; and an internal algorithm to build confidence in each response. The ability to capture client feedback and correct prior information would certainly be a leap forward.

The design methods of cognitive computing in this example are broken down into groups of elements. These segments enable data collection, establish context, generate cognition, and assist in deriving value.

Collect and Store

Data storage is shared, generally in the cloud. It may use a relational database (Oracle, DB2, or newer Amazon S3, etc.) and simple Facebook-style storage (driven by one of the largest installations of Hadoop). Facebook's bottomless page design is among the simplest presentation and user interface designs since the green screen display on VAX machines. All information is right there on a single Web page. As you scroll down the page, history from the archives appears seamlessly and endlessly.

This approach has been quite effective in presenting information to the user even as Facebook continues to grow at a rate of 600 GB per day (Bandaru and Kestutis, 2015). Amazon AWS also has a three-tier storage design with S3 and archive methods (Vagata and Wilfong, 2014). Data a few days old or not equally active is moved to cheaper (though slower) systems.

Search and Assist

Search and assist uses a cognitive method for understanding the new voice command or typed text and runs a Google-style API to search the database for prior incidents. A one- to two-second response time is generally critical, and the ability to relate on maximum words in the query improves the quality of the search. In case the search does not find the right match within the local database, it is linked to a number of external sources. Data confidentiality, access control, and privacy routines help determine where the search can occur.

Index and Relate

Indexing is a common technique driven through conventional and new cognitive computing methods. It begins with each new incidence, assigns it a new number, date and timestamp, personal identification, and so on, to relate the incidence to others. In a public forum, the data sensitivity rules are a bit relaxed for users with a valid ID. For cognitive indexing, use the API to integrate with custom code and determine whether the new incidence is unique on a set of common text elements.

Categorization of each incidence begins with domain, application, underlying tool or technology, and nature of incidence. Such effort is generally predefined before a person begins to use open text to write or record their problem. Cognitive design methods leverage similar structure to capture the classification of data.

Refine and Rank

Refine and rank was not frequently used in conventional databases or applications just a few years ago. Knowing the confidence level in a specific response builds trust and saves time and effort for a large number of users. The Facebook "like" button is one common way to capture public sentiment. It is driven by user feedback to build information based on the number of positive responses.

Alternatively, a response is compared with a subject matter expert's response to determine correctness. Each new incident can be slightly different from a prior one; identification of common components helps move closer to the resolution.

COGNITIVE ANALYTICS IN ACTION

The case of Microsoft Office in large enterprises provides an example of how a cognitive analytics help desk can contribute to the bottom line. With the increase in online support options, Microsoft Office products are typically no longer supported by a conventional help desk. Large IT companies still deploy these products to many of their global employees but do not pick up the calls for support.

However, Microsoft Office is known for problems with prior versions and an inability to easily upgrade users in a single step. Such experiences leave its users helpless and frustrated. Community forums and the Microsoft website only suggest upgrading to the latest version, irrespective of the specific problem. Such simple advice does not resolve the issue. Pushing the issue down to the end user reduces the IT company's cost but does not assure timely resolution. Loss of productivity due to such situations is not easy to directly measure and manage, but it is certainly worth preventing.

Cognitive computing attempts to ease such problems by automating resolution and providing a fix through techniques commonly used in the past. A fix can even be automated and performed while the user is not using the tool.

BUILD, TEST, AND DEPLOY

Cognitive development is driven by a large set of APIs called through conventional and dedicated development environments. Each major vendor has released its own platform to enable cognitive development. IBM has Bluemix, Microsoft has Cassandra, and Amazon is driving it through AWS.

A starter kit with standard libraries from a leading vendor helps save significant time and effort in developing cognitive applications. Open source Apache is leading the marketplace, being used by big names such as Facebook and IBM. Apache Spark can run code faster than several other environments and helps combine Java with streaming, SQL, and complex analytics. Java can include Spark classes for cluster computing and Spark configuration.

GitHub is becoming popular among several development communities. It covers code

review, project management, source code hosting, software integration with external components, community collaboration, and open source; generates documentation; and provides a cohesive single point of interaction.

Automation in DevOps is an emerging trend companies are working fast to adopt. The concept has been used for as long as production systems have existed. Our ability to quickly develop, test, and deploy new programs and code while minimizing repetitive steps helps manage cognitive analytics processes.

COGNITIVE ANALYTICS IN THE NEWS

Cognitive analytics has made impressive progress in many fields including retail, finance, and healthcare. In retail, it is helping companies predict their consumers' buying patterns, habits, and behaviors. In the field of finance, it is helping detect fraud, better manage risk, and even assist in understanding global stock markets. In the field of healthcare, it is helping professionals and patients with timely diagnosis, treatment with precision medicine, and adaptation to a changing patient response.

Finance

The U.S. Internal Revenue Service (IRS) recently implemented an application using machine learning (Butler, 2012). It leverages cognitive analytical methods to analyze vast amounts of tax data to identify fraud, deviations, and errors. The IRS claims to process $2.4 trillion in gross receipts and $415 billion in refunds. It calculates that it will spend $114 billion in enforcement in detecting errors, following up, and identifying of fraud and misuse. The initial return on investment for the new application was two years, and it has paid for itself many times over.

The system, a collection of about 450 applications, covers structured as well as unstructured data across forms, schedules, worksheets, attachments, images, correspondence, transactions, phone calls, notices, and transcripts. The customer information and analytics uses data from taxpayers, employers, preparers, banks, brokers, nonprofits, interagency sources, federal and state governments, treaty partners, and intermediaries.

A few years ago, the IRS had several challenges with the management and analysis of such a large data set. These problems included the cost of compiling data, enterprise tools not suited for analytics, operational data systems that couldn't interpret data for research and analysis, and different skill sets needed for analytics.

The analytical methods now used include regression analysis, time series, machine learning through neural networks and genetic algorithms, and time-proven statistical methods.

Other Growing Areas

Automated Customer Service. Many message apps such as Slack and, more recently, Facebook Messenger, include bots that users can call for help. These bots, which have natural language processing (NLP) and cognitive analytics foundations, can read messages and take actions. Even traditionally conservative institutions such as banks see the potential of chatbots. Wells Fargo and Company is testing a chatbot based on Facebook's messaging platform to provide customers with information on their

accounts and perform administrative functions such as password resets.

Establishing Credit Risk. Indian start-up Finomena is using over 20,000 data points available via social media to evaluate credit risk for students and others who have too little history to have a traditional credit score (Choudhury, 2017).

Better Guide Dogs. Guiding Eyes and its Canine Development Center are using personality and NLP on big data in the cloud to improve puppies' graduation rates and matches with owners. They analyze traits, characteristics, environment, and personalities (of dogs, trainers, and owners) buried in both structured and unstructured data (Zimmerman, 2016).

COGNITIVE ANALYTICS READINESS CHECKLIST

Below is a list of questions you should consider before implementing cognitive analytics in your organization. These questions may help assess whether any gaps exist which will inhibit the adoption of cognitive analytics. These issues should be addressed as you create a road map.

People

- Does executive sponsorship exist for the pursuit of cognitive analytics?
- Have key stakeholders been identified?
- Are business, IT, and finance behind the pursuit of cognitive analytics?
- What human interaction will be required with cognitive systems?
- Do you have the right talent within your organization?
- What new skills will need to be cultivated internally to best take advantage of cognitive analytics? Who will provide data curation?

Process and Strategy

- Does your organization's vision support the use of cognitive analytics?
- Are processes in place to support the growth and use of cognitive analytics?
- Have you evaluated which parts of your business will benefit most from cognitive analytics (use and value cases)?
- Is a system in place to communicate the changes and expectations?
- What gaps are between what already exists within your organization and where you would like to be?
- Do processes exist within the organization to evaluate new technologies?

Technology Infrastructure

- Are technologies in place which can be leveraged, extended, or integrated?
- What are the limitations of the existing system?
- Does the existing technology road map include cognitive analytics, or does it need to be updated?
- Have you evaluated whether you have the appropriate technology in-house, or can you leverage the emerging trend of solutions available as platform-as-a-service (PaaS)?

Data

- Do you know what data is required and where it is located, or whether it exists?
- Do policies exist to manage the data ingestion and curation process?
- Is the data structured or unstructured?
- How can you make use of unstructured data such as images, free-form text, music, video, audio, weather, or Twitter?
- Can the data quality be relied upon?
- Does the data need to be in a specific format for the cognitive system?

Value

- Have specific business cases been identified which will benefit most from cognitive analytics?
- What new questions can you answer with this new data?
- With what metrics can you evaluate the return on investment?
- Have any other organizations within your industry already done anything similar?

CONCLUSION

In this article, we've discussed what cognitive analytics is and how organizations can benefit from this next level of analytics. Like all new technologies, we must carefully assess where in the hype cycle we are with cognitive analytics. In other words, is what we read more hype or reality?

The term "cognitive analytics" itself is not one which Gartner uses or places on its hype cycle curve. However, several use cases or applications which leverage cognitive analytics are listed. General-purpose machine intelligence, context brokering, personal analytics, conversational user interfaces, and virtual personal assistants are all observed to have increasing expectations with 5–10 years for mainstream adoption. At the peak of inflated expectations in 2016, with more than 10 years to mainstream adoption, sit cognitive expert advisors and machine learning.

In addition, three key technology trends Gartner identifies are all cognitive in nature: transparently immersive experiences driven by integrated and linked data sets; perceptual smart machines leveraging cognitive and artificial intelligence; and a platform revolution to support the bridge forming between humans and technology (Gartner, 2016).

We won't argue with the observation that expectations around cognitive analytics have peaked, or will peak shortly. It is our prediction that if certain limitations of cognitive analytics are overcome, its mainstream adoption will be sooner than the 10-plus years which Gartner predicts. Those limitations which must be addressed within each organization before cognitive analytics can be a success include:

- **Availability of data.** There must be sufficient training data to meet the desired level of accuracy and precision.
- **Quality of data.** The data on which cognitive analytics relies can suffer from bias or be flawed or contradictory. Therefore, data curation and data management play a significant role in the adoption of cognitive analytics.

- **Variability and uncertainty in big data.** Data may be inconsistent or incomplete.
- **Limitations inherent in big data itself.** A large number of potential results may require a domain expert to evaluate the results for significance.
- **Foundation/infrastructure of IT.** This area includes the ability to support unstructured data as well as key platform-enabling technologies such as neuromorphic hardware, blockchain, IoT, and mature security.
- **Refining people-computer interactions.** We cannot emphasize strongly enough the importance of humans providing appropriate curation of data and validating data context.

If your organization is serious about making the most of analytics, there is no question that cognitive analytics has the potential to provide significant business and economic value. Furthermore, it doesn't matter where in the analytics maturity continuum your organization is. Address the gaps which exist. Establish an analytics road map which includes cognitive analytics. Build on your historical strengths and successes—your legacy IT foundation—and begin taking advantage of cognitive analytics benefits today.

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