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# Harnessing the power of cognitive technology to transform the audit

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# Foreword

Our work as audit professionals is fundamentally about "trust." For the capital markets to operate effectively and to the benefit of investors and society more broadly, there must be integrity and confidence in the system. In serving the capital markets and the public interest, we work to help instill trust and confidence in the information used to make important decisions.

In the following pages, we begin to explore how we can continue to promote trust during a time of profound change across the business landscape. Given the explosion of data and the digitization of our lives, we want to promote a discussion about how the audit profession must evolve its tools and approach to keep up with the pace of change and remain relevant in a dynamic marketplace. Specifically, our profession must embrace the use of advanced technologies, including data and analytics (D&A), robotics, automation and cognitive intelligence, to manage processes, support planning and inform decision making. At KPMG we are constantly thinking about the development of innovative capabilities and technologies that will enhance quality and strengthen the relevance of our audit into the future.

Where auditors once searched manually through reams of financial information to hunt down the anomaly that may give pause to the appropriateness of a company's assertion, the accumulation of large data sets and the application of advanced analytics and cognitive technologies make it possible to rapidly and precisely analyze larger, more complete populations of financial and non-financial data. The use of these technologies can also generate richer, more detailed audit evidence for evaluation and provide executives with actionable insights about their organizations, their core processes and their controls. What's more, supervised cognitive systems can learn from each encounter with new information enabling continuous refinement of the knowledge and analytical capabilities of the system.

To prepare for this environment, tomorrow's teams of professionals must possess more than just an understanding of accounting and auditing – they will need stronger critical thinking, analytical, data science and IT skills to complement their financial and business acumen. To that end, KPMG is committed to fostering a culture of innovation and learning, especially within our Audit Practice. We are working with universities, regulators and leading technology organizations to enhance the skill sets of our people, develop new capabilities to advance audit quality and build on the foundation of trust that is the cornerstone of our profession.

We hope you enjoy this report.

**Marc Macaulay**
Partner, U.S. Cognitive Technology Audit Leader
KPMG LLP

# Investing in innovation

It's really simple: Cognitive technology isn't just changing the face of financial reporting and auditing, it's revolutionizing it.

"We're seeing some very compelling and profound changes in the audit space as cognitive technology evolves, and we've only just begun to explore what's possible," stated Vinodh Swaminathan, Managing Director in KPMG LLP's (KPMG) Innovation and Solutions practice. "We believe these changes, combined with others – such as robotic process automation (RPA) and advanced analytics – will permanently change the auditing landscape. It's imperative that audit firms step up to this challenge in order to meet the ever-changing needs of the profession."

As businesses grow and transform, their operations become more complex, perhaps more global, and many will be modifying or overhauling their own IT systems with more sophisticated technologies. The exponential explosion of data in business has fostered unprecedented advances in data processing capacity and analytical power which will transform how data is used and understood.

"The firms you'll want to handle your audit are the ones making big investments in innovative, new technology," stated Marc Macaulay, KPMG's U.S. Cognitive Technology Audit Leader. "It demonstrates their commitment to delivering high quality audits that dig deeper into the data and reveal more about a business and its risks. Equally important, it helps them deliver audits with deeper insights on a company's controls, accounting practices and reporting processes."

"That's a major reason why KPMG is investing so heavily in cognitive technology and artificial intelligence capabilities," Macaulay added. "We're at the forefront of this transformation, working with leading technology companies, including IBM and Microsoft, to apply the power of cognitive technology to the audit. Audit firms that don't make the necessary investment in advanced capabilities won't be able to continue delivering the quality that their clients require and deserve."

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# Impact on the audit

As we will explore in more detail in this paper, cognitive technology will help enable your auditor to deliver higher-quality audits based on:

- Increased data coverage
- More granular analysis
- Deeper insights into your controls, accounting practices, and reporting processes
- Increased focus on higher-value audit activities in areas of heightened business risk and reporting complexity
- Broader perspectives on your business and its risks.

"The power of cognitive technology, and how it will help revolutionize the audit process is breathtaking," stated Roger O'Donnell, KPMG's Global Data & Analytics Audit Leader. "We've only scratched the surface of what can be done, but we're already seeing how our audits could benefit."

"For example, cognitive technology allows auditors to obtain and analyze information from non-traditional sources, including social media sites, TV, radio, and the Internet, and determine if any of this external information may impact an audit either directly or indirectly," noted Macaulay.

"It can then combine and process all of this information, together with the client's own financial and other records and, through the use of advanced analytics, draw a deeper, more robust understanding of potential business risks," he added. "These capabilities can help increase the level of detail available and the pace with which very large amounts of data can be evaluated."

In combination with visualization tools, cognitive technology can bring audit information to life through automated charting and graphics that allow for a greater understanding of what's been discovered, and promote timely and correct responses. For instance, these tools can allow for clear depictions of account relationships and transaction flows as well as anomalies in the data, both of which can offer a wealth of insights about a company's controls, processes and performance.

To be clear, O'Donnell noted, such observations "would be part of an independent, objective audit that assesses whether an organization's financial statements are fairly presented."

"When it comes to audit, cognitive technology has brought us to the brink of unprecedented breakthroughs."

**– Marc Macaulay**
**U.S. Cognitive Technology Audit Leader, KPMG LLP**

The bottom line is that cognitive technology will allow auditors to provide more detailed, higher-quality audits, discover where things have or might go wrong, and point out precisely where and how systems, operations, and processes can be improved. As audit committees, executive management and other stakeholders increase their expectations for greater assurance on the information they rely upon to make decisions, auditors will increasingly leverage powerful technologies to deliver greater analytical depth and enhancements to audit quality.

"What's more," O'Donnell observed, "it will help auditors keep pace with a dynamic marketplace and deliver audits that are appropriate – now and in the future."

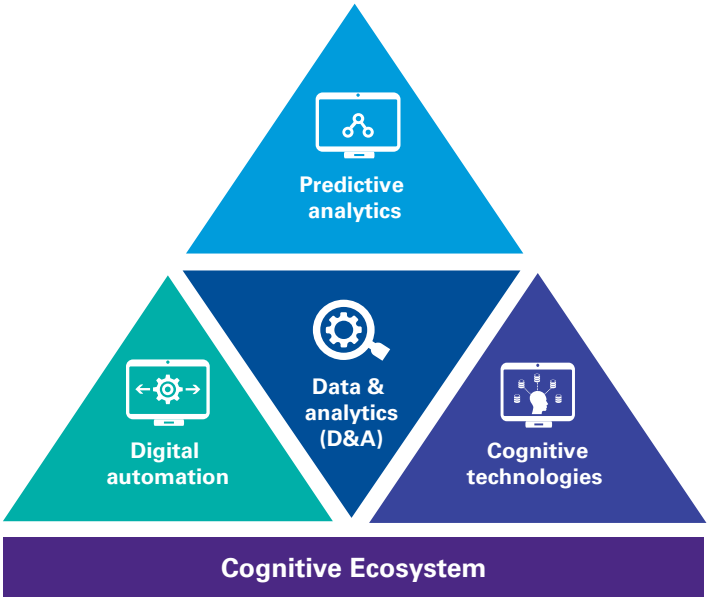


Figure 1

# Cognitive technology basics

When we refer to cognitive technology, cognitive automation, or artificial intelligence, we are really talking about an algorithm, or chains of algorithms, that enable software to absorb information, reason, and think in ways similar to human beings. When combined with advances in digital and process automation, and data and analytics, cognitive technology can have profound impacts across a broad spectrum of working environments and occupations.

The power and flexibility of cognitive technology is well suited for professions where knowledge workers predominate. For example, the technology can be used to schedule flights and then navigate airplanes from one location to another. Just as impressive is its impact in the medical profession where highly sophisticated technology is used in diagnosing disease as well as helping doctors research effective treatment protocols.

While cognitive and data and analytics are different, they work together to generate greater analytic depth, broader perspectives and more effective decision making (see Figure 2). This combination of capabilities is essentially a force multiplier that can increase the level of detail and accuracy of audit processes, which in turn, enables auditors to sharpen their focus on higher-value audit activities. "Cognitive technology, combined with D&A and increased process automation can allow for more effective, higher-quality audits," stated Macaulay.

"Looking five years out, we see a world where data analytics and technology continue to become more significant. Thanks to new technologies, auditors can offer insights and identify risks that may have been missed before."[1]

**– Karl Erhardt,**
**SVP and general auditor, MetLife**

**Cognitive and analytics are different but synergistic – working together to create value.**

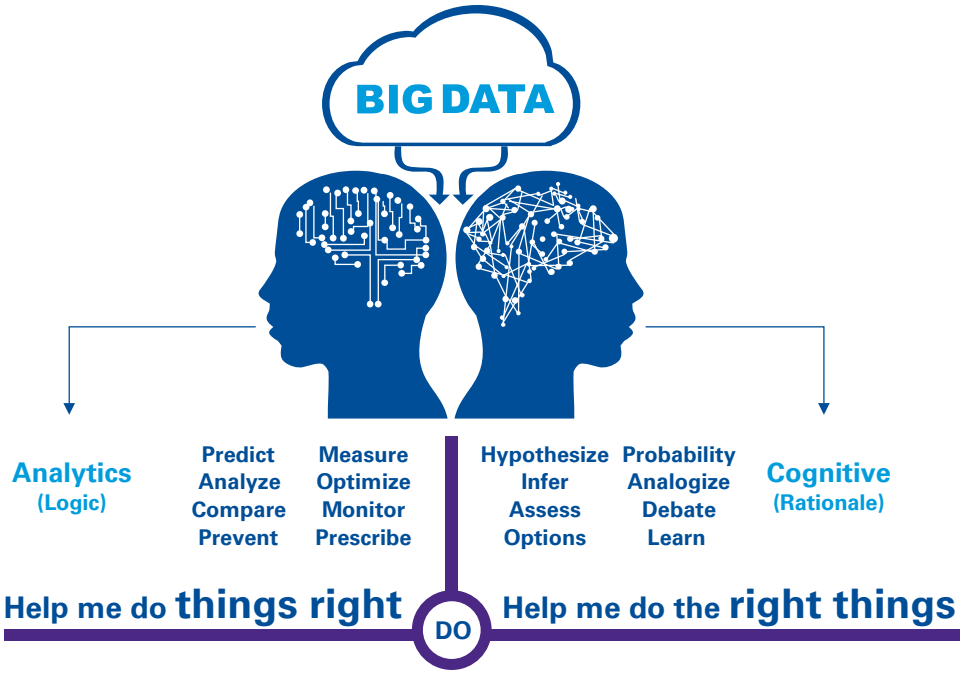


Figure 2

[1] Forbes Insights report: "Audit 2020 – a focus on change," page 9.

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# How we got here

The use of computer technology has been a mainstay in financial statement audits for decades. These programs have traditionally collected, organized, and presented a limited sample of highly structured financial and select operational data. However, cognitive systems deliver significantly more processing power and analytical capabilities. Specifically, cognitive intelligence can analyze data gathered from disparate sources and formats (including unstructured data[2]), generate hypotheses and make judgment-based decisions from the evaluation of supporting evidence.

KPMG's 2016 CEO Outlook Survey found that 81% of CEOs are concerned that their organizations are not keeping up with new technologies. Also, underscoring the growing recognition that advanced technology will have a major effect on auditing is a recent Forbes Insights survey where 58% of the respondents said that over the next three to five years, technology will have the single biggest impact on the audit. Additionally, 59% of respondents said that technology will provide tools for more sophisticated analysis of data. Swaminathan agreed that the survey findings aligned with how technology has affected the modern enterprise. He observed that, "technology has historically been a consistent catalyst for business transformation, and its impact is poised to bring new, unprecedented levels of automation and productivity to activities that have been traditionally driven by human judgment and experience."

He noted that the concept of cognitive automation is the convergence of robotic process automation[3] and cognitive technology. It has resulted in exponential increases in computer processing power and a foundation for artificial intelligence. "Ten years ago, it couldn't be done; the technology and the economics weren't there," stated Swaminathan. "But the technology certainly is here now; machines can read documents, process language, reason, interpret, infer, and evaluate data like human beings."

"Equally important, though, is the vastly improved price point of technology," he continued. "The advent of the cloud, combined with the decreasing cost and increasing power of computers, has resulted in a perfect confluence of factors that is driving the use of this technology."

**Advancements in process automation and machine learning are driving the use of technology.**

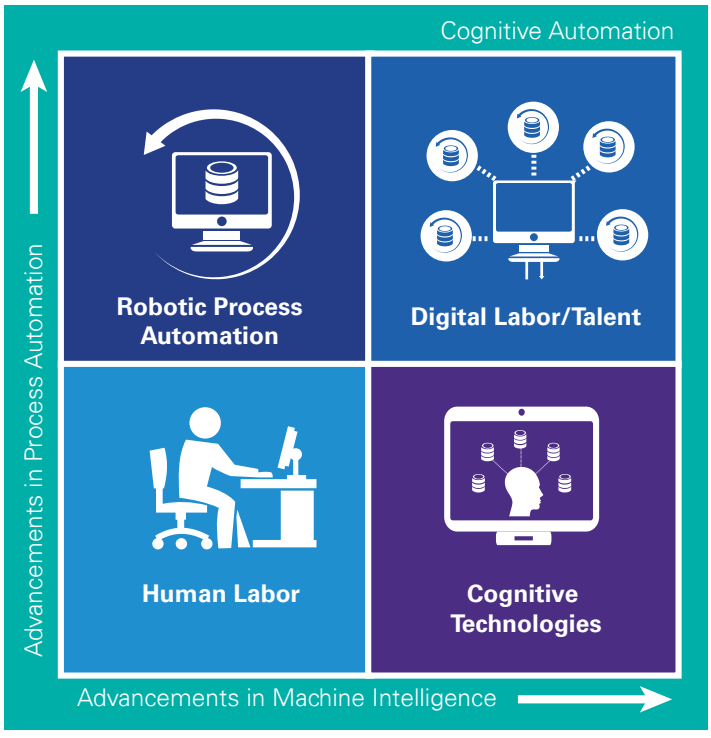


Figure 3

[2] Unstructured data refers to information that doesn't reside in a traditional row-column database. Rather, it is information that is contained in other formats or sources such as e-mails, free text documents, videos, photos, audio files, presentations, and Web pages.

[3] Robotic process automation (RPA) is software that uses advanced technologies such as artificial intelligence and machine learning to conduct repeatable tasks that humans previously performed. RPA is different from traditional IT automation in that RPA software can sense and adapt to changing circumstances, exceptions and new situations.

# Cognitive technology in action

We believe cognitive technology will result in a transformational change in the way audits are conducted. It integrates a combination of capabilities including predictive analytics, pattern and image recognition, data mining, and machine learning, to evaluate information and deliver auditor-guided judgments across a variety of areas. Below are some specific examples of how auditors will be able to apply cognitive technology to an audit.

**Tackling revenue recognition:** Let's consider the revenue recognition process of a large, global enterprise that offers multiple products/services and has hundreds, if not thousands, of contractual relationships. Errors in revenue recognition, even if inadvertent, can result in a tax, regulatory, and compliance nightmare.

Now traditionally, an auditor would take a sample of transactions and, among other actions, examine the underlying source documents, evaluate the company's accounting against the auditor's judgments, and assess the reasonableness of its revenue recognition.

With the power of D&A and cognitive technology, however, while the process *in theory* is the same, a far greater percentage of transactions can be analyzed, and audit test work can be executed with greater global consistency. The advantage that advanced technology can offer, particularly to larger firms operating in different parts of the world, is the ability to connect booked revenue with the appropriate contractual terms, and inform the auditor that the company's method of booking revenue is either right, wrong, or controversial.

The speed, depth, and breadth of analysis simply cannot be matched by a human auditor alone, or even a team of auditors.

Again, the auditor would not be rendering advice on how the client should be booking revenue; rather the auditor would objectively assess the manner in which the client is booking the revenue.

**More evidence-based audit procedures related to valuations:** The valuation of assets or the determination of a company's market value has long been a complicated and subjective area that is frequently subject to regulatory scrutiny. There typically are several possible methods on which to base a valuation, and there is often a measure of discretion and judgment involved.

As part of the audit of the financial statements, auditors may assess and test the reasonableness of a firm's valuation, including the underlying data, process and methodology used in the valuation. In the past, auditors were limited by their ability, as human beings, to process the vast amount of available information.

"The future will be won by firms that capitalize on the explosion of data and can effectively match the tremendous processing power of advanced analytical systems against that data to produce actionable insights."

**– Roger O'Donnell**
**Global Data & Analytics Audit Leader, KPMG LLP**

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Machine-augmented capabilities will dramatically change how valuations are audited. Auditors will be able to test the valuation controls more quickly and comprehensively than was possible in the past. Thus, the auditor will, on a more timely basis, be able to make a judgment on the reasonableness of the organization's valuation and explain why it is or is not reasonable.

**Bank loan portfolio:** Figure 4 offers a detailed illustration of how cognitive technology can be used in an audit of a bank's loan portfolio. Note how it will allow auditors the ability to gain a more detailed and comprehensive understanding of credit risk and potential audit exceptions based on loan grading.

O'Donnell noted, "Using cognitive technology will aid in gaining a better understanding of a company's risks and overall control environment. This enables auditors to focus their attention on areas of heightened risk or control weakness."

**Cognitive technology allows for the extraction of larger data sets from a company's systems and the ability to perform a more granular analysis of the underlying information for data outliers and anomalies.**

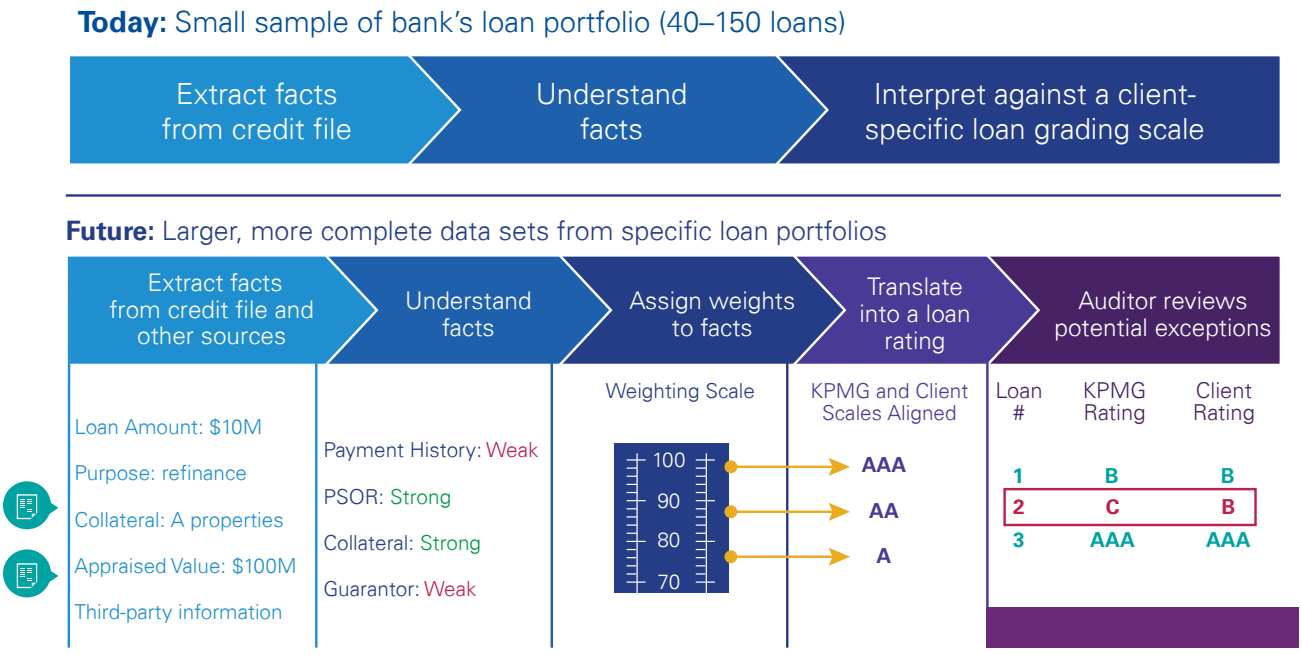


Figure 4

"The examples noted on the previous pages are just the beginning. The potential of these technological capabilities, combined with the skills and knowledge of talented audit professionals, is almost limitless. They will provide opportunities to continuously monitor the design and effectiveness of internal controls, and identify emerging or expanding risks. It's difficult to predict what all the changes will be and how clients will benefit in the future, but it's an incredibly exciting time to be part of what I believe is a transformative period in the audit profession."

**– Marc Macaulay**
**Partner, U.S. Cognitive Technology Audit Leader**
**KPMG LLP**

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# The human element: Still critical

Sometimes lost in all the talk about the potential benefits of cognitive technology is the fact that an audit professional still needs to be at the helm of the audit engagement.

Cognitive technology undoubtedly presents an incredible and, eventually, an indispensable tool in the audit process. But at the end of the day, it's the auditor who makes the critical decisions and offers the key analysis and insights in the audit of an organization's financial statements.

To use a chess analogy, many people may recall how in 1997, IBM's "Deep Blue" chess program beat then world champion Gary Kasparov in a six-game match. But far fewer know that more recently, when a person familiar with chess was teamed with a computer, the team consistently prevailed over another super computer – or expert chess player, for that matter – acting alone.[4]

That's why we believe that "supervised cognitive" technology – the combination of cognitive capabilities with the skills and knowledge of audit professionals – will be the best approach to conducting an audit. The ability of cognitive technology to conduct analyses, draw insights and employ "learned judgment" will be a tremendous supplement to the auditor's decision making responsibility. Because in the end, the auditor is the one who must make the final call on the audit opinion.

**Impacts of a cognitive technology enabled audit.**

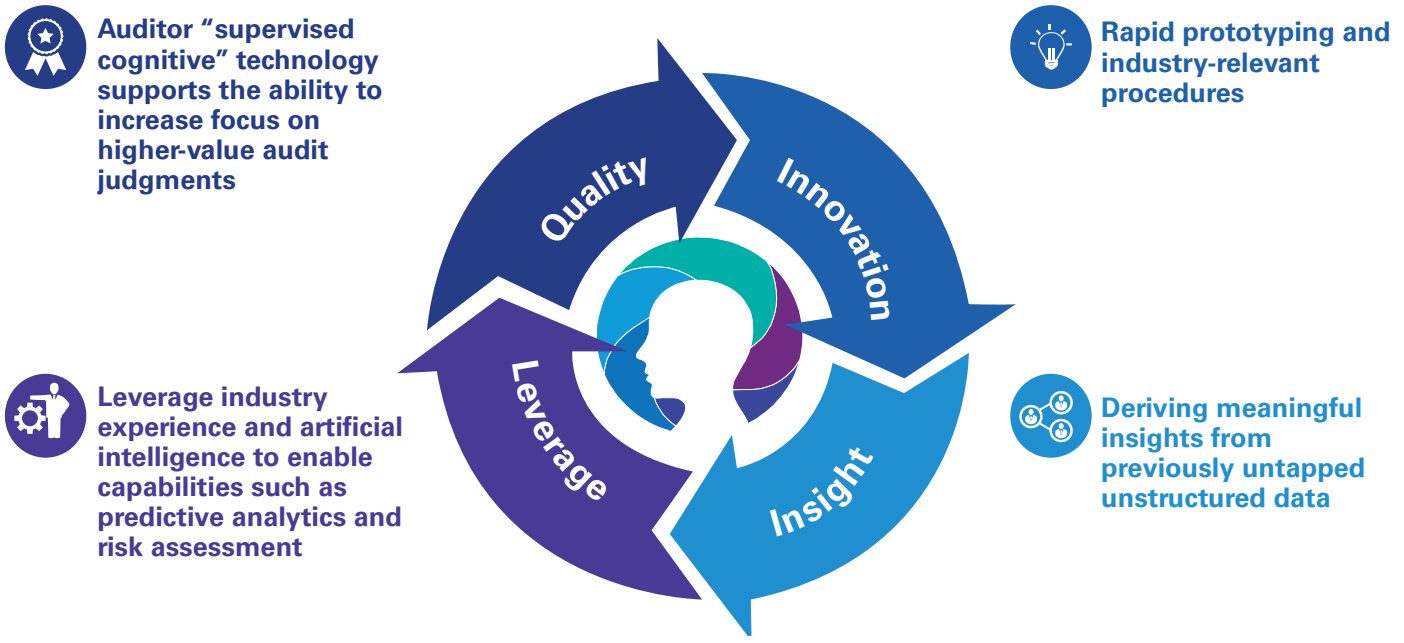


Figure 5

[4] Centaur Chess Shows Power of Teaming Human and Machine, The Huffington Post, March 1, 2015

# KPMG and technology innovators

As part of KPMG's ongoing effort to stay on the leading-edge of technology, we have entered into an exclusive partnering relationship with IBM Watson. (IBM Watson is the computer program that in 2011 defeated the two all-time top champions on the game show *Jeopardy!*). "IBM Watson has the capability to significantly enhance the amount of data our audit professionals can process as well as the quality of analysis and insight they can provide – both in terms of speed and depth," said O'Donnell. "We're investing in this innovative technology through relationships with IBM, Microsoft, and other leading IT companies because we know it represents the future of the audit profession."

"With cognitive technology we'll be able to offer our audit clients a more powerful value proposition – audits that are based on much larger, more complete data samples in the future – which in turn enable us to provide a high-quality audit as well as richer insights regarding business risks and performance," stated Swaminathan.

"Audit committees expect auditors to provide them and management with deep insights into a company's financial statement risks, business processes, and internal controls. We want our audit clients to know that an important by-product of our audit is the ability to generate insights that will provide long-term value to their business," stated Macaulay. "We believe that our audit professionals, supplemented by D&A and cognitive technology will be better able to accomplish that in the future."

By 2020, smart machines will be a top five investment priority for more than 39% of CIOs.[5]

## Questions to ask your auditor

Below are three key questions to ask your auditor, particularly in light of the rapid advancements being made in the application of cognitive technology:

- What is your firm's perspective on how cognitive technology will impact the audit?
- What are your short- and long-term plans for investing in cognitive technology?
- What training has your firm undertaken to get your auditors up to speed on the application of cognitive technology in auditing (e.g., do any of them have backgrounds in data science or analysis)?

[5] Gartner Predicts 2016: Smart Machines: https://www.gartner.com/doc/3175120/predicts–smart-machines

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# Why KPMG?

At KPMG, our goal is to provide quality audits with independence, integrity, and objectivity. Our focus on audit quality is intrinsically linked to our commitment to promoting confidence in the marketplace and serving the public interest. It is reflected in our culture of integrity and professionalism.

KPMG is dedicated to leading the discussion about the evolution of the auditor's role in business. We initiate as well as participate in ongoing dialogue among public company boards, regulators, investors, and members of the audit profession to appropriately set expectations and manage concerns. We view this as a continuing journey that will bring substantial benefits in the quality, insights, and value of the audit.

We are driving the development of D&A, RPA and cognitive technologies, in support of our audit. By effectively combining these powerful technologies through significant investments in our alliances with leading technology companies, we are building new innovative capabilities and a broader cognitive ecosystem that:

- Advances audit quality
- Supports our regulatory mandate
- Provides us with deeper insights into a company's business and risks
- Enables us to deliver audits that account for a company's changing circumstances
- Fosters a culture of innovation among our people
- Helps ensure that we remain highly relevant to the capital markets and other stakeholders that we serve.

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