Cognitive India

How AI is transforming Indian business, economics and engagement

IBM Institute for Business Value

In this report

An AI adoption roadmap identifying Indian executives' strategic priorities in front-, middle- and back-office functions.

Examples of innovative organizations in India that are leveraging cognitive computing and AI technology solutions.

Seven key imperatives Indian executives can adopt to enable their organizations to transform into Cognitive Enterprises.

How IBM can help

Clients can realize the full potential of artificial intelligence (AI)/cognitive computing and analytics with expertise, solutions and capabilities needed to infuse cognitive into virtually every business decision and process; empower more rapid and certain action by capitalizing on many forms of data and insights; and develop a culture of trust and confidence through a proactive approach to security, governance and compliance. For more information about IBM Cognitive and Analytics offerings from IBM, visit **ibm.com**/gbs/cognitive. For more information about cognitive solutions and cloud platforms that support cognitive workloads, visit **ibm.com**/cognitive.

AI acceleration

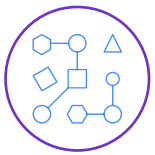
India is uniquely positioned to succeed in the artificial intelligence (AI) economy. By dramatically expanding human capabilities, AI has the potential to amplify – perhaps exponentially – India's demographic advantages. With 10-12 million new workers joining the Indian labor force every year, the leverage that can be provided by AI-augmented productivity expansion is little short of remarkable.[1] Applied to key sectors such as education and healthcare, AI can help redress bottlenecks, effectively supporting improved learning and wellness costs at scale. For individual businesses, cognitive computing and AI readily motivate significant efficiencies and growth opportunities.

Introduction

India is undergoing seismic demographic, social and economic shifts. By 2020, the country is predicted to have the world's youngest population.[2] And it is estimated that by 2030, India will account for almost 30 percent of the world's workforce.[3] What's more, the nation's population is on course to overtake China's by 2027, and the size of the middle class is predicted to overtake that of the United States, Europe and China.[4] The Indian economy benefits from strong entrepreneurialism and diversity. It ranks third globally in the number of technology start-ups. And it has one of the most active, connected and engaged diaspora in the world.[5]

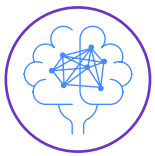
Considering that India is projected to have the largest labor force globally, it follows that the Indian economy stands to benefit more than others from labor-augmenting AI-enabled capabilities. Cognitive computing and AI increase worker productivity. But unlike other technologies, AI raises all boats concurrently, driving human productivity toward excellence. By equipping even average employees with the skills, capabilities and knowledge they need to excel, AI can dramatically increase the productivity of the average worker to match the level of today's top performers.

With the combination of these factors and India's natural advantages, the Indian economy and society are poised for a sea change. AI promises to fundamentally alter the underlying assumptions, activities and behaviors of the Indian economy (see sidebar on page 3, "Building an AI ecosystem for India's future"). Drawing on insights of more than 330 Indian executives across 18 industries, including government and education, this study provides a detailed functional roadmap on the impacts AI can have.



91%

of India's cognitive innovators* are realizing value from both structured and unstructured data, compared to 82% of other India respondents



97%

of India's cognitive innovators* indicate they are already cultivating the skills needed to adopt cognitive computing, compared to 74% of other India respondents

97%

of India's cognitive innovators* recognize the need to change employee roles as cognitive computing evolves, compared to 81% of other India respondents

Bigger labor force, bigger benefit

The National Association of Software and Services Companies has predicted that by 2022, a startling 46 percent of the Indian workforce will be engaged in jobs that do not exist today or that require radically different skill sets.[6]

Quality or availability constraints in education and training, which historically have impacted Indian businesses, can be mitigated by broad application of cognitive technologies.[7] Not only can AI-enabled tools and capabilities compensate for these limitations, but cognitive computing can provide the means of expanding access to and quality of education – affordably and at scale.[8]

For individual businesses, application of cognitive computing can drive deep, sustained differentiation. New business, revenue, operating and organizational models can accelerate business development and set Indian businesses on par with world leaders.

*Survey respondent group cognitive innovators represents approximately 10 percent of executives surveyed across the full global sample (n=6,050) and reflects an elite group defined by a strategic approach to adopting cognitive technologies.

Executing cognitive strategies for Indian businesses

Over the past three years, the IBM Institute for Business Value, in collaboration with the Economist Intelligence Unit, Oxford Economics and other organizations, has engaged in rigorous analysis of economic and business impacts – and optimal implementation strategies – of AI and cognitive computing. As part of this inquiry, in the first half of 2016, we surveyed more than 6,000 C-suite executives globally, including 333 from India's leading business, government and education institutions.

Among those surveyed, we identified a smaller group of executives – the cognitive innovators – who ranked highly on a number of AI-related metrics. We analyzed what this elite group was doing differently from others in their use of AI-related technologies and the specific benefits those activities yielded. We also conducted another two-step analysis to establish the priority and most impactful functional areas in which cognitive computing can be rolled out across the enterprise to help produce return on investment or value.

Additional insight on global trends around cognitive innovators, as well as functional priorities for cross-country, cross-industry organizations, are covered in the 2017 executive reports, "Fast start in cognitive innovation: Top performers share how they are moving quickly" and "Accelerating enterprise reinvention: How to build a cognitive organization."[10]

Building an AI ecosystem for India's future[9]

India's national planning body, Niti Aayog, is crafting a strategy for building a vibrant AI ecosystem in India under the brand name #AIforAll. Niti Aayog is focusing primarily on five sectors – healthcare, agriculture, education, smart cities and infrastructure, and smart mobility and transportation. It is also mulling establishment of a common data-enabled platform called the National AI Marketplace.

Insurance company uses bots to improve the customer experience

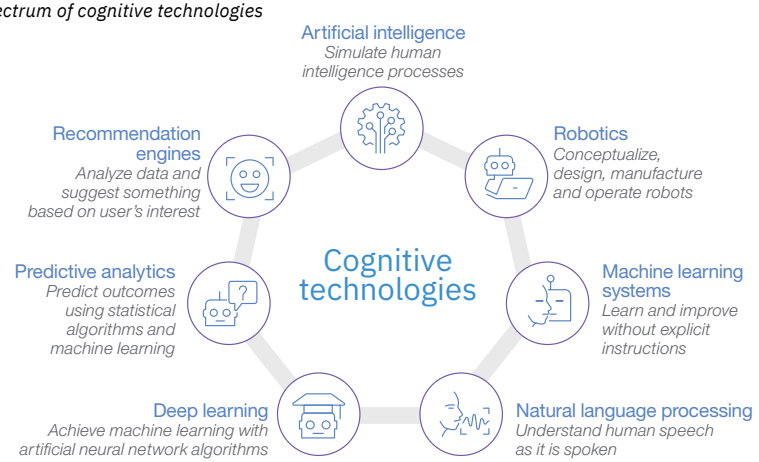
A major life insurance business in India has deployed a cognitive email bot that can read, understand, categorize, prioritize and respond to customer emails, gaining deeper insights into user behavior. The company also has launched an AI-based servicing bot for Twitter to answer policy-related queries. Cognitive computing has helped achieve increased operational speed and efficiency, along with improved customer satisfaction.

AI and why it's important

AI and cognitive computing refer to next-generation information systems. AI systems reason, learn and interact by continually building contextual understanding and knowledge. Specific cognitive technologies, such as machine learning, deep learning and natural language processing, can readily combine with enriched predictive and descriptive analytics, robotics or other forms of automation. As a result, AI or cognitive computing can deliver entirely new types of customer engagement, strategic innovation and business transformation (see Figure 1).

Figure 1

A spectrum of cognitive technologies



Source: IBM Institute for Business Value analysis.

Expected benefits from AI for economic growth and business efficiency are significant for Indian organizations, individuals and the entire economy. Consider this scenario: while traveling to work, the vehicle you are driving detects that you are about to suffer a major medical event. The cognitive intelligence underpinning the vehicle instantly routes real-time health-related data to nearby healthcare professionals. It optimizes treatment options based on the latest research and delivers you to the facility best equipped to provide immediate, world-class medical care. And it does this while arranging pre-approval with your insurer and notifying your closest family member, friend and/or employer of the incident.[11]

Or consider another situation in which cognitive intelligence, recognizing that an upcoming weather event will likely lead to major travel disruption, motivates your personal virtual concierge to instantly reconfigure your holiday plans based on your interests and preferences. The cognitive intelligence takes into consideration other disruptive weather events around the region – or indeed the world – and their likely impact on air, rail and road transportation options.[12]

Technology startup uses cognitive computing to build digital trust platform

An Indian software startup synthesizes and analyzes unstructured data from a wide range of sources, including court cases, regulatory and statutory filings, and social media, among others. Cognitive computing identifies patterns of fraud, money laundering and other illicit activities, and provides recommendations as to the efficacy of specific organizations and the associated risks of future contractual engagement.

India’s cognitive innovators

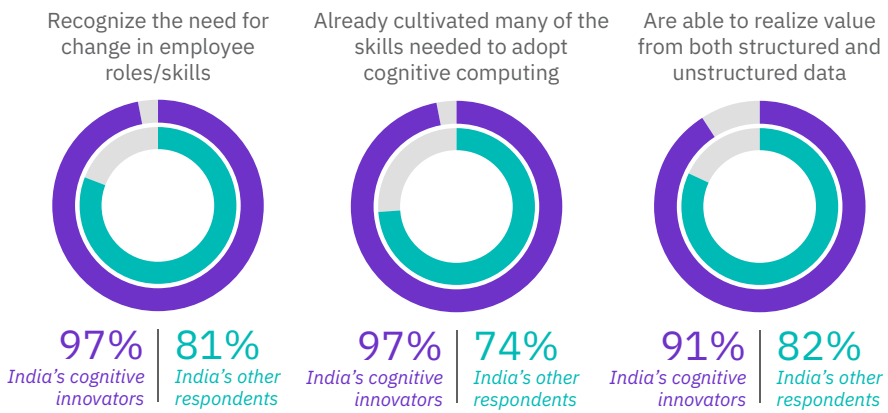
As previously discussed, cognitive innovators comprise a subset of survey respondents that lead in adoption of cognitive technologies. This elite group ranks highest across five pertinent dimensions:

- Familiarity with cognitive technologies and concepts
- Leadership in innovation
- Recognition of the importance of cognitive capabilities to their organizations
- Willingness of their industry to embrace cognitive computing
- Demonstrable steps indicating they have begun their cognitive journey.

The group of cognitive innovators is relatively small, representing only 10 percent of all executives surveyed. They are disproportionately high performers compared to their peers: 34 percent of global cognitive innovators outperform the competition in both revenue growth and operating efficiency, compared to only 12 percent of the remaining global respondents who outperform their peers.

India’s cognitive innovators almost uniformly recognize that both the roles and the skills of their employees will need to evolve with the deeper application of cognitive computing technologies. Indeed, cognitive innovators have typically already cultivated many of the skills needed to adopt cognitive computing (see Figure 2).

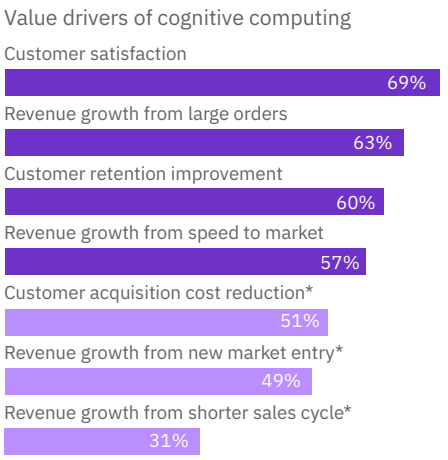
Figure 2
India's cognitive innovators



Source: IBM Institute for Business Value survey on cognitive computing in collaboration with Oxford Economics, 2016; IBM Institute for Business Value analysis.

These innovators primarily view AI and cognitive computing adoption as a growth play, identifying customer satisfaction, revenue growth and customer retention as key rationales for embracing cognitive technologies. They also see cognitive-enabled capabilities as central to rethinking and dramatically improving the customer experience (see Figure 3).

Figure 3
Key value drivers for India's cognitive innovators



*Note: *n count is less than 20.*
Source: IBM Institute for Business Value survey on cognitive computing in collaboration with Oxford Economics, 2016.

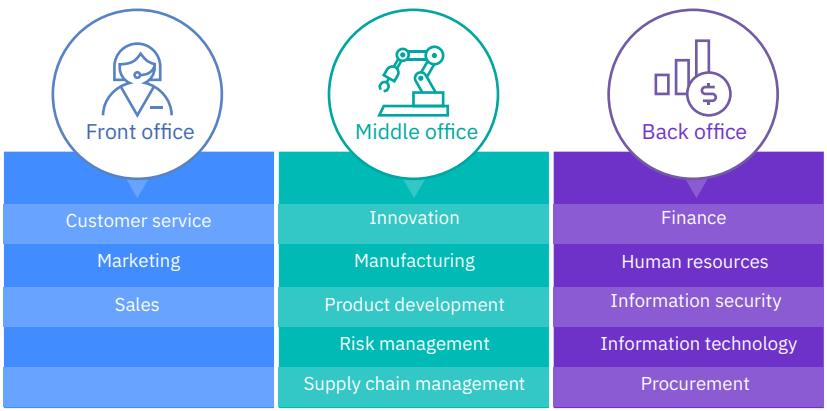
Hospital group employs cognitive computing to improve advanced cancer care

A leading Indian hospital group has successfully built a cognitive platform that analyzes data to formulate personalized patient treatment options for oncologists. Access to a broad, up-to-date corpus of medical research and other documentation, combined with self-learning capabilities, helps make sure doctors have access to the latest medical insights and expert perspectives from around the world.

Creating a Cognitive Enterprise

The impact from AI and other cognitive technologies is far more than the sum of these technologies' parts. AI and cognitive computing can transform business functions, driving rapid evolution within organizations. To explore this effect, we decomposed enterprises into 13 key functions categorized across front, middle or back office (see Figure 4).

Figure 4
Enterprise's key functions



Source: IBM Institute for Business Value analysis.

In the front office, self–learning AI systems enable deep customer engagement, through which technology interacts with customers, learns and constantly improves. In doing so, cognitive systems can increase customer satisfaction and retention by enhancing intimacy in customers' relationships. These systems are typically part of a broader workflow environment in which marketers or sales staff can approach new or existing customers to create hyper-personalized experiences.

In the middle office, AI empowers employees who manage large volumes of data. Faster, better decision making can occur when leaders shift from depending on staff for data management and curation to generating insights in real time. In the back office, AI improves productivity by automating repetitive tasks, and enables organizations to establish and promote transparency and control of data, processes and actions across shared functions. In addition, it reduces or eliminates human error, improving compliance and control.

HR technology provider uses machine learning to revolutionize recruiting practices

With dual objectives of reducing bias in recruiting processes and improving efficiency, a leading human resources technology provider in India has successfully employed advanced linguistic algorithms to extract deep behavioral insights from unstructured data, and identify and recommend best-fit candidates.

Bank deploys software robotics to automate internal banking operations

A large Indian bank has introduced robotic automation into more than 200 business processes across multiple functions. The cognitive automation enables the bank to employ machine learning, natural language processing, bots, and facial and voice recognition to dramatically improve efficiency, accuracy, responsiveness and business agility.

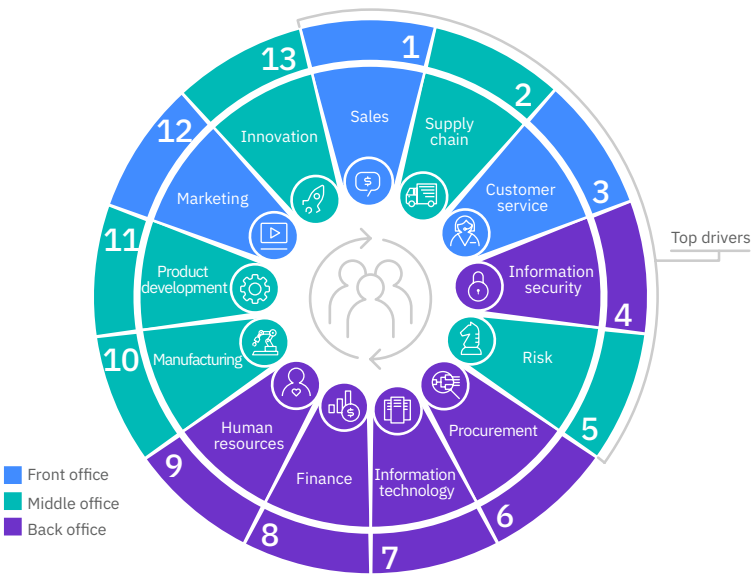
Indian executives' cognitive enterprise priorities

Executives surveyed globally anticipate a 15 percent return on investment from their cognitive initiatives. And IDC predicts global spending on cognitive platforms to climb from around USD 12 billion in 2017 to more than USD 57 billion by 2021.[13]

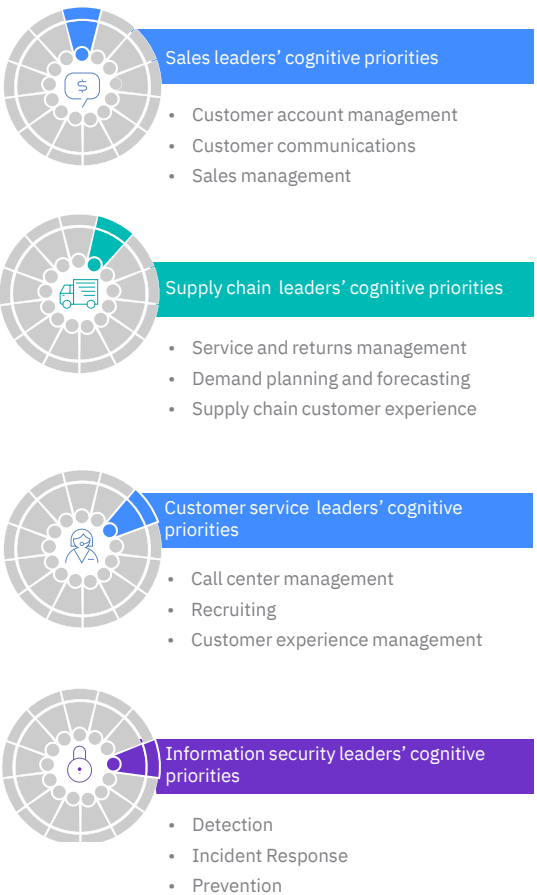
But to decompose the relative value of AI investments more specifically, we ranked functions across the enterprise based on the likely ROI anticipated by the Chief Executive Officers (CEOs) we surveyed. In a second-tier analysis, we established investment priorities within functions based on the likely ROI anticipated by the executives responsible for each respective function. For example, Chief Risk Officers prioritized AI investment for risk and compliance functions, Chief Marketing Officers for sales and marketing functions, and Chief Innovation Officers for innovation functions.

Indian CEOs identified sales as the most important – or valuable – business function for cognitive or AI investment. In the global study, executives rated sales in second place. Indian CEOs rate supply chain second, customer service third and information security fourth (see Figure 5). Following are more detailed insights for each of the functional areas based on our research.

Figure 5
Cognitive computing priorities of Indian CEOs



Source: IBM Institute for Business Value survey on cognitive computing in collaboration with Oxford Economics, 2016.



1. Sales

Applied to sales, AI can help organizations improve efficiency of customer-facing services, expand customer account management capabilities, increase cross-sell and up-sell opportunities and – through richer contextual understanding – improve efficiency of lead management.

2. Supply chain

AI or cognitive capabilities can help companies improve insights for decision making; build trust in the type, quantity and quality of goods purchased, delivered, received and invoiced; and reduce working capital needs to support commerce. They can also help logistics professionals better predict the likelihood of impacts on the supply chain, anticipate actions needed and more accurately predict potential future issues.

3. Customer service

AI or cognitive computing can help companies connect more deeply with customers through automation of vast amounts of information. Not only are organizations able to identify customer attitudes, needs and desires, they also can better anticipate and resolve issues to create even higher levels of customer satisfaction.

4. Information security

Cognitive computing can enable faster, more reliable detection of fraud or other activities within volumes of structured and unstructured data. It can potentially save thousands of staff-time hours, freeing personnel to focus on more business-critical initiatives by accelerating threat detection and reducing resolution time.

5. Risk

By ingesting massive amounts of relevant data, including regulation and company policy information, AI can help risk managers better assess different types of risks. Cognitive computing can anticipate compliance gaps by mining ambiguous data to identify indicators of unknown risks that humans may miss.

6. Procurement

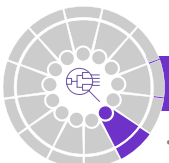
AI or cognitive computing can improve global sourcing and integration with suppliers, accelerate and enhance analysis, enable more effective automation of repetitive procurement tasks, and support more efficient returns and replacements activities.

7. Information technology

IT ranked as the highest priority among executives surveyed in the global sample. However, it ranked seventh among Indian executives. Application of cognitive computing and AI can promote accelerated solution design and improved amplification of employee expertise in IT. And it can support faster, more efficient planning, development and testing of enterprise software, and enable greater agility.

Risk leaders' cognitive priorities

- Risk compliance management
- Risk operations
- Risk analysis

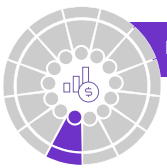


Procurement leaders' cognitive priorities

- Spend analysis
- Logistics
- Sourcing and supplier management

Information technology leaders' cognitive priorities

- IT finance/procurement/ vendor management
- Operations (e.g., location data)
- IT architecture and engineering



Finance leaders' cognitive priorities

- Procure-to-pay
- Regulatory and statutory monitoring/ compliance/reporting
- Supporting organic growth strategies partnering with the business

Human resources leaders' cognitive priorities

- Performance management
- Learning and development
- Diversity and inclusion

Manufacturing leaders' cognitive priorities

- Facilities and energy management
- Quality and preventive maintenance
- Assembly

8. Finance

In the finance function, AI or cognitive computing can help mitigate risk, proactively prevent fraud, and accelerate and improve due-diligence processes for new suppliers. It can increase cash on hand by accelerating payment cycles and by substantially improving decision making for regulatory compliance through natural language processing, machine learning and automated reporting.

9. Human resources

Cognitive computing can significantly improve payroll and benefits administration efficiency, as well as workforce planning. Through advanced linguistics and machine learning, cognitive capabilities also can increase recruiting speed and accuracy by instantaneously providing a 360-degree view of a potential candidate via social media and other channels.

10. Manufacturing

In manufacturing, AI or cognitive computing capabilities can unlock valuable insights from dark data – which is acquired through various computer network operations but not used in any manner to support decision making – in failure reports, as well as highly intelligent automation. They can integrate new sources of Internet of Things (IoT)-based sensor data and improve the productivity of field engineers through access to more granular analysis and insights in real time. And they can reduce production outages through better, more insightful analysis of equipment data.

11. Product development

Indian executives rate other functional areas as more valuable candidates for AI, but recognize that cognitive computing can improve prototype development capabilities and testing at scale. For example, it can enhance designs efficiently by significantly compressing verification process times associated with design changes.

12. Marketing

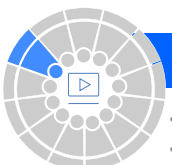
AI or cognitive computing can process vast quantities of data, helping organizations more accurately identify target audiences and leverage a variety of channels for campaigns. Better, faster, richer automation of research across multiple channels, including those channels with unstructured data, enables market researchers to spend more time on strategy and execution, as opposed to mechanical tasks and basic analysis.

13. Innovation

AI helps organizations formulate hypotheses, identify and validate new ideas, accelerate and deepen scenario envisioning throughout incubation, and make unexpected associations. Specific activities might include: sourcing existing patents, engaging entrepreneurs to build new products and services that better monetize enterprise assets, or drawing upon new investments for other geographies or parts of an industry.

Product development leaders' cognitive priorities

- Life cycle management
- Research
- Innovation/idea generation



Marketing leaders' cognitive priorities

- Content creation
- Marketing campaigns and promotions
- Marketing automation

Innovation leaders' cognitive priorities

- Enabling an environment of openness in the organization
- Conception of new ideas
- Improving the amount of collaboration internally in organization

A cognitive India

What we mean by "The Cognitive Enterprise"

On the heels of digital trends that are starting to mature, the next wave beyond digitization has begun. The rise of new and exponential technologies – including AI, blockchain, the Internet of Things, robotic process automation, virtual and augmented intelligence, 3D printing and others – is teeing up another era of business architecture change. We define the result of such revolutionary change as "The Cognitive Enterprise."

In our report, "The Cognitive Enterprise: Part 1 – The journey to AI and the rise of platform-centric business architectures," the Cognitive Enterprise is defined as encapsulating the next big shift in business architectures, enabled and driven by new and exponential technologies.[14] That report examines how leaders can begin to explore these new business architectures and core platforms.

We have found that to gain sustainable – and possibly accelerated – competitive advantage, executives are building the capabilities needed to create a Cognitive Enterprise. To that end, there are seven key imperatives Indian executives can adopt to enable this transformation within organizations by harnessing key market forces and leveraging exponential technologies.

Clarify intent of core platform focus
Strategic platforms are no longer the domain of new disruptive entrants like Facebook and Uber. Examine your processes, data, skills, customer base and market positioning to discern the essence of your organization – and envision its future identity. For incumbent businesses, technologies such as blockchain can offer new pathways to establish industry platforms, reasserting your position within your industry and reducing waste and friction by employing proprietary data to better integrate your operations with those of supply chain partners and others.

Re-engineer workflows to use cognitive capabilities
Identify key workflows that support your organization's strategic platform(s), then reimagine and automate those processes to foster new machine learning, sensing and automation technologies, and data. Optimize these business processes end-to-end from a top-down perspective, beginning with envisioning the new business model, and the roles and objectives of business users and partners.

Reinvent workforce proactively
Cognitive Enterprises require new ways of working, and different skills and organizational approaches. To adapt, reskill existing teams, source new talent and manage legacy workforces. Recognize that human traits, such as empathy, creativity and the ability to deal with abstract concepts, become more valuable in the Cognitive Enterprise, as such things cannot be performed by machines. And remember that financial value must be balanced with societal and community implications.

Curate proprietary data actively
The Cognitive Enterprise is data-rich. And substantial data is required for and captured from business processes, whether they be automated or involve human decision making. Make sure that data is organized, of high quality and accessible. This is a foundational prerequisite for the Cognitive Enterprise, but it becomes dramatically more crucial when dealing with ecosystems of partners also employing and producing volumes of structured and unstructured data.

Secure your data, processes and platforms end-to-end
As regular controversies demonstrate, security is at the heart of all businesses. A misstep, a hack, a breach or some other type of leak can easily sideline businesses for weeks or even months. Customers, partners and regulators are becoming less patient with avoidable data breaches. Focus on developing trust in strategic platforms, customer relationships, and proprietary data and processes to support the durable success of your business model. Clearly align business cases for justifying significant security expenditure to the potential for catastrophic business loss.

Travel marketplace launches AI-powered chatbot to simplify travelers' lives

An Indian travel marketplace uses an AI-enabled bot that provides fast, individualized answers to travel-planning questions and booking-related inquiries. The accuracy and relevance of its capabilities improve in real-time with the personal travel assistant already learning from more than thirty million data points.

Research methodology
In cooperation with Oxford Economics, the IBM Institute for Business Value surveyed 6,050 global executives representing 18 industries, including leaders of government departments and educational institutions. Included in this global group of respondents were 333 Indian C-suite executives and functional heads. Roles of responding executives globally included major C-suite members – CEOs, CMOs, CFOs, CIOs, COOs and CHROs – as well as heads of customer service, information security, innovation, manufacturing, risk, procurement, product development and sales.

Integrate agility across organizational boundaries
Organizational agility – as exemplified by agile methods such as scrums, sprints, and tribes – will be critical to executing complex transformations and to maintaining your organization's long-term health. Create an agile environment to help make responsiveness a way of life. This ability to transcend traditional organizational barriers across departments, functions and geographies is a critical driver of your organization's ability to not only innovate, but to do so at scale.

Revisit and adjust technology architecture continually
Once your enterprise redefines its operating model, the supporting architecture becomes an enabler to executing against your new strategic vision. Create a clear blueprint and migration plan, together with an assessment of architectural options and trade-offs. Remain aware that a system platform choice or other strategic decisions made along the way can turn out to be either an accelerant or a deterrent to medium-term ambitions. Retain flexibility and maintain a willingness to modify decisions as necessary.

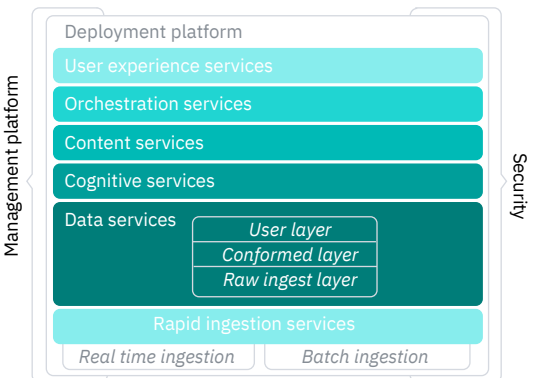
The data imperative

One of the most important elements of a Cognitive Enterprise's architecture is its data platform. After culture, the most common barrier we see to companies' digital journeys is access to a "fit-for-purpose" data architecture. Data architecture needs to enable clear and efficient organization of, and access to, competitive internal data and information, as well as to insights from external data sources. It also needs to be robust and flexible, accommodating legacy requirements without being restricted by them.

A sample data platform reference architecture highlights the importance of defined service layers on top of a foundation that draws on multiple data sources (see Figure 6). At the ingestion level, it needs to be flexible enough to handle batch as well as real-time data, and secure throughout to protect your proprietary data and that of your ecosystem or platform partners.

This type of platform is critical to enabling the data imperative – especially when developing a strategically differentiating corpus of knowledge. Enterprises can leverage data platforms to incubate and scale AI and cognitive capabilities, and drive sustainable competitive advantage.

Figure 6
A data platform reference architecture



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Key Questions

How can your organization use AI to transform your customers' experiences? Which segments will you target first and how can you better engage customers as individuals?

What cognitive capabilities can best enable front-, middle- and back-office strategic differentiation in strategy, organization and operations?

What will be the best path to new AI-enabled business and operating models?

What new skills, capabilities and resources will be needed to realize these new ambitions?

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