Expert Insights

The Cognitive Enterprise: Reinventing your company with AI

Seven keys to success

IBM **Institute for Business Value**

IBM

The Cognitive Enterprise: Reinventing your company with AI

Seven keys to success

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Introduction

A new era of business reinvention is dawning. Organizations are facing an unprecedented convergence of technological, social and regulatory forces. As artificial intelligence (AI), automation, Internet of Things (IoT), blockchain and 5G become pervasive, their combined impact will reshape standard business architectures. The “outside-in” digital transformation of the past decade is giving way to the “inside-out” potential of data exploited with these exponential technologies.

We call this next-generation business model the Cognitive Enterprise.

At IBM, we see companies placing bets on the creation of business platforms to solidify competitive advantage and differentiation. These platforms must be massively digitally connected from the outside-in and fully cognitively enabled from the inside-out (see Figure 1). Many of the strategic plays are based on the ability to redefine the business within its four walls by leveraging the estimated 80 percent of global data that is still proprietary.[1]

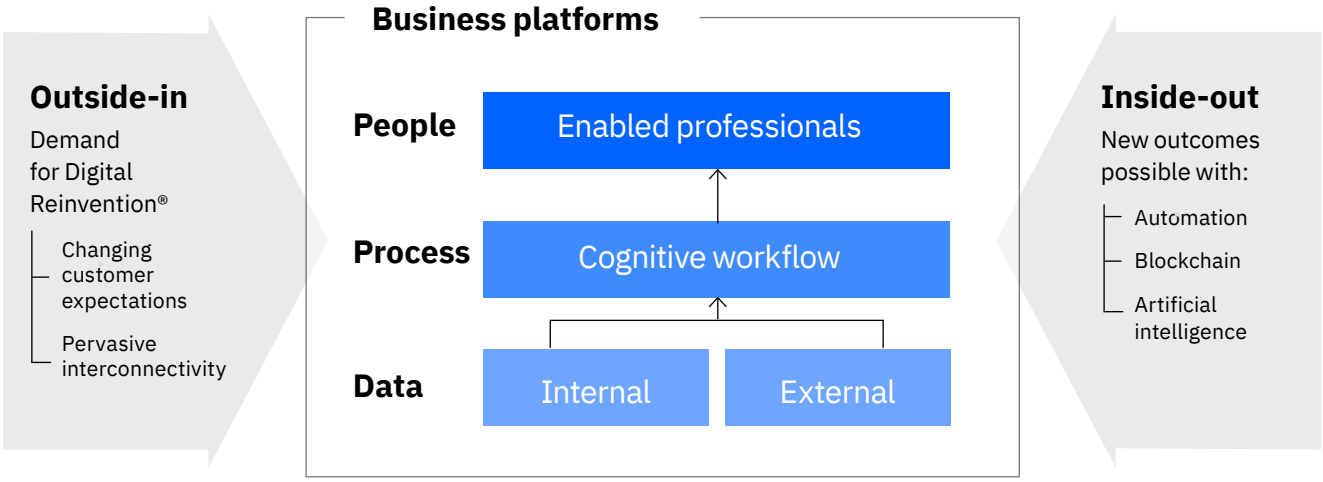
Others see the chance to play a platform role across their industries. A few companies are using platforms to expand their expertise and compete in markets adjacent to – but until now separate from – their traditional businesses.

Most organizations, though, are just beginning to prepare for the dramatic changes that will characterize the coming decade. They are still struggling to define their strategic differentiation. They are experimenting with multiple technology proofs of concept to evaluate process impact. And they are tackling the difficult task of shifting their applications and infrastructure from legacy to new. Most importantly, organizations are finding that the biggest barriers to progress are their own people and culture. They need different mindsets and skills to take advantage of new business capabilities.

We want to share what we have learned about shaping and evolving into a Cognitive Enterprise, as well as the focused actions that we believe can help you succeed. We see potential for huge value in both the short and long term, as well as substantive challenges.

Figure 1

A platform-centric business model



Source: IBM Institute for Business Value (IBV) analysis.

We believe the business platform concept will be fundamental.

Definition of a business platform

Platform. It's one of the most overused terms in business. So what exactly do we mean by a business platform? How does it relate to other types of frequently referenced platforms?

As companies around the world describe their strategies in terms of platforms, they are anchoring to the idea of a "stage" or "field of operation" – an area where a range of unique capabilities can be deployed and where the companies can seek to establish a control point over a range of value-creating activities.

Here is a taxonomy of the different platform types (see Figure 2):

1. Business platforms. These differentiate an organization by combining data, unique workflows and expertise to drive competitive advantage. Examples include risk management for a bank, claims processing for an insurer, merchandising for a retailer and supply chain for a consumer goods company. They will often be underpinned by technology platforms and may connect into other ecosystem business platforms. These business platforms can take three different forms and scopes of activity:

- *Internal platforms* help enable operational competitiveness. They make activities within the company more effective and efficient by using new technologies and skills, for example, the customer experience platform of CEMEX, a global materials company (see case study, "Platforms change everything," on page 6).
- *Industry platforms* enhance the company's relative market relevance and position by delivering key process capabilities on behalf of partners and potentially competitors. MetLife's Small Business Insurance Platform is one example. MetLife is combining IBM Cloud and third-party components to create a platform to administer, service and maintain small business insurance policies with faster processing times, real-time communication across parties, and enhanced benefit options and rates for employees.[2]
- *Cross-market platforms* capture new and adjacent marketspace by managing essential or value-added processes on behalf of a broader ecosystem of partners that could be previously unrelated. For example, Skywise, an open data platform, promises to greatly improve the operational performance and business results of major players in the aviation industry. Skywise customers, which already include several major airlines, share flight and aviation data on its platform. AI, applied to this truly massive pool of shared data, generates new insights to – among other things – optimize aircraft performance and fleet management, practice predictive maintenance, and generate efficiencies in cabin and ground operations.[3]

2. Technology platforms. These can enable application and infrastructure platforms that underpin workflows and support business platforms. Next-generation enterprise applications such as SAP, Salesforce, Workday and the cloud-based infrastructures such as Azure, Hyperledger for blockchain, IBM Cloud and Red Hat come to mind. We are also seeing new classes of technology platforms emerge for AI, IoT, automation and more.

3. Mass consumer platforms. These are the widely leveraged, mainly customer-centric platforms that have been the disruptors of the past decade, such as Amazon, eBay, Alibaba, Facebook and the like. Mass consumer platforms often generate data or insights that can be sought after by business platforms as part of their value propositions.

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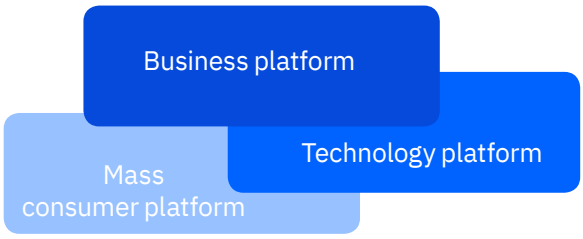
Figure 2

Cognitive Enterprises can gain competitive advantage with a business platform composed of proprietary work flows, leveraging new technology platforms for speed and mass consumer platforms for ecosystem connectivity



The value of business platforms

As organizations attempt to navigate this new world and transform into Cognitive Enterprises, we believe the business platform concept will be fundamental.

From a strategic perspective

- Business platforms will be the new instantiation of the strategy of an organization.
- They will act as a "North Star" for change programs and investment priorities to help navigate from legacy to the future.
- They will be the basis of and a critical connective tissue with other ecosystem partners and networks.
- They will continuously learn, getting smarter and smarter over time through AI and machine learning.

In terms of execution

- Business platforms will bring purpose and intent to the task of leveraging transformative technologies – especially AI – and re-engineering critical processes and workflows.
- They will create the focal point for data curation from internal and external sources.
- They will provide the architectural frame within which agile management approaches can be exercised to move from the old to the new.
- They will set the direction for skills-building and culture changes required to develop the workforce of the future.
- They will boost security by tapping into ecosystems and rapidly acting on insights.

There are multiple potential areas of focus for an organization's key business platform choice. A few clear criteria have emerged (see Figure 3):

- Deep-seated expertise that can be leveraged for the platform's purpose.
- Access to proprietary data that can be combined with external data sources to create differentiated workflows and insights.
- Unique process innovation and performance potential through applied technology.
- Channel access and network credibility to operate in the chosen platform area.
- Scale, or potential to exploit and extend scale, through platform leverage.

Once made, the choice of platform represents a big bet for the organization. The decision has implications for capital allocation, mergers and acquisitions, talent strategy, and the value narrative for capital markets and beyond. The organization and operating model will need to significantly realign along platform lines – and leadership will transform as well.

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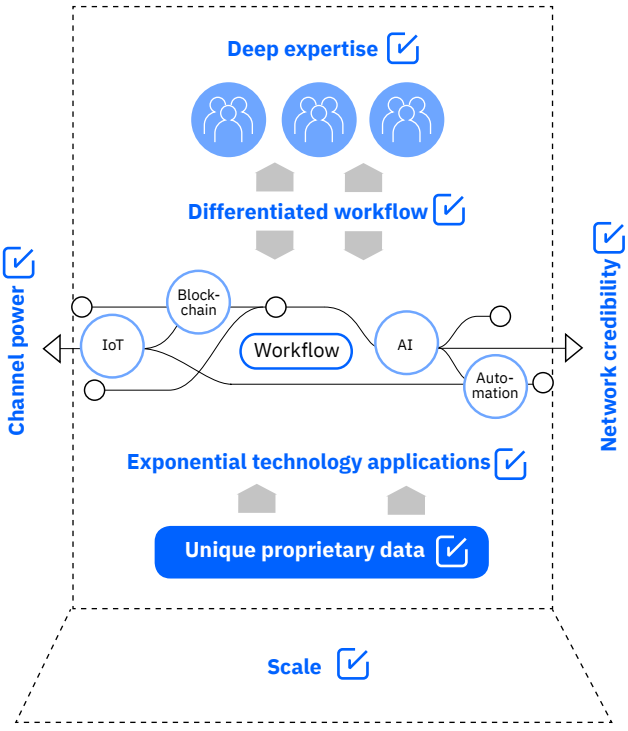
Figure 3

To create a winning business platform, a few clear criteria have emerged



Platforms change everything[4]

Three years ago, the CEO of CEMEX, a global cement and heavy construction material company, made a bet that investing in a superior client experience would be the single most important source of competitive advantage for his company. To accomplish this, he knew the company would have to transform its culture as much as its technology. It would have to learn how to be both more experimental and innovative while at the same time building out a new digital platform and persuading his clients to use it.

To transform its culture, CEMEX turned to design thinking to map its customers' journeys, and to DevOps and agile methods to innovate and accelerate speed to market. Continuously upskilling and reskilling talent, the company recognized, would need to be treated as a core competency. CEMEX partnered with IBM and a leading university to educate top management on digital transformation and develop agility in its leadership ranks, as well as curiosity about the opportunities that technology could unleash. It established the Monterrey Digital Hub, a co-working space aimed at attracting and developing new digital skills for the next generation of talent and entrepreneurs. It launched CEMEX Ventures to formalize innovation inside and outside the company and scan the horizon for meaningful early opportunities aligned with its purpose. It also connected them with leading enterprises undergoing significant transformation across Mexico and broader global markets.

For CEMEX, digitization was a significant challenge because it operates in an industry with one of the lowest adoption rates for this technology. Most of its transactions with customers were person to person, based on "analog" methods. With the customer experience at its core, CEMEX has engaged the rest of the company in redesigning its business while rapidly experimenting and scaling cognitive-enabled front- and back-office functions. These include dynamic product catalogues and pricing engines, AI-based recommenders for customers and the sales force, robotic process automation throughout the order-to-cash business processes, and supply chain optimization across inventory and transportation management. At the same time, CEMEX Ventures is engaging with startups, ecosystem partners and industry standard bodies and investing in the next generation of technologies with the opportunity to impact itself and its clients.

To support "CEMEX Go," as its platform has been named, the company reinvented enterprise workflows for offering management and re-architected its systems, implementing open standards and API-enabled microservices. In 2019, CEMEX partnered with IBM and a building materials organization to offer both software as a service (SaaS) and platform as a service (PaaS) options – white-label solutions of CEMEX Go that its customers can buy and use. These solutions help enable materials leaders worldwide to leverage CEMEX's digital investments and drive additional top- and bottom-line growth opportunities in their markets.

In its first year, CEMEX onboarded over 20,000 clients in 18 countries to its business platform: 60 percent of its global client base. Adoption is accelerating, with the most recent countries achieving near 100 percent adoption. Today, new digital data, combined with new skill sets, is creating a steady stream of insights about its customers' businesses. This positions CEMEX to engage and help clients in ways that could not have been envisioned twelve months ago.

CEMEX illustrates a journey that started with an enterprise platform, evolved to an industry platform proposition, and is now aspiring to deliver extended value to the entire construction ecosystem. As an industry platform, CEMEX Go has exceeded expectations of its ability to serve heavy building materials customers, suppliers and competitors. It plans to extend its business on the platform to construction networks outside today's core business. It plans to integrate customer relationship management (CRM), digital commerce and supply chain solutions, as well as business-to-consumer (B2C)-connected stores and last mile delivery platforms, "uberizing" the long- and short-haul transportation of materials so that midsized distribution networks can compete with established distributors in underdeveloped markets. With each success, the deep curiosity and entrepreneurship embedded now at CEMEX will continue to drive additional value for its platform.

CEMEX is an example of the journey and the success factors involved in creating a winning platform. This includes clarity of purpose for its platform: superior customer experience; deep expertise in the industry, down to the last-mile requirements; differentiated workflows, designed for adoption; curiosity about exponential technologies that fuel its intentional application; scale and presence in the industry; established channel partners; unique data about its products, its application and the supply chain requirements to deliver them as needed to their clients; and trust and credibility as an enterprise.

The Cognitive Enterprise

Imagine the Cognitive Enterprise as composed of multiple business platforms. One or more of these acts as the core or primary platform(s), providing key differentiation. Organizations leverage and access secondary or supporting platforms as well. For example, middle- and back-office processes and underlying technology suites may be used to partner with other industry players or third parties.

The business platform, then, is made up of capability layers. Each is subject to major transformation, and the potential that we envision for companies and organizations is huge. We think that incumbents will – as we are increasingly seeing – strike back if they can orchestrate change at scale. Companies have the opportunity not only to attack and secure new markets but also to restructure their cost bases for the long term – with a possible huge payoff to their bottom lines.

Therefore, the key layers of the Cognitive Enterprise are (see Figure 4):

- A culture of agile innovation that embraces new skills, workforces and ways of working, and humanizing the enterprise
- An ecosystem of business platforms, both industry-specific and transactional
- Cognitively enabled workflows for front- and back-office processes and decision making
- Applied exponential technologies – for example, AI, IoT, automation and blockchain
- Data that is curated to support key workflows and platforms
- Next-generation applications that span new and legacy solutions
- Open, hybrid and secure multicloud infrastructures

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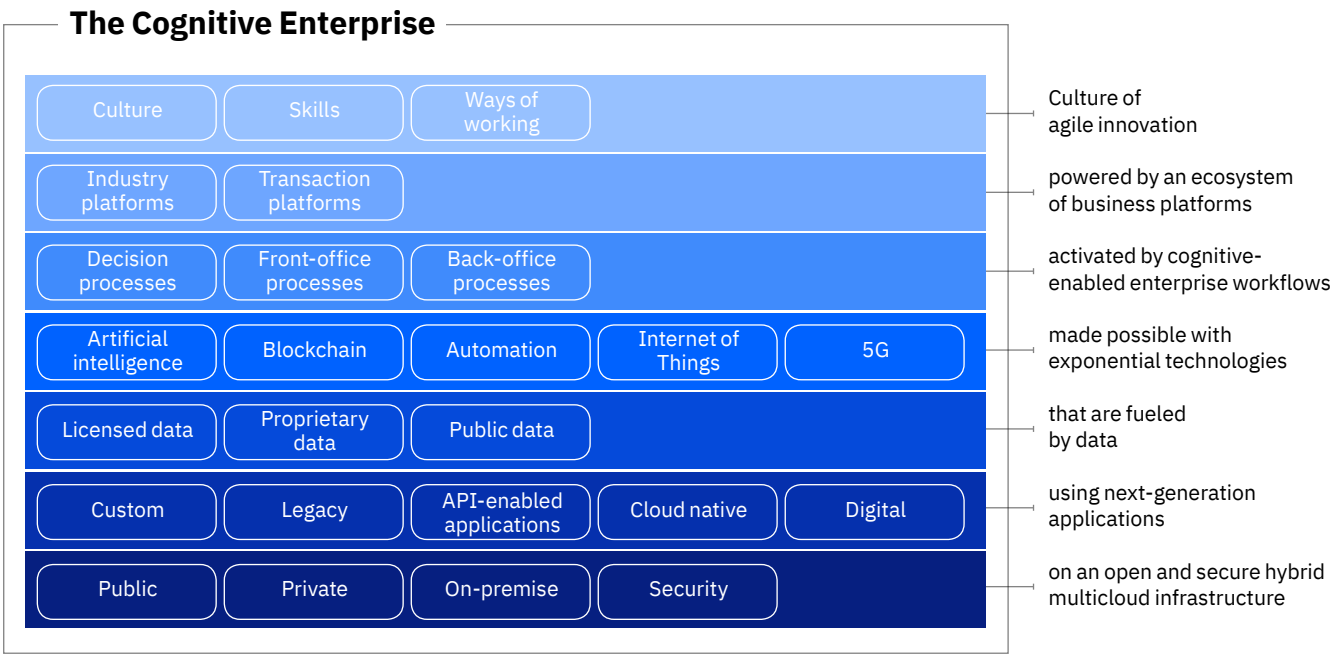
Figure 4

Capability layers for the Cognitive Enterprise



Source: IBM IBV analysis.

Humanity at the heart of the Cognitive Enterprise

For all the focus on the impact of new technologies and AI, the most important aspect of the Cognitive Enterprise is still going to be its people. The new technologies and corporate architecture enhance both the customer and employee experiences, provide insights to spark creativity, and engage and entertain. All of this raises the bar for expectations around the personal touch, human interaction and empathy – qualities that allow companies to stand out.

Even now, we can visit an Apple Store and be amazed by the sales support technology and frictionless retail transaction. But we still value the expertise of the sales assistants and their help with navigating choices and getting the most out of the technology we purchase. Doctors, too, can increasingly leverage AI to help make diagnoses and explore treatments. Yet the need for a compassionate "bedside manner" is critical to building a trusting bond with the patient. As the "human-machine" interface shifts, remembering that businesses are composed of people – and ultimately exist to serve people – is critical.

The culture of the Cognitive Enterprise will need to keep these human factors front and center. The professionals and experts who sit in our newly enhanced workflows need to apply even more experiential intimacy, creativity and empathy. This clarifies and communicates a clear company purpose. It anchors the underlying values which should still inform the core of these new business models.

Making this work seamlessly will require a much stronger set of continuous feedback mechanisms and methods of engaging the wider organization in the co-creation of attractive experiences. The most successful companies will be those that excel in this area.

Seven key success factors

Seven essential actions lie at the heart of successful digital and cognitive transformations. Each is explored in greater depth in the chapters that follow, with detailed lessons from the field on what really works. Here is an outline of our cognitive playbook.

1. *Create platforms to unleash Digital Darwinism.*
   - Business platforms are being built for competitive advantage and applying the right strategic criteria to the core business platform is vital.
   - Platforms must leverage deep expertise, open workflows and data synergies to seize expansion potential within an ecosystem.
   - Design-thinking, co-creation and agile approaches are required to accelerate the build of winning business platforms.
2. *Leverage the incumbent advantage in data.*
   - Proprietary and heterogeneous data and analytics can be integrated and curated to drive business platform performance.
   - Trust in data and avoidance of bias is required at the heart of valid cognitive workflows and decision making.
   - Data rights concerns and permissioned information access will become more important.
3. *Architect your business for change.*
   - The business platform intent will set the architectural shape and drive the target operating model of the Cognitive Enterprise.
   - Enablement of agility and flexibility requires a few fundamental architectural choices to provide a practical frame to make progress – these choices relate to workflows, data, AI and computing.
   - Intelligent orchestration of open and hybrid architectures is needed across networks and ecosystems.
4. *Redesign company workflows around AI.*
   - Customer-facing workflows must be humanized, as well as automated, end to end.
   - Adaptive operational processes and workflows will continuously learn and be self-aware.
   - Platform workflows will be open, and enable and span ecosystems and networks.
5. *Get agile, change fast and build things.*
   - Strategic agility is about aligning your increasingly pervasive agile activities to core platform intents.
   - Operational agility is about "flow" and removing bottlenecks in workflows.
   - The DevOps of business change needs to be implemented.
6. *Reinvent your workforce to ignite talent.*
   - New business platforms and workflows require new and ongoing skills attainment.
   - AI is enabling skills inference, transforming workforce management and learning.
   - Agile teaming is the new paradigm of work, supporting rapid skills transfer and development.
7. *Win with trust and security.*
   - Security of the business platform will be critical to its trust and longevity – but companies need to balance this with seamless customer and employee experiences.
   - Organizations must secure both the human and machine elements along key workflows and data sources.
   - An ecosystem of business platforms requires an open network approach to security across parties, driving collaboration and insights at speed.

The challenge? Initiating and orchestrating a stream of innovation and creating the new platforms.

Tips for the road: How to start the journey

Practically every organization is striving to embark upon this next wave of transformation, establishing digital strategies and appointing Chief Transformation and Chief Digital Officers. They are queuing up Centers of Excellence for AI, data science and the cloud. Proofs of concepts and minimum viable products are pouring out of agile teams. And yet, leaders struggle to engage their wider organizations and middle management in their visions.

The issue? What to do with legacy systems, skills and operations that reinforce old behaviors. Attempts to build "digital islands" have largely failed to transform enterprises in sustainable, scaled or impactful ways. Organizations need a fresh approach to build new platforms and skills while maintaining, modernizing and operating their legacy environments.

The "garage" answer to a legacy question

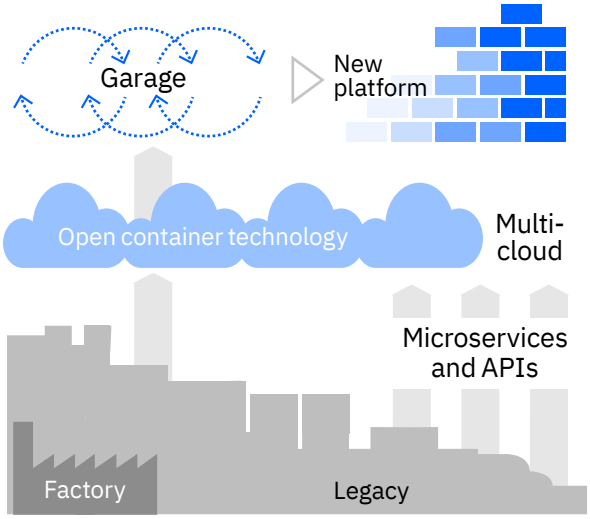
Where is the answer to this challenge? In the "garage." The garage approach involves the creation of cross-organizational spaces where cross-functional teams can come together with strategic partners, such as IBM, and other ecosystem players and startups to co-create, co-execute and co-operate the new business platforms.

Garage environments can jumpstart innovation by putting technology options into the context of customer journeys, critical workflows, pain points and value potential. They allow for early testing of ideas against customer and employee feedback, avoiding wasted activity. Design-thinking, agile and DevOps approaches move concepts quickly from ideation into day-to-day operation. Scrums, squads and sprints can break up the build process into manageable, valuable building blocks. In the garage, new business platforms can be developed at greater pace and lower risk, enabling benefits from continuous learning.

To deliver true transformation, garage environments must align with the factory approaches that are maintaining and modernizing legacy environments. When garages and

Figure 5

Hybrid multicloud environments and garage methods enable a lower-risk transition from legacy to new platforms in a synchronized manner



legacy factories are synchronized, organizations can build new platform components while migrating legacy architectures, skills and operations to hybrid multicloud environments and other new platforms (see Figure 5).

The garage approach can also be instrumental to the change process. Creating metrics for the impact of each building block informs the commitment of resources to winning ideas. Metrics can reinforce the clarity of outcomes and intent for the business platform. They can also provide proof points to the organization as more components migrate to business platforms. Garage participants can become a network of advocates for digital and cognitive change.

The transition to a Cognitive Enterprise is daunting. Incumbents and disruptors see a huge opportunity, but also must navigate a great deal of complexity and choice. Over the past year, we have worked to understand more about the factors and approaches that distinguish the likely winners from the also-rans. Each of the following chapters provides important insights about how the new business platforms will be built and how the different components of the Cognitive Enterprise will come together. Remember the prize at stake: the next level of competitive advantage.

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Create platforms to unleash Digital Darwinism

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Depending on your point of view, an economy remade by platforms is already here or imminent. This new structure for creating value has in fact been emerging for more than two decades. Today, business platforms dominate markets in every region. Some already occupy winner-take-most status.

In every industry, platform players are trading supply-side for demand-side economics, opening up their platforms for others to join and rewriting the rules that once determined value creation. Nearly a third of C-suite executives report their enterprise is already reallocating some portion of its capital to advance their future on platforms (see Figure 1). And nearly half – 46 percent – are either operating, implementing or considering one.[1]

– Business platforms are being built for competitive advantage, and applying the right strategic criteria to the core business platform is vital.

– Platforms must leverage deep expertise, open workflows and data synergies to seize expansion potential within an ecosystem.

– Design-thinking, co-creation and agile approaches are required to accelerate the build of winning business platforms.

Deciding what is core to the business is a nontrivial choice with significant consequences.

Platform choice really matters

A business platform doesn't just change the organization's business model; it becomes the new operating model, able to extract new value from data by algorithmically orchestrating processes or markets, and providing new space to exercise expertise.

Despite the sums being invested and decisions being made, many organizations admit they aren't always sure about the path they're on. It can be difficult to maintain clarity of purpose because business platforms change every aspect of the organization at once and often evolve rapidly.

Most companies are still grappling with fundamental questions. What parts of their business should they operate as a platform? Should they join the platforms run by others? How do they respond to competing platforms?

The allure of new platform economics is well documented. Platform operators are adept at exploiting assets they don't own to establish new markets. To grow exponentially, they practice demand-driven and supply-side economics simultaneously to accelerate network effects. By the time they've taken a small piece of the market, their advantage can be locked in. This is why so many organizations are scrambling to stake their positions now.

Organizations adopting a business platform should have a singular overriding ambition – to be the best in a strategically selected area. That starts by identifying what the core of their business should be going forward, and marshaling their investment and expertise to transform that core as a business platform. Deciding what is core is a nontrivial choice with significant consequences. Almost always, the core is the part of their business where organizations have already established a differentiating advantage, supported by troves of proprietary data.

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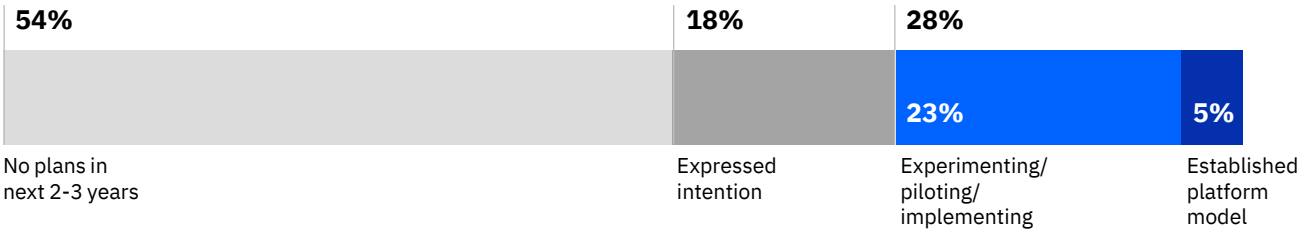
Figure 1

Twenty-eight percent of CxOs are actively investing in the platform business model



Source: "Plotting the platform payoff: The Chief Executive Officer perspective." IBM Institute for Business Value. May 2018. ibm.biz/ceostudy. Percentages represent the number of respondents who selected each platform adoption level. Q. In terms of adopting a platform business model, what stage is your enterprise at?

The superior opportunity could very well be something created as shared value.

Data – powered by artificial intelligence (AI) and machine learning – augments the capabilities and expertise of its employees, and deepens engagement with customers. Expertise, together with the capacity to learn quickly, sustains the rapid lifecycle of innovation and iteration on business platforms. New workflows, leveraging exponential technologies, extend the organization's capacity to create new value (see Figure 2).

Once organizations have clearly identified their core, they need to rethink what they do and how they do it, looking well beyond current market dynamics. For example, insurers considering platforms are shifting from risk aggregation to claims prevention. Some organizations even jump industries: retailers, for example, are bundling payment services and telecommunication companies are becoming content providers.

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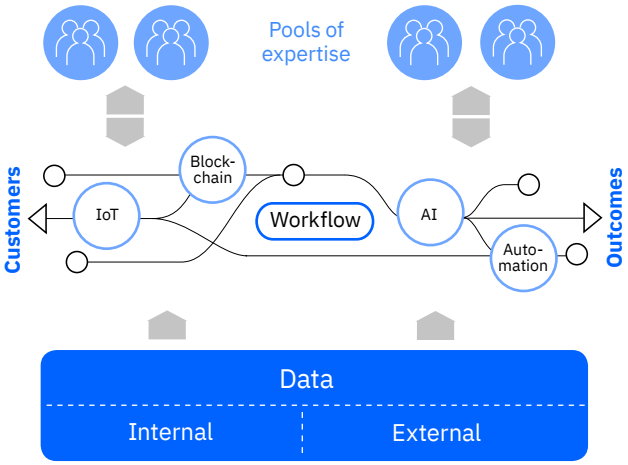
Figure 2

Effective business platforms integrate exponential technologies with pools of expertise and proprietary data to serve customers better and drive new value



Consider what's happening in the auto industry. Volkswagen is building a platform so that it can turn its car into a premium "channel."[2] General Motors is helping its owners rent their cars to each other.[3] Volvo has made it possible for packages to be delivered to unattended parked cars.[4]

What all these transformations have in common is that the enterprise has made its customers the center of gravity. It's too easy for a business platform to take on a life of its own, to become unfocused. When the customer is clearly the center of gravity, priorities fall into place.

Intensely customer-centric platforms are especially sticky. They are designed to keep customers on the platform. Customers universally expect a high degree of personalization, so that alone won't be sufficient. They demand better experiences, but those too are taken for granted. Immediacy, ease of use, matchmaking – you name it, customers can probably find it elsewhere.

What customers don't yet have at deep enough levels is trust. Platforms are natural conduits of trust. On blockchain networks, for example, organizations can demonstrate – to a deep level of detail – the brand promise, whether it's lowest price or eco-friendly sourcing and manufacturing. Reputations can be "credentialized" on the blockchain by revealing an organization's track record in detail. This not only increases trust between business partners, but also makes it possible to more easily take on new partners and reduce operational risks.

In some cases, the service being conceived on platforms will require new levels of trust. Think of handing over the electronic keys to your car so that a delivery person can load a package in the trunk or so that somebody you don't know can rent it for the day. Or consider AI-enabled

decisions such as applying for a loan and having to trust an algorithm to determine creditworthiness. See Chapter 2, “Leverage the incumbent advantage in data,” for how to mitigate cognitive bias and extend trust with your customers.

On platforms, deep and persistent levels of engagement cultivate trust; relationships and a commitment to transparency build the brand. The promise extended to customers is cultivated between partners on a platform as well. Alibaba gave new life to the small shops it brought onto its platform by exposing them to new customers, and the data it freely shared helped those shops create closer bonds with their customers and improve performance.[5]

Platforms combine business and technology drivers to win

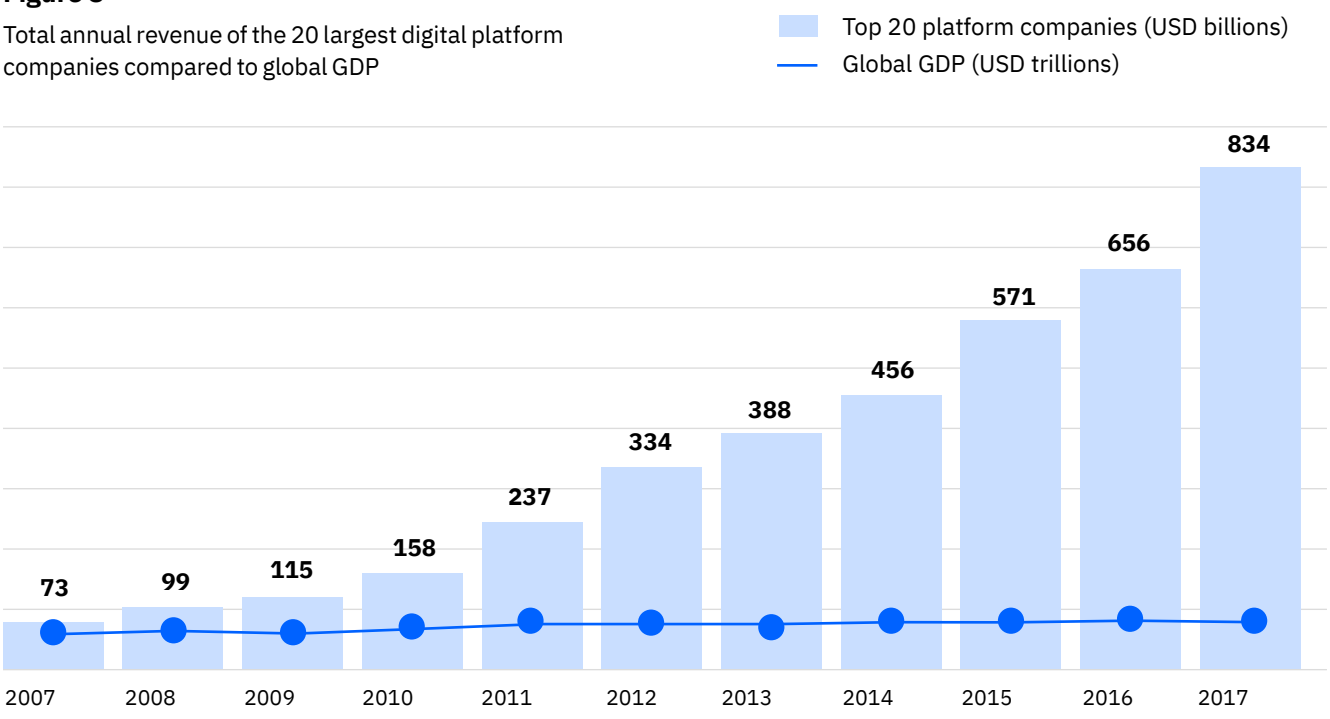
Platform businesses radically restructure the organization to achieve nonlinear growth. Over the past ten years, the top 20 global digital platform companies have achieved dramatic growth while global GDP has followed a more traditional trajectory (see Figure 3).

Three differentiating competencies, which when applied can guide the development and deployment of new business platforms, are:

- *Scale.* Designing and executing platforms for nonlinear growth.
- *Speed.* Continuously reassembling infrastructure and expertise.
- *Scope.* An evolution in strategy from specialized to expansive.

Figure 3

Total annual revenue of the 20 largest digital platform companies compared to global GDP



Source: IBV analysis of publicly available financial and economic data.

Strength in numbers[6]

The TradeLens blockchain-enabled shipping network that recently scaled to more than 100 ecosystem partners promotes more efficient and secure global trade, supports information sharing and transparency, and spurs industrywide innovation.

TradeLens is backed by a collaboration agreement between Maersk and IBM, and lays the foundation for digital supply chains by empowering multiple trading partners to collaborate – publishing and subscribing to events data – establishing a single shared view of a transaction without compromising details, privacy or confidentiality. TradeLens enables digital collaboration among the multiple parties involved in international trade. Shippers, ocean carriers, freight forwarders, port and terminal operators, inland transportation, customs authorities and others can interact more efficiently through real-time access to shipping data and shipping documents, including Internet of Things (IoT) and sensor data.

TradeLens is setting up an Industry Advisory Board comprised of ecosystem participants to help govern the growing network, shape the platform and promote open standards. The network is working with bodies such as United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT) and industry groups such as OpenShipping.org to help ensure interoperability. At a future stage, third parties can build and deploy applications to a TradeLens marketplace – unlocking new value for network members.

It's up to business platform owners to create the conditions for scale. The responsibility to design a platform for network effects, both direct and indirect, becomes the basis for execution. Multiparty platforms generate network effects and exponential growth, but even traditional business platforms create stronger bonds and deeper relationships to accelerate growth.

Platform owners that intend to create an ecosystem should start with a sure sense of their own ambition, but approach it with something closer to a blank sheet, created in close collaboration with the key members of its ecosystem. When value is not equally distributed across the ecosystem, they will need to design incentives to entice other organizations to join. Incentives could include reduced transaction fees, rebates or even opportunities to shape the platform's evolution.

Organizations have become accustomed to framing innovation as an opportunity to capture revenues that others can't. Now they must change their mindset: The superior opportunity could very well be something created as shared value.

Most business platforms, even those that are already in the market, are engaged in a race of scale and speed. The prize? Attracting key members of the ecosystem. On platforms, speed is measured first as the speed of change. How fast – and how frictionless – can you onboard a new participant on your platform? How quickly can you respond to a new customer requirement? Can you assemble and reassemble new infrastructure and interfaces, new workflows and teams fast enough to keep ahead of competitors?

The business platform must be highly architected – it must become composable, made up of highly interoperable system components and infrastructure built using cloud, AI and other exponential technologies. Microservices and APIs can be configured and reconfigured with ease to dynamically create shared value in the form of new products and services, within and between an ecosystem of partners. As-a-service components enable agile business configurations. Real-time and external IoT data coupled with AI and machine learning create a state of intelligent awareness.

In a garage, business leaders, technical leaders, designers and developers learn together and innovate together.

The organization is able to simultaneously sense changes in customer expectations and environmental conditions, then reorient workflows to act on them (see Chapter 4, "Redesign company workflows around AI").

Platform strategies are, by definition, boundary busting. They knock down the barriers between industries and walls between organizations. For some, the natural evolution of strategy will be an expanded scope. They grow by extending to adjacent spaces, connecting broad categories of complementary products and services in a way that makes experiences more holistic for customers. A platform that links real estate agents, home inspectors, insurers and mortgage lenders, for example, puts the customer at the center of a more seamless experience.

Like the ecosystems of nature, business model platforms thrive on diversity, including the diversity of data. The rich patterns revealed by abundant and heterogeneous data lead to more granular personalization for customers and a better understanding of their needs. When combined with the opportunity for multiple parties to collaborate to create shared value, the data generated by platforms makes them an especially fertile ground for breakaway innovation.

Insurance giant Ping An, for example, has populated its platform with apps that span multiple industries, including automotive and health, in order to gain access to heterogeneous data that reveals its customers' needs. It can access data from more than 880 million users, 70 million businesses and 300 different partners.[7]

How to build a business platform

Becoming digital was never the destination; instead it is a stage, the start of a transformation into what we call a Cognitive Enterprise. That journey starts with data and the technologies that extract its full value and inform intelligent, differentiating workflows. But success remains a quintessentially human – not technological – endeavor. It depends on deep customer relationships supported by design for ever-better engagement and its ability to elevate and upgrade skills and work as agile teams.

Think of the hype just a few years ago about fintechs. Thanks to their technological prowess and head start in platforms, pundits expected them to kill off traditional banks. That didn't happen. It was the banks that had earned the customer relationships and possessed deep industry knowledge, which they could apply to new products and services.

It was the banks' long history of deep and continuous engagement with their customers and all the proprietary data those relationships yielded that determined who held the dominant position. Everything else – integrating technologies, architecting platforms, orchestrating ecosystems – the banks could buy or learn to do, and they did. Some of them learned in a garage.

In a garage, business leaders, technical leaders, designers and developers learn together and innovate together. The garage is the gearbox to conceive, scale and execute a redesigned workflow, architecture or business platform. And in the process, teams acquire new skills that can be brought back into the organization.

Typically, cross-organizational teams, including key business partners, come together first at the ideation stage. They use design thinking, empathy and customer journey mapping to conceive and prototype minimal viable products (MVPs). (See Chapter 4, "Redesign company workflows around AI.") Often, MVPs can be produced in about one-third the time it would normally take.[8]

Once on the platform, which is architected as a more open environment than traditional workplaces, organizations will find it easier to extend agility across teams in every domain and even to external partners. In this way, organizations can operationalize a new phase of digitization that establishes far deeper interoperability and connectivity with the ecosystems that surround their customers.

Business platforms change the rules for success, the dynamics of markets and the makeup of whole industries. They may usher in a new age of Digital Darwinism, but they are also ripe with possibility for those with the fortitude to take them on.

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Leverage the incumbent advantage in data

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Big data continues to grow apace. What matters more is its growth in value, especially its contribution to an organization's differentiating advantage. In general, advantage goes to those who have access to the most heterogeneous data. The scope and diversity of data matters because when combined, they have the potential to create the deep context and insights required to operate successful business models.

For example, a typical supply chain in 2018 accessed 50 times more data than just five years earlier. However, less than a quarter of this data is being analyzed in real or near real time.[1]

Who enjoys this data dividend – and keeps it going forward – will depend on more than volume and scope of the data they possess. New leaders will be those who understand that:

– Proprietary and heterogeneous data and analytics can be integrated and curated to drive business platform performance.
– Trust in data and avoidance of bias is required at the heart of valid cognitive workflows and decision making.
– Data rights concerns and permissioned information access will become more important.

The gap between those who use data to great effect and those who fail to do so is growing.

Incumbent advantage

Tenure has its advantages. About 80 percent of the world's data is tucked behind the firewalls of organizations.[2] These incumbent organizations have extracted data in abundance from activities in both the online and physical domains. The data they've accumulated is proprietary. It's theirs to exploit and yet most organizations admit they fall far short of utilizing it. In other words, they have big data but too little insight and value.

The gap between those who use data to great effect and those who fail to do so is growing. Organizations that have adopted the platform business model, for example, have doubled down on data and typically achieved revenues eight times the average.[3] These platform operators excel at using data and analytics holistically to inform their business strategy and also to hone continuous performance improvement.[4] The data they possess is well integrated and fit for purpose.

For too many, the enterprise-wide integration of data remains more ambition than reality. Fewer than 4 in 10 organizations have integrated their data across the enterprise, or designed and deployed an enterprise-wide data architecture.[5]

Moreover, the target keeps moving. Instead of catching up, organizations find themselves falling further behind. For example, organizations recognize that it's no longer sufficient to simply pour all their data into a data lake and expect everyone to go fishing. Instead, organizations must curate and enrich data so that it meets specific business needs, functions and workflows. A marketer, for example, needs a very different view of data than the deep data dive preferred by R&D.

As yet, fewer than half of organizations surveyed in our 2018 IBM IBV Global Artificial Intelligence (AI) Study have developed a systemized approach to data curation.[6] To do so requires robust data governance, driven by business needs, and metadata. Metadata, the information about information, describes both content and context. It depicts the relationships among data, its source and history.

Absent robust metadata, it's difficult to integrate data and retrieve it for a specific purpose, or to deploy analytics and AI models. Agreed-upon governance practices are necessary to set the parameters, concur on "labels" and decide what metadata is needed. Machine learning technologies can then be trained to profile and classify data, automating metadata generation. "Cartridges" – pre-built sets of industry-specific data – are also a way to streamline curation of heterogenous data.

Unstructured and real-time data presents other challenges. Organizations train virtual agents, for example, by having them "listen" to recorded voice calls. Voice is converted to text and then a summation of the context of the calls, the answers to questions asked, and a prioritized list of dialogues is produced. The data, however, must be maintained and linked in its various states, including voice, text and summarized Q&A. This is because often when an organization completes one phase of a project, data analysts are finally smart enough to go back to the beginning and ask better questions.

If organizations don't persist and link all of the data, the discovery process is long and costly. The mission of AI-ready data should be to enable a virtuous circle of discovery fueled by the last great pattern detected. Organizations don't want anything to stand in the way of that kind of velocity.

Mining for data[7]

For one company, data accumulated over its 80-year history could truly be worth its weight in gold. That was the case for Goldcorp, a gold producer operating in North and South America. Its geological data was rich in history but so heterogeneous it could be difficult to access and use. It could be hand drawn or digitally structured data contained in multiple relational databases, or even an unprocessed core sample sitting on a shelf somewhere. One consequence: Goldcorp's geologists spent most of their day – about 80 percent of their analytical time overall – searching for and preparing data from drill logs, geological block models and other unstructured information for analysis.

Goldcorp's Exploration with Watson has gone live in production earlier this year after moving its data to a high performance 3D geospatial data platform on the cloud. This enables complex 3D distance calculations and data exploration capabilities. Geology-specific machine learning models have also been deployed as cognitive decision support for selecting new drilling targets. Data processing time has plummeted from 165 to 4.5 hours – freeing up the geologists' time to be more creative and collaborative to strike the most gold.

"The potential to radically accelerate exploration target identification combined with significantly improved hit rates on economic mineralization has the potential to drive a step-change in the pace of value growth in the industry," said Todd White, Executive Vice President and Chief Operating Officer, Goldcorp.

Trust in data

AI and its capacity to generate advice free of self-interest could go a long way in restoring trust in industries that sorely need it – such as pharmaceuticals or the financial industry. But first, organizations will need to consider the quality of data, as proved through its lineage and also cognitive bias, which – albeit unintentional – is baked into many AI models and data.

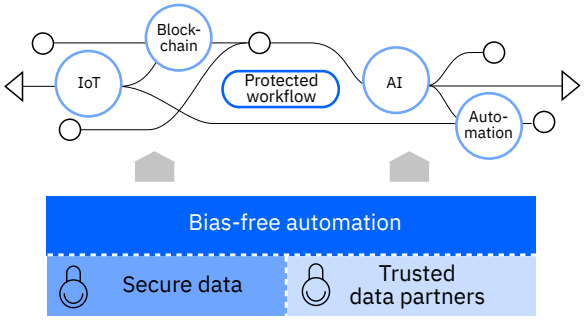
The ultimate expression of AI is its capacity to learn – to ingest the knowledge of the expert and of the crowd alike, to extract knowledge from historical data as well as data generated in the moment. The deeper the data set, the better the training. Of course, that is only true if the data is accurate. To know that data is trustworthy, organizations need to verify the data's provenance and lineage. As more organizations tap into unstructured data, including data streaming from GPS systems, satellites and IoT devices, the challenge to track the provenance and lineage of data grows significantly.

Blockchain technologies can trace the provenance and lineage of data in robust and reliable detail. This includes the source of data, the identities of those who've had access to it, and any changes made to data, along with when and why they occurred. It eradicates data drift.

Maintaining the lineage of data is one challenge; eliminating bias is another. Often, the bias may exist in the algorithmic model itself. The humans who create those models may expect, for example, that the best data to determine creditworthiness is past history. In reality, other factors may be equally or even more determinative (see Figure 1).

Figure 1

Establishing trust requires a holistic view of integrity for data, algorithms and workflows



To date, more than 180 human biases – any one of which can affect how humans make decisions – have been defined and classified.[8] The sheer complexity of identifying and eliminating each piece of potentially biased data makes it an excellent candidate for automation. Organizations are learning to train the models themselves to recognize bias and automatically suppress it.

As the decisions supported and made by AI systems become more consequential, employees and consumers alike seek assurance that algorithmically derived answers can be trusted. Interpretable AI models can offer answers with evidence. The challenge is to make that evidence easy for humans to understand.

In the meantime, organizations, including IBM, stipulate the importance of transparency – the need to be very clear about the data being used to train machines. Bias is just one aspect to consider. Human error, manipulation or data drift, which causes data to become inaccurate or incomplete over time, are just a few of the factors that render data less than ideal for training.

Data rights

At present, incumbent organizations enjoy the data advantage. It is, however, contingent. Changes to regulations, consumer sentiment, and even new business models could shift data pools just as surely as they shift profit pools.

New regulations, such as the General Data Protection Regulation (GDPR) governing the European Union, are dictating massive changes to how companies handle data – and even their rights to keep it proprietary. In Europe, for example, banks are being forced to give away their proprietary advantage by sharing their customer data with organizations in other industries. Cut off from personal data by new regulations, revenues from targeted ads could decline. User or customer information once freely shared with suppliers and other business partners could be curtailed.

In many countries, where data privacy and personal data regulations are not as restrictive as in Europe, organizations have been at the forefront of developing business platforms based on more liberal access to and use of data. But even in countries with looser regulations or enforcement of them, the expectation is that

On blockchain networks, permission to use data can be pre-programmed by the consumer for different situations.

restrictions will grow over time. For organizations that expect to operate globally, the strictest standard could become the default.[9] In China, the government is leveraging its access to citizens' personal data to develop a social credit system, which it plans to implement by 2020. Such a system would measure the overall "trustworthiness" of its citizens from both an economic and social perspective. The plan has generated considerable debate.

Changing consumer sentiment about the ownership of data – including who has the right to profit from it – has become another unknown (see Figure 2). Even outperforming organizations can't be complacent. Paradoxically, because they draw more heavily on customer data than their peers, they may be the most at risk from any new constraints on personal data.

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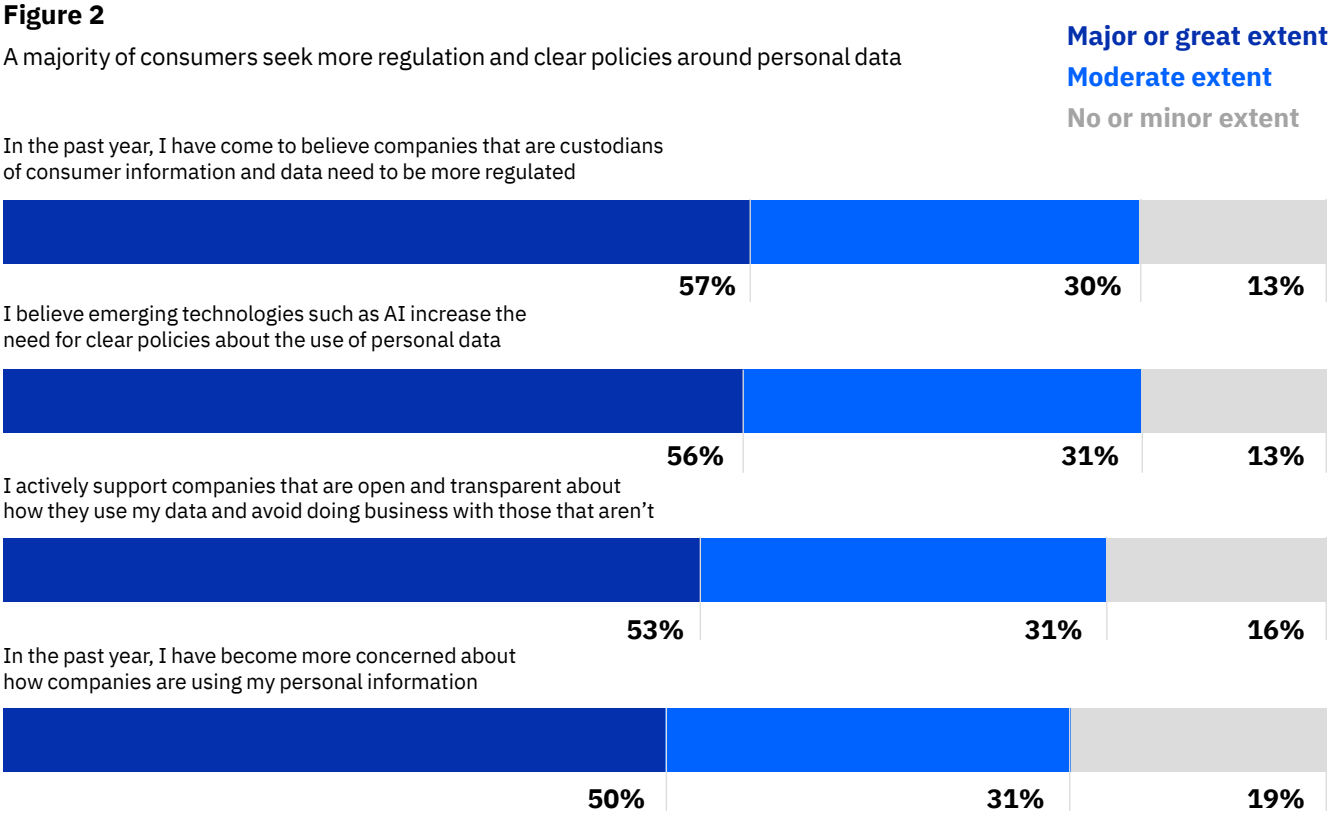
Figure 2

A majority of consumers seek more regulation and clear policies around personal data



Source: 2018 IBM IBV Consumer Trust and Data Survey.
Q. To what extent do you agree with the above statements?

Blockchain technology is particularly well suited to managing personally identifiable information, because it can be done without relying on a centralized control authority. Smart contracts on blockchains can embed rules that automate the opt-in or -out processes. They can define who has the permission to collect identity-related data, to what level of detail and for what use.

On blockchain networks, permission to use data can be pre-programmed by the consumer for different situations, including consent to the use of data for personalized offers, for example, versus consent to sell data to others. Vendors that hope to directly monetize data could incentivize permission by issuing micropayments or loyalty points to consumers on the blockchain with each use of their data.

Customers' attitudes are influenced by the norms and regulations in the region in which they live but are by no means uniform. For many, the tradeoff is whether they consider the use of their data to be exploitive or something for which they get value in exchange. Organizations benefit when they can prove that value, especially through robust personalization, and also prove how well they can protect it (see Chapter 7, "Win with trust and security").

Six of the leading banks in Canada came together to create a digital identity service that their customers can use to open accounts with other businesses, such as a cellular phone operator or a utility. The Know Your Customer (KYC) data that banks established to comply with regulations became the foundation for the customer's identity key. When customers use their digital identity at institutions outside the industry, the banks collect a fee.[10]

Concerns about data privacy and security, as well as complex cross-border regulations, are already constraining the use of personal data. If users know that personally identifiable information is theirs to command, they may be more likely to share it. Benefits could accrue to those organizations that have moved beyond mere compliance. Organizations that have committed to transparency and good policy are likely to earn the customer's trust, and with it, a new data advantage.

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Architect your business for change

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Most organizations have yet to develop an enterprise architecture, a conceptual blueprint that defines their structure and operations. Of those that have, almost half admit they're not very effective at the exercise.[1] In part, this is because enterprise blueprints often reflect accumulated history – the accidental aggregation of legacy choices made by the enterprise over decades.

Although they can expose current misalignment, most enterprise blueprints don't represent a future state. They don't constitute a plan for change, which should be their defining purpose. To become a Cognitive Enterprise, organizations are adopting new business platforms that can be a basis for enterprise architecture. Key points to consider include:

– The business platform intent will set the architectural shape and drive the target operating model of the Cognitive Enterprise.

– Enablement of agility and flexibility requires a few fundamental architectural choices to provide a practical frame to make progress – these choices relate to workflows, data, artificial intelligence (AI) and computing.

– Intelligent orchestration of open and hybrid architectures is needed across networks and ecosystems.

Architecture as operating model

Organizations can't get away with accidental architecture and unplanned growth any longer. The expectations of customers are too high. And the elegant, intuitive experiences customers anticipate exert new pressures on the application architecture and can be surprisingly hard to integrate into legacy systems.

As organizations begin to build out new business platforms, the pressures multiply. Architecting such a platform – unlike the "house-building" kind of architecture – is all about continuous change. The business architecture needs to align with the emerging technology architecture. Each change to an organization's legacy systems, each choice made about a new technology and how it is integrated with legacy systems, needs to be synchronized with the evolving target operating model.

Too often the business side of the house evaluates the architectural choices to be made in isolation – as the cost of enabling a new business project or a desired customer interface, for example. Paradoxically, it's the business functions that are most likely to be constrained by siloed thinking. And it's the business side of the house, not the technology team, that needs to step up to the challenge and reframe its approach.

Change starts in the C-suite. Instead of reviewing architectural roadmaps – or delegating the review to others – the C-suite itself should take responsibility for co-creating the evolution of their operating model, identifying and defining its central elements (see Figure 1). They can begin by thinking boldly and in partnership with their Chief Information Officer (CIO) to create a manifesto for change, beginning with the area of the organization that needs to operate as a business platform. They should then consider what aspect of the organization's architecture is constraining that platform's development or growth. Specifically, which parts aren't open or flexible enough?

Figure 1

Sixty percent of executives identify product/service differentiation as a central element of their operating model

Source: 2018 IBM IBV Winning Business Strategies Survey.
Q. What are the central elements of your organization's operating model?

Architecting a new business platform can be approached as a series of timely architectural choices. Processes need to be combined and aligned with new workflows. Business platforms are where legacy systems begin the journey to modernization, shift to the cloud for scale, and extend through application programming interfaces (APIs) and software as a service. This new architecture becomes the railway tracks on which the Cognitive Enterprise operates with full agility (see Figure 2).

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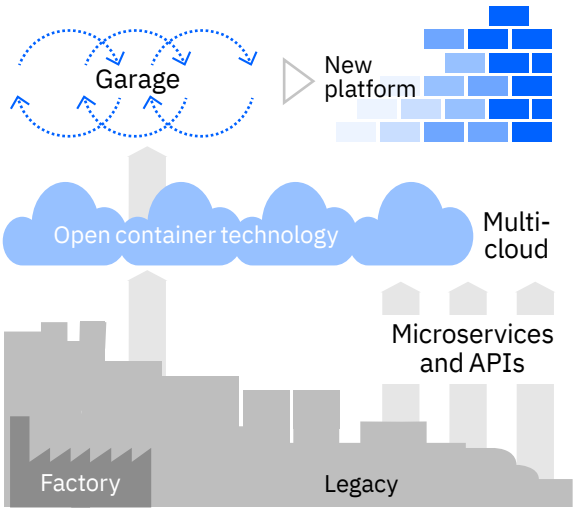
Figure 2

Hybrid multicloud environments and garage methods enable a lower-risk transition from legacy to new platforms in a synchronized manner – building platforms at the same time as legacy components are phased out



Out of the garage[2]

One oil and gas company's digital garages are going viral, spreading upstream, downstream and worldwide. At these garages, teams are advancing design-thinking and agile approaches to modernize the company's digital architecture and drive the adoption of new ways of working, especially the capacity to move at lightning speed. In short time and rapid succession, teams have applied design thinking to generate a stream of innovation and identify the top two or three things that move the needle. For consumers, they've developed mobile payment apps and for their sales force, apps populated with personalized content for face-to-face visits with customers. They've introduced powerful new risk management processes for operations and AI to provide greater insight. As they architect new platforms for agility and speed to market, they are modernizing their digital infrastructure with a focus on two areas. First, the reusability of components. And second, security by design, process controls so that developers' work is continuously tested for resiliency.

Modern digital architectures need to be equipped for the extreme openness and flexibility that business platforms require.

Framing the future – The layers of the architecture "cake"

Business platforms, designed for scale and speed, must be easily extendable to new constituents, and flexible in order to continuously change. To achieve this, organizations need to adopt two principles: loosely couple their architectural components and align with open standards.

The digital architecture of the modern enterprise isn't equipped for the extreme openness and flexibility that business platforms require. Today, legacy systems lock in already outmoded processes and workflows. Approximately 30 percent of enterprise applications have been migrated to the cloud, leaving more than 70 percent of computing workloads yet to be migrated.[3] Data is difficult to extract, let alone exploit for intelligent and immediate action. Siloes predominate.

To break down siloes and infuse agility and flexibility, organizations depend on a few key architectural choices to provide a practical framework for progress and innovation. Those choices relate workflows, computing and data.

Workflow
Historically, the components that make up workflows have been tightly coupled to an enterprise's architecture, which meant that usually a change to one component would cause another component to break, disrupting the workflow. An open architecture can liberate things. Instead of being hardwired, architecture can be loosely coupled. It will be up to the enterprise architect, in tandem with business leaders, to create well-defined integration points based on current workflows.

As organizations shift to business platforms, customer-centric workflows are often the basis for differentiating advantage. By shifting back-office workflows to as-a-service components, organizations can reduce costs and redirect investments to the core customer experience.

APIs were an early instantiation of loose coupling. Microservices, containers and serverless computing are newer techniques that facilitate, among other things, the continuous delivery and deployment of new workflows. Microservices allow monolithic applications to be broken down into single-use services – such as inventory, shipping and accounting for an online retailer – so that teams can work on them in parallel. Containers bundle microservices in such a way that they are portable. They can be easily automated and deployed to a wide variety of environments without modification. With serverless computing, organizations can write cloud-native functions that scale on demand and pay-per-use with no cost for idle time.

Computing
On business platforms, where ecosystems come together, so too do code and cloud.

If the future business platform is composable, organizations will want to leave their options open, and that begins with architecture. For most organizations, enterprise architecture should consist of an ongoing and dynamic synthesis of multiple platforms and clouds rather than the development of a single static infrastructure.

Most organizations have mission-critical legacy applications as well as data constraints that necessitate a private cloud. At the same time, they expect to take advantage of public clouds for cloud-native application development. Where once architects advocated hybrid cloud – a public-plus-private cloud – they now look to multicloud so as not to constrain an organization's options. Multicloud environments include more than one public cloud. Applications and capabilities often run best on different clouds, so a choice of public clouds is essential.

In order to retain optimum flexibility in a multicloud environment, organizations establish an orchestration layer to sit over the public and private clouds so that applications can be easily moved between clouds according to need. This orchestration layer also helps ensure that applications in the private cloud can be easily transferred to public clouds as constraints are lifted. Open standards make interoperability across platforms possible.

Data
The Cognitive Enterprise combines and scales vast quantities and types of data to determine its business strategy, offerings and operations. It widens its scope to include as much contextual data as possible – data that informs the organization's understanding of its customers' sentiment. Additionally, environmental data helps operations sense what's happening around them. And it applies AI to that data to automate and autonomize workflows.

Enterprise architects build conceptual, logical and physical data models to show what data is needed and how one piece of data relates to another (see Chapter 2, "Leverage the incumbent advantage in data").

On business platforms that include multiple parties, open standards for data transfer and governance become a critical endeavor. Organizations, for example, need to make decisions about who owns which piece of data and where it will reside. Enterprise architects also use process data to monitor and – with predictive analytics – refine workflows and the enterprise architecture itself.

In both cases above, the architect needs to ensure that data can be shared and accessible to all relevant parties – including customers and business partners – but also be bulletproof. Data must be architected so that all insights and intellectual property stay within the company, unless a company chooses to share them with trusted partners.

Design-thinking and garage approaches that put customers at the center and chart customer touchpoints help an organization evaluate its architecture and conceive its future. ATB, a financial services firm in Alberta, Canada, takes the garage approach in its Digital Innovation Lab, which is home to ATB 's design and digital experts. Here, ATB and its ecosystem partners, including IBM, combine design-thinking and agile teams to create innovative experiences for its customers. Together, the teams created a digital platform based on a multicloud strategy and open source technologies. Initiatives developed at the lab include Onboarding Express, which speeds up the process of opening an account, and ATB Prosper, an investment app.[4]

Intelligent orchestration – Architecture outside the four walls

Most organizations are likely to be composed of a series of business platforms, some of which they own and operate; others they participate in. The challenge: how to align this new business architecture (made up of multiple business platforms) to the new technical architecture.

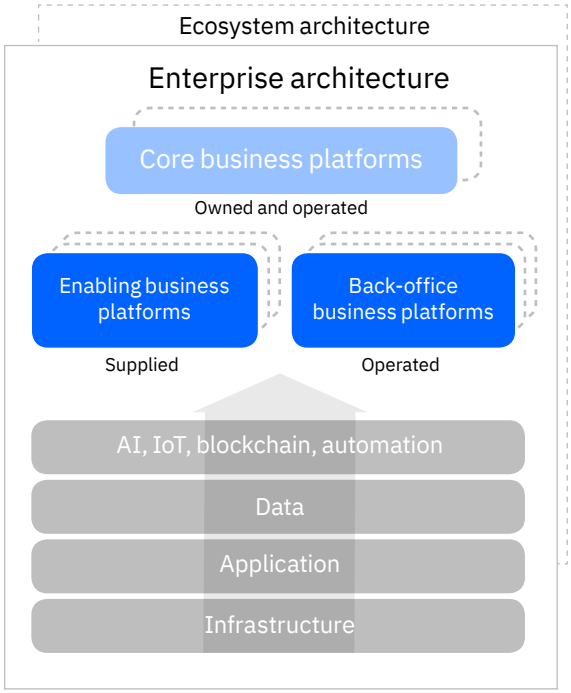
As organizations create value outside the enterprise by collaborating with other institutions, the term "architect" as a job description might fall short. Enterprise architects need to think more like an urban planner – building out a smart city – rather than the architect of an individual enterprise. Like urban planners, enterprise architects need to focus on creating shared value across an ecosystem and also on movement, facilitating the connections and flow of data between organizations.

The destination for most organizations is scale of both data and transactions. But enterprise architecture must take into account the increasingly fluid boundaries spanning an ecosystem. Because business platforms succeed in part by scaling fast and ahead of the competition, it's up to the platform owner to help ensure that new business partners can join the platform as effortlessly as possible. They must engineer the platform for frictionless connection across all architecture layers: infrastructure, application, data and exponential technology (see Figure 3).

A growing number of organizations have turned to blockchains as the platform connecting them to other enterprises. we.trade, for example, a blockchain network established initially by nine European banks, runs on the open Hyperledger fabric platform. we.trade enables efficient and near real-time financing for cross-border commerce. To create a joint operating model, the participating banks needed to agree on common standards for a range of business and technical issues, including compliance and security.[5]

Figure 3

The cognitive enterprise requires an open and flexible architecture in which information flows up and powers the exponential technologies that drive business platforms



Organizations can no longer afford to take a wait-and-see approach to determine what works for others in their industry, or which technology or service is going to "win." Enterprise architecture – like business strategy – must anticipate the future but also leave its options open.

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Redesign company workflows around AI

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Cognitive organizations operating on business platforms are often focused on being the very best in one main area, whether it's a customer-facing experience or an aspect of their supply chains. That ambition is achieved by rethinking strategic workflows. On a business platform, workflows aren't just automated, optimized and efficient. They're also agile and intelligent. They can scale with ease so that both human and machine learn continuously.

Instead of processes imposed on workers to direct their actions, artificial intelligence (AI) and exponential technologies are liberating organizations to reorient how work gets done. They reimagine workflows by orchestrating interactions between smart machines and even smarter humans across the organization. Key points include:

– Customer-facing workflows must be humanized, as well as automated, end to end.

– Adaptive operational processes and workflows will continuously learn and be self-aware.

– Platform workflows will be open, and enable and span ecosystems and networks.

The humanized experience

The bar on customer expectations keeps rising. Chatbots are almost ubiquitous. Augmented reality and touchscreens are transforming storefronts. Voice technologies, guided by intelligent assistants, are replacing online sites for shopping. Everything is configurable and has the potential to be personalized.

Customers, however, want something more. They expect to be engaged in ways that aren't just personalized, but also humanized. The humanized experience, founded in empathy and attuned to context – a customer's specific preferences in the moment – makes experiences irresistible. And cognitive organizations view improvements in customer-related metrics as the most important strategic rationale for adopting exponential technologies like AI (see Figure 1).

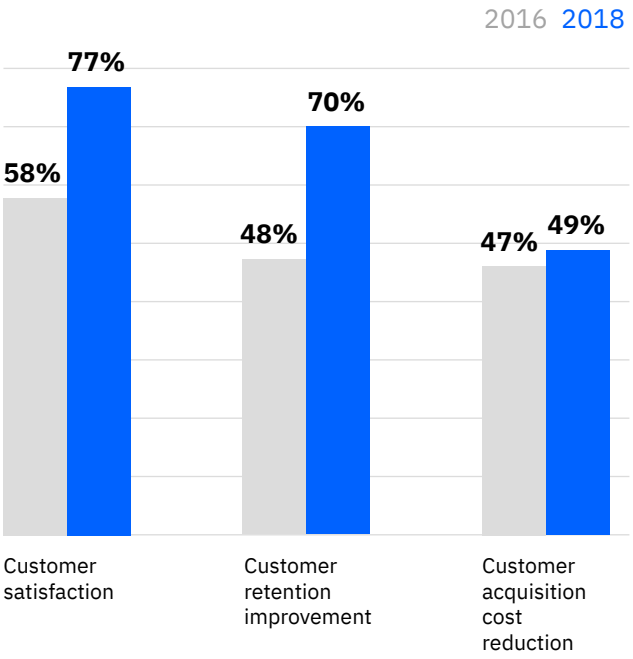
Most enterprises can now link data to people, but much of what they capture is still too vague to be useful on its own. Does the organization know, for example, whether a request was for the customer or on behalf of her mother? The demands on data to humanize the customer experience are significant.

Counterintuitively, the astute use of AI can deepen insights into what makes us human, as well as humanize the experience. Tone analyzers, for example, can read emails and tweets to determine if the writer is angry, frustrated or thrilled. Sentiment analysis, alongside traditional demographics, can improve the prediction accuracy for consumer preferences.

Knowing that Millennial foodies are often interested in artisanal food brands, Knorr, a food brand operated by Unilever, wanted to help ensure its big global brand also made it into their shopping baskets. It created the "Flavour Profiler" for the Knorr Love at First Taste campaign using AI technology. Modeled like a personality quiz, the profiler analyzes consumers' answers, classifies them into one of twelve flavor personality types and then serves up perfectly tailored recipes. Sitting at the core of Knorr's popular campaign, the Profiler has received 1.3 million visits, and was an integral part in driving a 12 percent increase in purchase intent among Millennials.[1]

Figure 1

Executives continue to rank customer satisfaction and retention as primary objectives of their AI investment



Source: 2018 IBV AI Survey. Q. What are the important value drivers for artificial intelligence/cognitive computing? n=5,001 total (financial outperformers included in figure).

The next great transformation of work extends well beyond engineered efficiencies to advance interactions with customers, whether the advice a customer needs is for a new coat or a mortgage. Instead of relegating AI to the automation of basic tasks and self-service, leading organizations deploy AI to augment employee decisions, help them interpret customer wants and interact with customers in ways that build trust. Decisions are supported at the edge, whether that's a salesperson on a shop floor or a customer service rep in a call center.

The astute use of AI can deepen insights into what makes us human.

The next significant opportunity may be to transfer the trust that arises most naturally in face-to-face interactions to virtual ones. In fewer than three years, 7.5 billion digital assistants are expected to be operating on behalf of consumers.[2] As more organizations learn to tap into and understand data that reveals human sentiment, digital advisors can become more like coaches to employees, students or athletes. Health assistants can respond with sensitivity to homebound seniors or patients in a waiting room.[3]

For data, analytics and AI to reveal and satisfy what's human, organizations often begin with a design-thinking approach. They don't jump to solutions or conclusions; they ask why first. They stand in the customer's shoes to explore every touchpoint, map the journey and identify gaps in the experience. They can – and should – draw on social, psycholinguistic and other unstructured data to create personas. They look for opportunities to build trust, the currency of the humanized experience.

Journey maps reveal when and for whom the digitization of any touchpoint makes sense. In one example, a Las Vegas hotel used customer journey mapping to determine a common pain point for its customers – the long lines at check-in. If fixed, this could provide an enormous impact on customer experience. The hotel turned to check-in and keyless entry by mobile app, but recognized that it had to do something more to keep its engagement even more responsive. It created an automated concierge for rebooking if the customer wasn't satisfied with the room.[4]

A personalized and humanized customer experience makes new demands on data. Its effect is felt keenly in redesigned workflows for customer services and sales, but also in supply chains, logistics and delivery, where promises to customers are made, kept or broken.

Self-aware operations

As organizations learn to contextualize data for better customer engagement, they've begun to adopt a similar approach for operations.

Where once operations were configured for efficiency, they can now be designed for responsiveness. For example, programs like Lean Six Sigma rely on historical data to advance continuous improvement and standardize processes, based on what worked well in the past. Traditional enterprise resource planning (ERP) approaches effectively stripped out waste and inefficiency, based on industry best practices. While ERP optimized operations, it also locked them in.

Workflow enabled by AI, automation and machine learning, in tandem with the Internet of Things (IoT), changes the equation (see Figure 2). Organizations can detect everything happening around them, from the movement of a person or a piece of equipment, to inventory turns or downed power lines. Organizations that quickly detect changes in the environment can optimize operations for situational awareness, including the unexpected. These new agile workflows can even become the inspiration for new business models.

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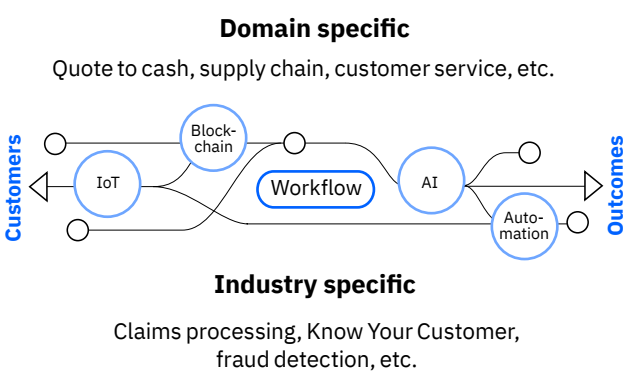
Figure 2

Domain- and industry-specific workflows must be reimagined to support the integration of exponential technologies



Fostering deeper learning through AI

Where once organizations engineered processes for efficiency and imposed them on workers to direct their actions, AI and exponential technologies are liberating humans to make better-informed decisions on their own. In many domains and professions, such as medicine, oil exploration or avionics, AI expert systems foster deep learning and problem solving. As a result, every role or profession can pivot from mining data and experiences for patterns – the machines can do that – to exploring further what those patterns mean.

With just-in-time and predictive optimization, real breakthroughs become possible, from the end of waste, whether it's errors or inventory, to the automation of fully dynamic processes. Self-driving trucks could balance their own loads to automated demand. Sales forecasting could drive real-time supply adjustments on the factory floor.

Analytics that predict when a piece of equipment is likely to break down or require repair already exist. So, too, does sophisticated modeling of weather events, which predict patterns that could slow down a job or make irrigation systems more intelligent. However, few organizations allow machines to make decisions – to act with some autonomy. Robotic process automation (RPA) is not enough. With AI, machines can learn from patterns and trends, and recommend changes and reconfigurations to their own workflows. In this way, "intelligent automation" is ushering in the Fourth Industrial Revolution.

To optimize operations for situational awareness, the networked connections of machines and devices will be the bare minimum. To respond with accuracy and speed, machines will need to be instrumented to produce data that humans can rely on for learning. With augmented intelligence on hand, for example, the maintenance crews at Korean Air are diagnosing and solving problems 90 percent faster – and can even handle issues as they occur in flight. What's more, they're able to turn insights into preventative actions by sharing what they're learning with original equipment manufacturers to improve parts and equipment.[5]

Tomorrow's customers will demand seamless experiences across organizations connected on platforms.

No matter how simple the system, organizations can't just automate and walk away. Even the most mundane repetitive tasks require human supervision of some kind. As organizations aggregate more bots and as interdependence becomes more complex, an orchestration layer becomes indispensable. The more complex the businesses, the more critical it is to both monitor and redirect bot activities. Humans must be able to respond to changes in areas such as regulations, shareholder needs, and business objectives – and to readily adapt workflows and processes. Managers must stay in control of the business and the customer experience to address new categories of risk and other challenges (see Figure 3). They have a duty of care.

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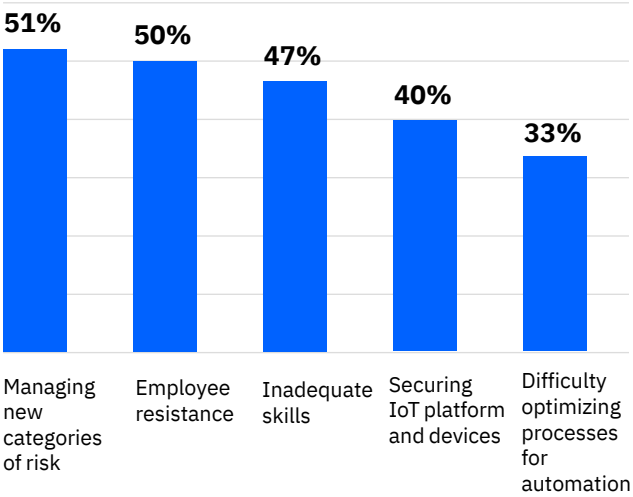
Figure 3

Executives identify the use of AI to optimize process/workflows as a moderate challenge



Source: 2018 IBV Winning Business Strategies Survey. Q. Which of the following present the greatest challenges to your organization's use of artificial intelligence/cognitive computing? Select up to 5. n=1500.

The peerless ecosystem

Today, customers expect seamless experiences across all the channels of an organization. Tomorrow, they will demand seamless experiences across organizations connected on platforms.

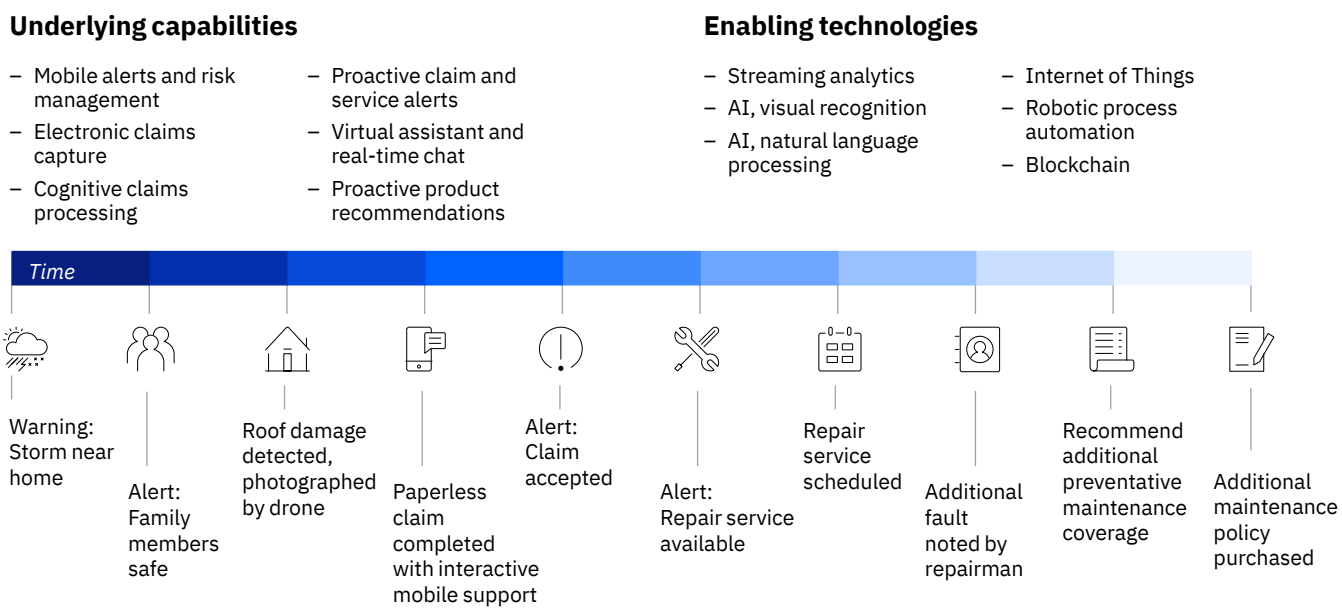
In a technology-enabled customer journey, workflows can be re-engineered to capture information at the source and then route it to other organizations for action. When a customer submits an insurance claim, for example, it could trigger a repair request and other notifications, saving the customer the time involved in filing paperwork and communicating with others (see Figure 4).

Novel ways to create value are coming into view. Simply digitizing interactions that have been largely paper-based because that was considered more secure is already having consequential effect. Shipping goods, for example, between just two ports can require sign-offs from more than 30 organizations or parties, and if a form is misplaced or lost, containers get stuck in port.[6]

New technologies like blockchain are quickly proving their worth in supply chains from the sourcing to the manufacturing, distribution and eventual recycling of products. Blockchain networks are tracking the movement of goods and their provenance to create new value from trust. For example, consumers can trust the coffee they buy was produced with fair labor practices. Manufacturers can be assured the fresh goods they ship are kept under the right conditions and don't spoil en route.

Figure 4

A customer journey made possible with exponential technology. Example: Insurance claims process



Source: IBM IBV analysis.

In the United States, Walmart and Sam's Club are requiring suppliers of leafy greens, such as spinach and romaine lettuce, to use blockchain technology. It was romaine lettuce that prompted massive recalls because of E. coli contamination. Using blockchain technology, Walmart will track each item as it moves along the supply chain. This allows the retail giant to pinpoint the exact origin of contaminated food in minutes rather than days, with the potential to save lives.[7]

A substantial opportunity is present for organizations to shape and lead a complete overhaul of the value chain by working together to create entirely new workflows – the next great wave of business change and the new backbone of business.

To learn more about how IBM can help, visit **ibm.com**/services/process and **ibm.com**/services/automation.

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Get agile, change fast and build things

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As organizations migrate to new platform models, boundaries blur and frictions fade, leaders are asking a deceptively simple but hugely consequential question: How fluid can we – and our workflows – become? Insightful leaders recognize that enterprise agility can become a foundation for corporate culture transformation, new ways of working and exponential growth in learning across the organization.

In the Cognitive Enterprise, agile teams span organizational boundaries – between business and IT as well as functions. As they do, new possibilities emerge in three key areas:

– The DevOps of business change needs to be implemented.
– Strategic agility is about aligning your increasingly pervasive agile activities to core platform intents.
– Operational agility is about “flow” and removing bottlenecks in workflows.

Agility, after all, is more than execution; it's a means to discover and evolve new strategies.

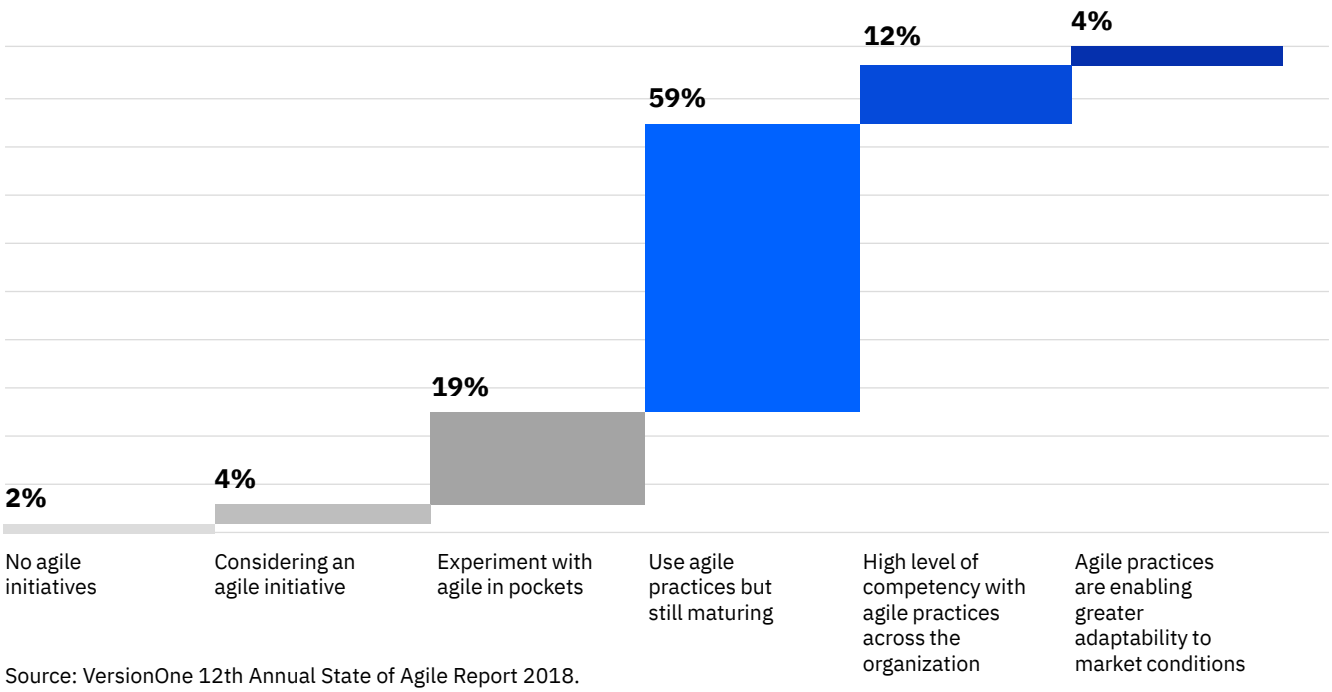
Leadership: Implementing the DevOps of business

It's frequently said that enterprise agility is not something an organization does but something it achieves. In other words, enterprise agility can't be reduced to the methodologies and tools associated with agile and lean methodologies, although it is inspired by the principles that evolved from them. How is enterprise agility achieved today?

With the advent of DevOps, the making of things became integrated with the delivery and maintenance of things, fundamentally changing the approach to software and services. DevOps extended agile principles beyond the development of software to the delivered service in its entirety, prescribing close collaboration with customers, product management, developers and quality assurance to rapidly iterate toward a better product. Today, those practices are again extending, this time to include the "conceiving" of things – the formulation of strategy, including exploration of the customer interactions at the heart of an organization. Most organizations have begun to adopt agile but are still maturing their capabilities (see Figure 1).

Figure 1

While 16 percent of companies report a high level of competency with agile practices across their organizations, the majority are still maturing



Source: VersionOne 12th Annual State of Agile Report 2018. https://explore.versionone.com/state-of-agile/version-one-12th-annual-state-of-agile-report

Once operating at agile scale, organizations have the wherewithal to take on the DevOps of business – the agile execution, delivery and continuous iteration of the business platforms that confer differentiating advantage today.

The requirement for change has two components: teams and leaders. Teams operate by a set of design principles that help lower the center of gravity, empowering smaller teams to get to client-valued outcomes more quickly. But experience shows that change won't necessarily happen if an organization's leaders have a traditional hierarchical management mindset. The new model of working requires a new type of leader.

It is up to the leaders of agile organizations to establish one of the most fundamental agile principles: being "tightly aligned and loosely coupled." This requires leaders to create a strong sense of purpose – a North Star for their teams to follow. Only then can they liberate employees to become problem solvers and partners in iterating the enterprise's strategic direction. Leaders of agile organizations encourage experimentation and fast failure and value employees with the fortitude to push against established norms.

Too often, when changes start to take root, an organization's middle management reverts to the less risky status quo and protects hierarchical norms – like antibodies attacking an infection. But enterprise agility requires reinvention – not protection. As leaders drive agile thinking down through the management layers, they often find intervention is most needed in the middle levels.

One of the most difficult changes for middle managers and even executives is becoming more open to learning. Many organizations are sitting on troves of data but only utilize it for basic decision making. Instead, they should be mining the data for discovery. Agility, after all, is more than execution; it's a means to discover and evolve new strategies. Moreover, it requires leaders with the courage to change direction based on what they learn. According to a Korn Ferry study, organizations with the highest rates of learning agility among executives achieved 25 percent higher profit margins compared to peer companies.[1]

The good news is that CEOs have learned these lessons well. Asked to rank the capabilities most instrumental to their organizations' success, CEOs cited two characteristics above all others: a new willingness to experiment and the support of empowered employees.[2] That's an important start to becoming an agile enterprise.

Strategic agility: Innovating with customers on business platforms

Business platforms establish a foundation that accelerates the flow of both ideas and data – the inspiration and spark for innovation. The organization and its strategy become fluid, able to generate a continuous stream of insights and assess, experiment and adapt.

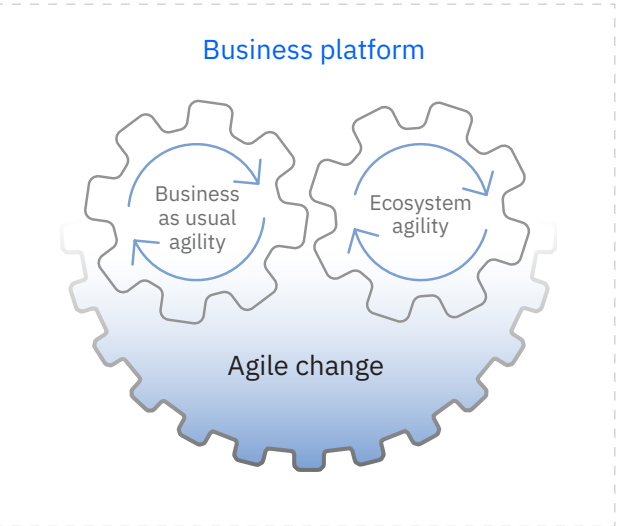
Some organizations have already applied the concepts of enterprise agility to functional domains such as finance and human resources. But they've done so primarily in the pursuit of efficiency. Leading companies that break free of this mindset can derive greater value by expanding the focus from operating costs to areas like enhanced customer experience and ecosystem partnerships, for example (see Figure 2).

Manufacturing at L'Oreal[3]

L'Oreal has grounded its newfound agility in design thinking, reducing its lead time to develop new products – of which it can average 1300 in a year – and also radically make over its manufacturing centers to flexibly handle so many product changes. For example, it now has manufacturing lines that can switch over to about 20 different formats in less than 5 minutes. That agility, however, introduces new complexity for the operators managing the lines. L'Oreal can now pull real-time data fed from its production facilities to a Watson Internet of Things (IoT) platform onto a mobile app. Operators can now walk the line with app in hand, being fed the information they need at the moment they need it, to manage the changeover in product lines and anticipate critical tasks related to quality and safety.

Figure 2

Broad and deep agility requires new business platforms and culture change across the entire ecosystem



Customer-aligned agile teams can balance the need to satisfy customers today with the demand to accelerate discovery of unmet customer desires. Cross-functional teams empowered to make decisions can enhance customer intimacy. When these teams are also free to directly collaborate with customers, they can become a source of innovative services and products.

Consider an Asian electronics manufacturer, a leading innovator and a fast-growing provider of appliances worldwide. In the words of its CEO, the company enhanced customer intimacy by creating "zero distance" between its customers and employees. Its teams are fully aligned to customers, empowered not only to make decisions but also manage budgets and make new investments. Moreover, this company excels at co-creation. Any customer can propose new products that are voted on by a community of customers, suppliers and employees.[4]

Teams have to be empowered to do something about the logjams they confront and to do so with dispatch.

When customer-facing teams span the full functions of the organization, including operations, they can be fully responsive to customers (see Figure 3). An added and not inconsequential benefit from cross-functional teams is information spillover. Team members naturally share insights, ideas and data that otherwise might be trapped in functional siloes. They learn on the go, and they learn from each other – and should be encouraged to teach and coach each other (see Chapter 6, "Reinvent your workforce to ignite talent").

In the IBM Global C-suite Study, customer-aligned agility stood out as a leading indicator for the capacity to change and adopt new platform business models. Seven in ten leading organizations cultivated autonomy and continuous learning to establish a more fluid cross-organizational work structure for their teams. Four in ten of all other organizations did so.[5]

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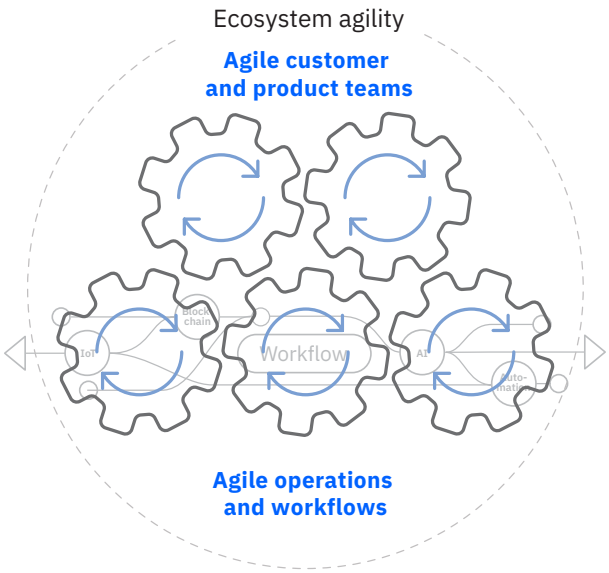
Figure 3

The Cognitive Enterprise seamlessly brings together customer-focused teams with operations and workflows to achieve a new level of agility



Operational agility: Work that finds its flow

In the first machine age, the science of management was born in the factory. The guiding principle was to measure each person and each machine according to utilization. This optimized the piece-parts of production but failed to harmonize the whole.

In the information age, in which we are augmenting people with machine and human expertise with AI, a new measure for operations has emerged – flow. Flow measures throughput, and a focus on flow naturally can lead to both peak efficiency and peak productivity.

Flow, as broadly defined, is about seeing bottlenecks that impede an organization's progress as they emerge and then being able to take swift action to remove them. To do so, teams must be able to visualize the work they're doing in its entirety, even if it cuts across geographies, business units, or outside vendors and suppliers. A bottleneck could be a person juggling competing priorities, a process that has broken down or even something structural like the organization's information architecture.

Teams have to be empowered to do something about the logjams they confront and to do so with dispatch. Bureaucracy may be the most common – and certainly the most pervasive – bottleneck. Agile teams are empowered to make decisions that advance their work and are free of the middle management constraints that impede work flow and add costs.

When work hits an unexpected jam, agile teams evaluate tradeoffs and prioritize according to customer value. On an ongoing basis, they learn how to limit the work in progress. For example, teams might curtail the amount of multitasking they do to speed up their completion and initial quality rates. Other benefits include the ability to manage changing priorities, project visibility and business/IT alignment (see Figure 4). Both customer and team adhere to clear, mutually agreed upon criteria for any exceptions that need to jump the queue. Such methodologies and tools from agile and lean principles support the shift from utilization to flow.

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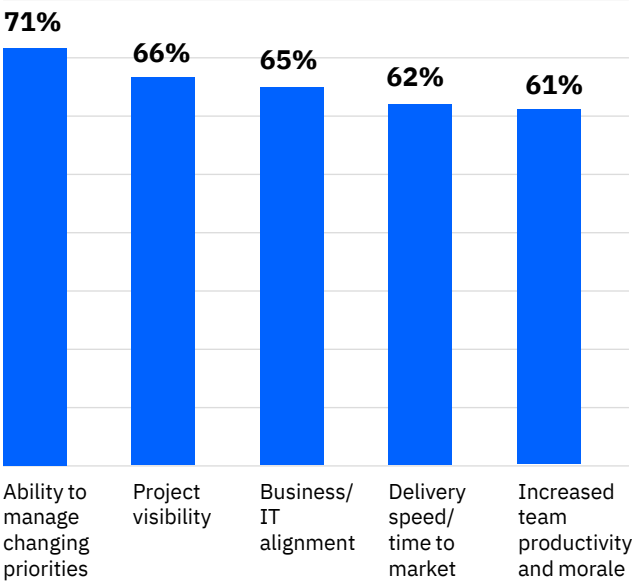
Figure 4

Adopting agile is linked to improvements across operations and team management (percent respondents)



Source: VersionOne 12th Annual State of Agile Report. 2018. https://explore.versionone.com/state-of-agile/versionone-12th-annual-state-of-agile-report

Beyond methodologies, the surest way to achieve flow is to reorganize teams. For operational agility, this typically consists of cross-functional teams that are formed around products or services. The nature of these teams establishes end-to-end visibility and in-the-moment accountability, which lowers the risks of poor decision making.

As organizations migrate to new platform business models, they're more likely to share a platform with an ecosystem partner and even collaborate to create new value for their customers. The challenge becomes how to align agile teams for common purpose.

The principles for agile teams needn't change; they simply must be in synch. The bigger challenge is aligning the culture, appetite for risk and other intangible factors that influence team behavior. To begin practicing ecosystem agility, organizations may choose to start with value streams such as supply chain where strong relationships with partners already exist.

For some time, agility was the exclusive domain of IT, characterized by small-team scrums and sprints. Agile principles such as flow are now being applied to any process or product that requires continuous improvement. Business platforms, which support well-integrated and cognitively enabled workflows, are becoming, in turn, the ideal habitat for agile leaders and teams.

To learn more about how IBM can help, visit **ibm.com**/services/business/agile.

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Reinvent your workforce to ignite talent

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The skills shortage doesn't show any signs of easing up. Instead, as more companies adopt business platforms as the core of their operations, the need for new skills and continuous re-skilling is accelerating. As companies strive to succeed on business platforms, to respond with innovation and speed to new possibilities, one thing has become clear: Everyone is competing with everyone for talent. The 2018 Conference Board C-Suite Challenge and the most recent IBM Global C-suite Study both cite people skills as one of the top challenges CEOs face.[1] The issue has become so dire that nearly half of organizations say they don't have the talent they need to execute their business strategies.[2]

Organizations successfully navigating this new environment are fundamentally reshaping how they manage skills, talent and culture:

– New business platforms and workflows require new and ongoing skills attainment.
– Artificial intelligence (AI) is enabling skills inference, transforming workforce management and learning.
– Agile teaming is the new paradigm of work, supporting rapid skills transfer and development.

The half-life of skills is shrinking.

Skills first

As the talent shortage grows deeper – driven in part by exponential technologies like AI – and industries continue to converge at a rapid pace, organizations are competing for resources in a very shallow talent pool. This includes but is not limited to the need for technical expertise (see Figure 1).

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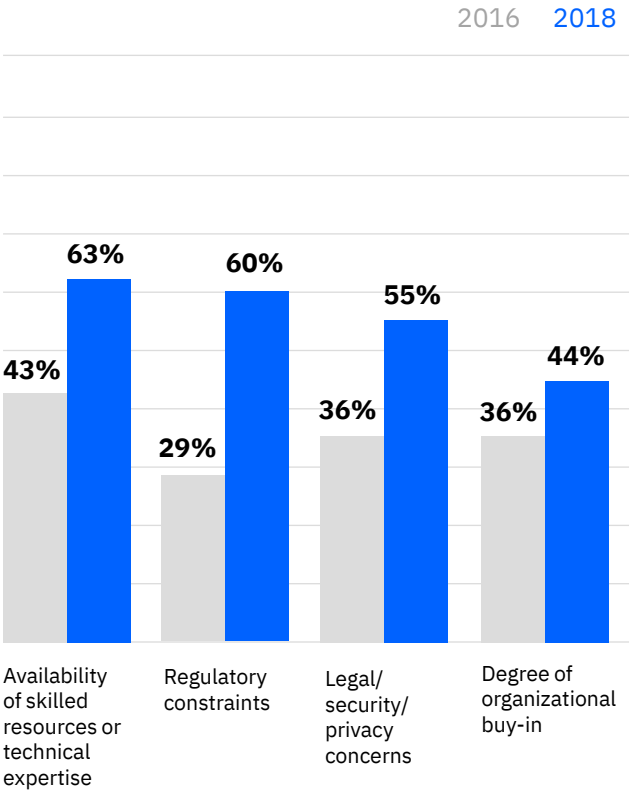
Figure 1

A growing percentage of executives identify the availability of skills and expertise among the top barriers to implementing AI



Source: 2018 IBV AI Survey. Q. What are the top barriers your organization faces in implementing artificial intelligence? n=5001.

On top of this, the new technology-enabled workflows at the heart of the Cognitive Enterprise are driving fundamental reassessments of the skills and expertise that organizations will need. As the half-life of skills continues to shrink, most organizations recognize that hiring is not a sustainable solution.

Indeed, it is becoming clear that every organization will need to develop an internal capability to continuously develop skills to stay ahead of the half-life of skills relevancy. Today, most organizations are operating in the dark when it comes to skills; they don't know the skills they have, let alone what will be needed just around the corner. AI-enabled systems can provide the business with a deep understanding of what skills the enterprise may require now and in the future – and also shed light on the availability of those skills internally and externally. Even so, it can be difficult to keep up as the skills available and needed change with increasing frequency.

The process of "re-engineering" skills is not a one-and-done exercise. To get the skills needed for the agile teaming and integrated workflows characteristic of business platforms, organizations must embrace continuous learning as well as new workforce planning tools. Skills gap analysis, as well as a review of the programs for hiring, training and managing talent, should occur frequently as a joint exercise between functions – not just as an HR endeavor. New AI tools and systems now make this level of analysis possible. Organizations can learn from the challenge professional services firms have. They're continually trying to size and scale their practices for market relevance. To do so, they're focused on skills assessments, training and development as the core of their business.

Using data from an organization's HR systems, its social and collaborative spaces, and other sources, AI can infer which skills are available with significant granularity. As a result, organizations are developing talent frameworks in which they curate skills profiles based on their specific requirements as well as industry standards. If they have access to deep data sets, both internal and external, organizations can even associate specific skills and competencies with outcomes and predict which skills will be important in the future.

Learning should be both continuous and deeply personalized.

For example, Goodwill North Georgia deployed an AI-enabled talent framework to define success for 38 different job roles and assess the skills it would need in the future. The organization went on to develop effective training and learning programs and shrink its skills gap by as much as 30 percent.[3]

Once organizations understand with precision the skills they have and those they need, they can begin thinking of skills as the plumb line that runs through every aspect of their management system. The key ingredient for this is skills transparency. This involves communicating to employees and their managers the skills levels they have attained, the desired skills level and rate of skills improvement for performance in the role, and the skills that are in demand and declining in demand in the enterprise. When organizations transparently integrate skills into hiring and performance criteria and tie skills attainment to pay increases, promotions and career opportunities, employees are incentivized to build and develop the right skills.

AI tools can also be useful in managing internal mobility. Most organizations consider previous roles as the prerequisite for moving to a new one, similar to the approach often used for external hiring. Once an organization shifts to a skills approach, AI-enabled coaching tools can suggest potential new roles based on whether an employee possesses skills similar to others who have successfully performed in that role. In this way, AI can link people to jobs they might not have thought about and, armed with new knowledge about what it takes to succeed, employees are motivated to take on new skills and tasks. That kind of confidence is critical in an environment that favors innovation and speed, exploration and iteration. It can also help reduce employee concerns about adopting AI in the workplace.

The new learning organization

Organizations can't hire for skills fast enough to keep up. But humans are more than the skills they've acquired. As the cultural anthropologist Mary Catherine Bateson observed, "We are not what we know but what we are willing to learn." Instead of hiring based on specific technical or professional skills, some organizations are learning to hire based on curiosity and aptitude – the capacity to learn, stretch and reinvent oneself. These enterprises embed learning into every aspect of workflow so that employees can learn continuously and in the manner that suits them best.

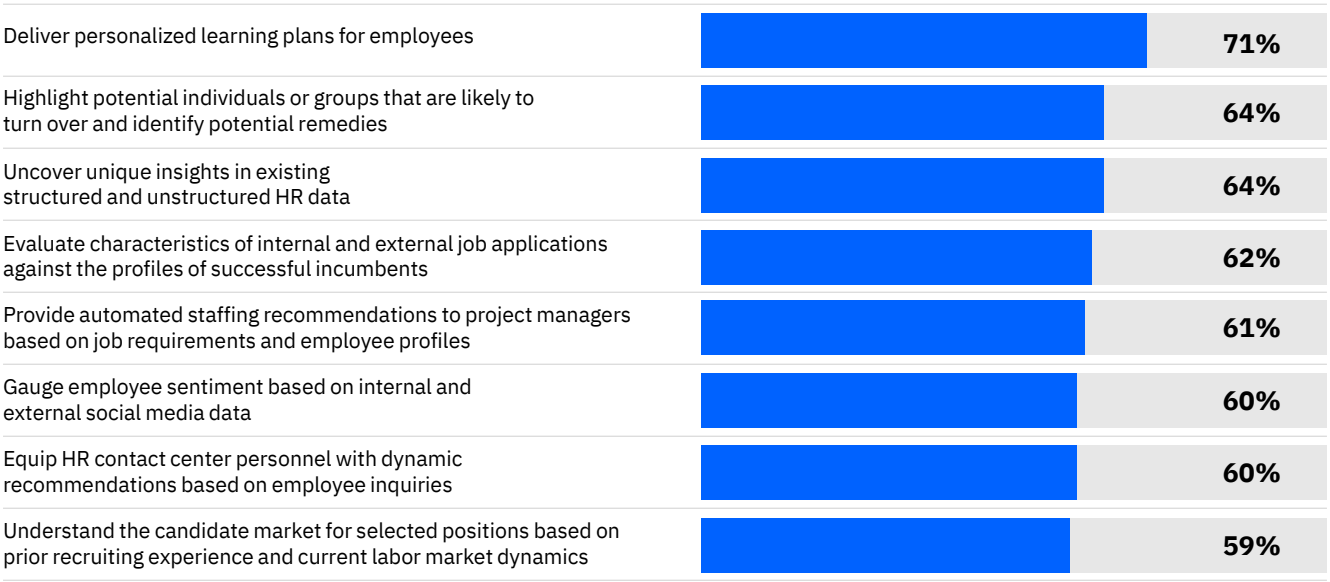
Thanks to AI, even machines are learning, and as humans and machines learn together and teach one another, a culture of exponential learning takes off. Given this evolution, organizations are embracing a new sense of what's possible. An exponential learning culture emphasizes perpetual, ultra-rapid skills development and the intentional design of interactions to learn side by side and as a part of employees' customary routines.

An essential component of the new learning paradigm is the recognition that learning should be both continuous and deeply personalized. Employees expect experiences at work that are contextualized to the moment.

That means anytime, anywhere access to learning – education embedded in the company's workflows and served up when and where the employee needs it most. Learning systems should be consumer grade – meaning both consumable and self-directed – as well as personalized (see Figure 2).

Figure 2

HR executives envision a way to rapidly close the skills gap: personalized learning



Source: IBM 2018 Chief Human Resource Officer Study. Q. How valuable would the following capabilities be to your enterprise in the next 2-3 years? Percentages represent the number of respondents who selected 4 or 5 on a 5-point scale.

Just as it can with customer experiences, AI can help organizations personalize employee experiences. Personalized learning draws on demographics like job role, geography and business unit or function, as well as the employee's interests, objectives and preferred approaches to learning. AI solutions can suggest content tailored to the individual employee, effectively curating a personal, on-demand curriculum for every learner in the enterprise. And by connecting to external sources, AI-enabled learning platforms can help organizations ensure their workforces are accessing the most relevant learning materials at all times – as well as mitigate the risk of AI skills and expertise becoming an obstacle to adoption.

In a world where employee experience rules, organizations must also work to cultivate experiential, peer-to-peer learning. These kinds of programs emphasize skill building directly from peers and teammates as part of an employee's daily experience. To succeed, the organization's culture and rewards system will need to emphasize accountability. Every individual becomes responsible for upping the game of the team, helping others build their skills.

Finally, as the Cognitive Enterprise begins to adopt advanced technologies such as augmented and virtual reality to improve the customer experience, it can – and should – apply them to create more immersive learning environments for the workforce as well. This is particularly important in industries that rely on physical interactions, such as healthcare and manufacturing, and also appeals across generational divides.

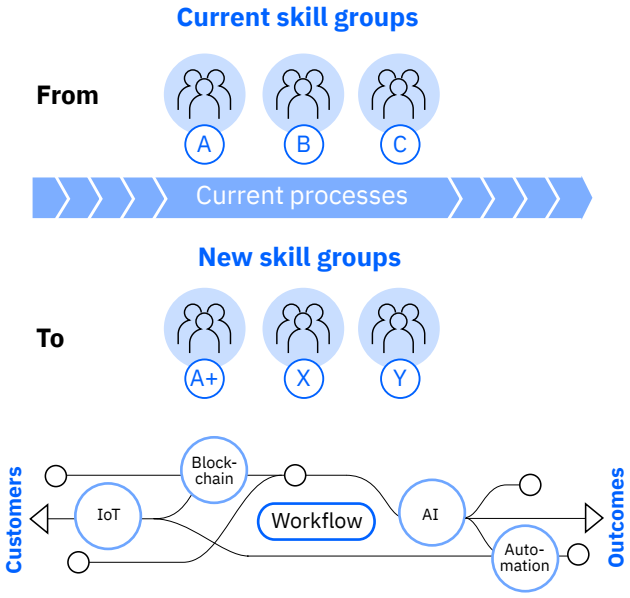
Working and learning as teams

Increasingly, organizations on the path to becoming a Cognitive Enterprise are flattening their hierarchical structures in favor of agile and empowered teams. In the United States, eight of ten employers now hire based on the applicant's teaming and problem-solving abilities.[4] Effective teaming is how self-directed skills development and learning become baked into the culture. Managers and team leaders, however, continue to have important and ongoing roles. Chief among these may be ensuring that teams and the workflows that support them are organized for optimum effect (see Figure 3).

From an organizational perspective, the sum total of skills may be less important than how the skills are deployed. For example, it's widely recognized that teams with diverse but complementary skills outperform and out-innovate more homogeneous ones. Managers with a deep view of each individual's skill set could assemble teams with the requisite skills to accomplish specific tasks, from solving short-term problems to serving a specific customer.

Figure 3

As the workforce develops new skills, the makeup of teams can change more dynamically, enabled by intelligent workflows



Because individuals on teams naturally learn from one another, managers can design and reorganize teams so that learning becomes viral. When a team member becomes proficient in a certain area, for example, he or she can move to a new team to "circulate" the learning.

Teams with diverse but complementary skills outperform and out-innovate more homogeneous ones.

Approaches adopted for agile teams emphasize learning in new ways, especially through reflection on doing. Team leaders and coaches share feedback daily or weekly. In some cases, that continuous cycle of feedback is captured and shared with managers or coaches that sit outside the team to reinforce and support employees' ongoing skills development. Learning sessions are organized as brief sprints, leaving time for employees to test new skills on the job before moving on to new opportunities to extend their learning.

When the skills inferred by AI and experiences logged by employees are shared on internal platforms, employees can reach out to each other for help, guidance or new opportunities. Expertise platforms such as these create an additional incentive for employees to take responsibility for keeping their skills current.

New skills are essential for business platforms to effectively integrate people, workflows, exponential technologies and data to deliver new outcomes. Re-skilling approaches aligned with business platforms are an essential factor to success, as they provide both the purpose and the mechanism for sustainable learning and skill growth in the Cognitive Enterprise.

As agile practices move beyond IT to enable enterprise-wide agility supported by customer-centric workflows, leaders are being asked to empower teams, create transparency and transform their corporate cultures to become more open (see Chapter 5, "Get agile, change fast and build things"). Culture, of course, is notoriously difficult to change. One approach to changing culture is to think of it in terms of the employee experience. Employees, like customers, have new expectations for how they're engaged.

Data, analytics and AI can help organizations understand those employee expectations and also how to meet them. Much as organizations do now for their customers, design-thinking techniques can map the "employee journey" to understand what motivates employees and how they experience their work environment.

Not surprisingly, when most companies review the pain points that exacerbate their employees, performance reviews stand out as particularly dissatisfying. Best practices include incorporating peer and 360-degree feedback. Also, disbanding annual objective setting and performance reviews in favor of more agile approaches allows employees to update goals and solicit feedback iteratively during the year.

Agile teams are motivated by an organization's purpose and a clear understanding of their role in it. By linking skills and learning, career development and employee experiences to that purpose, organizations are learning how to empower teams – and the individuals that comprise them – in entirely new ways.

In the Cognitive Enterprise, business platforms are constantly evolving to create new value for customers – and do so by helping to enable new ways of working. Agile teaming and deep collaboration are foundational. Employees inspired to continuously seek out new skills are the spark.

To learn more about how IBM can help, visit **ibm.com**/talent.

7

Win with trust and security

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Chief Information Security Officer,
IBM

Mary O'Brien
General Manager,
IBM Security

Security has become something of a tug of war – a battle between the need to create frictionless customer experiences and also help ensure strong authentication of transactions. Excessive caution constrains legitimate activity, impacting the bottom line and customer engagement. Too little caution is also costly and not just in a financial sense. Customers' trust that an organization will safeguard their data has become a compelling expectation. Organizations have to respond appropriately.

Combined with the right talent and governance, artificial intelligence (AI) can help accelerate a shift in cybersecurity, turning what was primarily a defensive proposition into a proactive one. In attempting to make such a shift, organizations should consider three important guidelines:

- Security of the business platform will be critical to its trust and longevity – but companies need to balance this with frictionless customer and employee experiences.
- Organizations must secure both the human and machine elements along key workflows and data sources.
- The ecosystem of business platforms requires an open network approach to security across all parties, driving collaboration and insights at speed.

Business leaders depend on seamless flows to move quickly with foresight; security can't hold them back.

Speed and insight for trust

On business platforms, transparency and trust are the hallmarks of close customer relationships. So, too, is constant collaboration – which features workflows that span enterprises, data that flows easily, and friction-free interactions with customers and partners alike. Business leaders depend on these seamless flows to move quickly with foresight; security can't hold them back. Instead, security teams must respond to a new challenge to anticipate, manage and respond to risks at warp speed.

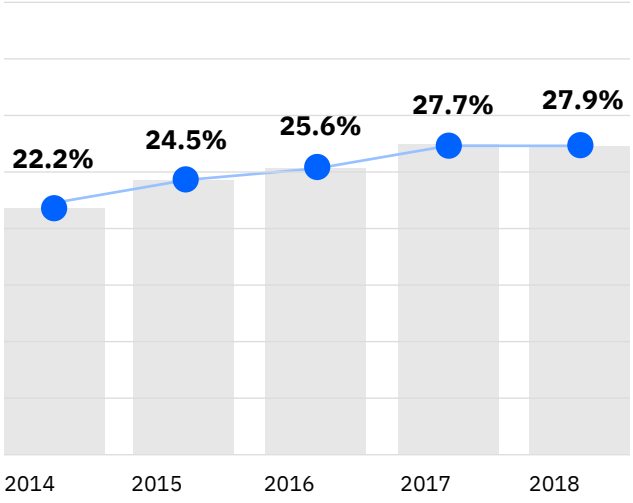
As the volume of network connections and associated cybersecurity threats continues to grow, the capacity of traditional cybersecurity approaches is severely strained. On average, security teams sift through more than 200,000 security events per day, and over 20,000 hours per year are wasted chasing false positives.[1] With the probability of security incidents increasing (see Figure 1) and regulations dictating how data must be secured also expected to grow in number, simply keeping pace will be a challenge. The introduction of AI technologies into security operations centers will be critical to protect the Cognitive Enterprise and its assets.

Traditionally, organizations have secured their data by identifying subsets that they consider their crown jewels and optimizing security efforts to protect that data. The Cognitive Enterprise, however, extracts value – and intellectual property – by analyzing heterogeneous data. This vastly extends the volume and types of data it must secure.

Most security tools focus on analyzing and detecting threats in structured data. But today, unstructured data from blogs, articles and videos adds important context and, increasingly, an opportunity for business advantage. AI helps cybersecurity professionals interpret, learn and process the vital intelligence found in unstructured data and respond to threats at a speed and scale previously unimagined.

Figure 1

In 2018, the global average probability of a data breach was nearly 28 percent



Source: 2018 Global IBM Ponemon Cost of a Data Breach Study. https://www.ibm.com/security/data-breach

Moreover, the threat data shared by cybersecurity professionals across industries is often itself unstructured. Applying AI and machine learning capabilities to this threat data exponentially increases security professionals' knowledge. No matter the approach, establishing trust in an ecosystem requires a holistic view of integrity – data, workflows, and the people who interact with the organizations' systems (see Figure 2).

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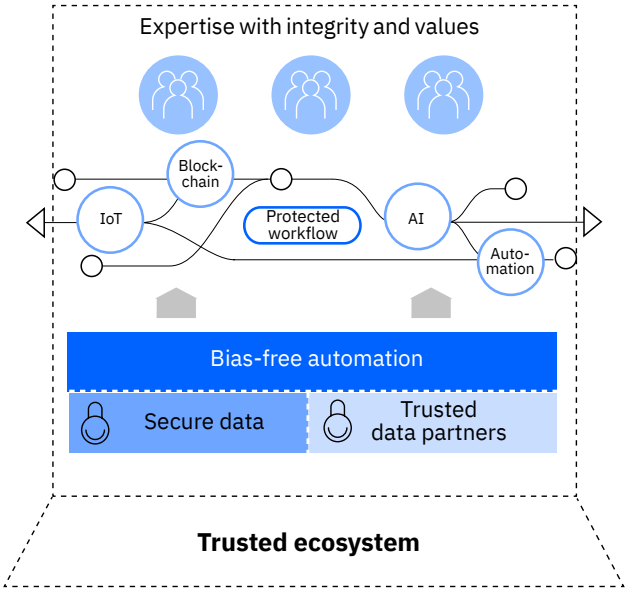
Figure 2

Building a trusted ecosystem requires a comprehensive security approach that addresses data, workflow and cultural implications across the ecosystem



Security through human and artificial intelligence

Traditionally, AI and other technologies applied in cybersecurity have been used to detect threats. More complicated tasks associated with diagnosis – understanding what kind of attack took place, for example – as well as the response to an attack, are processed manually. The scale and complexity of emerging threats and continued shortage of skilled professionals present a challenge. It's essential that enterprises empower their cybersecurity teams to use AI and other technologies more effectively to advise and guide behavior, prevent and detect threats, and accelerate and automate resolution once a threat is detected.

Throughout the Cognitive Enterprise, employees increasingly interact with technology-enabled solutions and services. Whether with malicious intent, or through accidental or erroneous action, employees can create vulnerabilities that threaten the security of the enterprise. Similarly, as enterprises continue to rely on huge volumes of data, these data flows become vulnerable to exploitation using smarter, faster, more potent tactics.

As communication across hybrid deployment models and API-linked services increases and algorithms automate business processes, the technology itself needs greater protection. AI-enabled business functions can become targets through manipulation of data, reverse-engineering and even training bias. Cybersecurity professionals must anticipate the malicious use of AI across all these scenarios and consider the risks associated with new business models, including the scaling effects of cross-industry platforms.

Providing a seamless, security-rich customer experience[2]

For an international bank, cybersecurity is an issue that extends far beyond core IT systems. The proliferation of digital channels, with transactions being performed on multiple mobile devices, creates vulnerabilities across an ecosystem of customers and partners. The bank needs to monitor activity on endpoints to prevent unauthorized access, respond quickly if an incident is detected, and train employees and customers to guard against the constantly evolving tactics of cyber criminals, rogue employees and human error.

Using machine learning and behavioral biometrics, the bank's cloud-based security solution continuously adapts to increasingly sophisticated attacks, monitoring for patterns that stray from normal customer behavior. It analyzes changes in location, device, access patterns and even clicks and mouse gestures, relentlessly watching for the telltale signs of fraudulent activity and malware. The solution changes the way the bank thinks about security and helps it focus on customer awareness as part of its cybercrime strategy.

The solution has helped the bank provide a seamless and more secure customer experience without creating friction in the authentication process. It has also reduced the number of false positives by 50 percent, cutting the amount of time spent pursuing unnecessary investigations and allowing staff to focus on real threats.

Cybersecurity professionals using AI-enabled tools have already begun implementing countermeasures designed to enhance effectiveness while detecting and thwarting AI-enabled attacks. AI-enabled agents can be used to provide security and nonsecurity professionals with access to role-based information and decision-making support in real time. With this guidance, employees across the enterprise can learn to perform their business tasks in a more responsible, effective and secure manner. Machine learning capabilities can rapidly process large volumes of data and detect suspicious activities and behavioral patterns. This can include outliers – activities that fall outside the range of normal – that may indicate malicious, accidental or erroneous behavior.

Risk-based authentication and biometrics can help prevent breaches, and several tools now focus on distinguishing human-like behavior, such as keystrokes and mouse movements, from machine or remote-controlled behavior. For example, the latest mobile devices are capable of tracking dozens of biometric parameters, including pressure, swipe length, and typing speed and precision, to continuously validate user identity.[3]

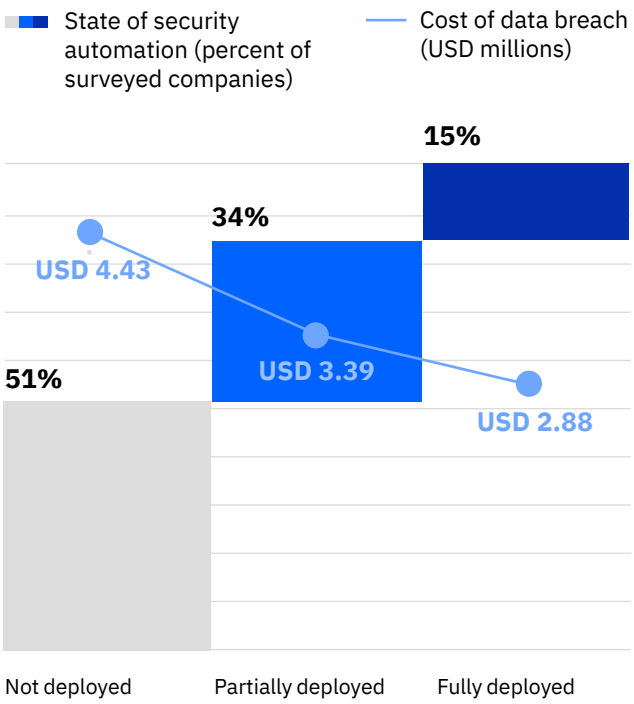
When a data breach, ransomware attack or other security incident does occur, human expertise augmented with machine intelligence across the threat lifecycle helps enable a faster, more precise and more efficient response (see Figure 3).

To stay ahead of malicious actors equipped with advanced technologies, it is important to develop and leverage a robust security toolkit. This includes conducting rapid and continuous testing with working code implementations informed by up-to-date data on recent attacks and defenses.

Connected enterprises should participate in or lead the broadest possible orchestration of cybersecurity.

Figure 3

Security automation decreases the average total cost of a data breach by over USD 1.5 million



Source: 2018 Global IBM Ponemon Cost of a Data Breach Study. https://www.ibm.com/security/data-breach

Cybersecurity professionals are under intense pressure to continuously and proactively learn. To keep pace with industry developments, professionals must digest overwhelming amounts of information, including data related to 75,000 known software vulnerabilities, 10,000 security research papers published each year and 60,000 security blogs published each month.[4] By leveraging AI and machine learning capabilities to extrapolate the necessary insights, cybersecurity professionals can spend more time focusing on areas where skilled individual expertise is essential, such as complex incident response.

Using AI to augment cybersecurity, businesses have:

- Found threats 60 times faster than through manual investigations[5]
- Reduced the time spent on analysis from one hour to less than one minute[6]
- Acquired ten times more applicable insights[7]

Toward community immunity

With greater collaboration across enterprises, the use of AI to expand cybersecurity orchestration from the enterprise to the ecosystem is a logical next step. Rather than competing with one another to have the best cybersecurity and exacerbating the shortage of qualified security professionals, enterprises can collaborate on an effective cybersecurity ecosystem while allocating greater investment in pursuit of differentiation and value.

Within a single enterprise, the combination of hybrid and multicloud environments, shared APIs, and scores of devices and sensors connected to the internet means there is no specific entry point and no clear perimeter to defend. Even internal business platforms are massively digitally connected and exposed to the external world.

As enterprises shift toward a composable enterprise model, taking up services owned, built, bought and supplied across an ecosystem of multiple organizations, new risks are introduced, and the scope of the environment necessary to secure will grow.

As an ecosystem grows, managing the scale of people involved requires automation and real-time intelligent responses. People across the ecosystem, including security professionals, company insiders, customers, and other stakeholders, each need to understand how to perform their roles in a secure way. Organizations should leverage AI-enabled agents and support structures to define secure methods and guide secure behaviors. As AI is increasingly built into other sophisticated products and services, secure practices for end users need to be defined and incorporated. To remain secure, enterprises will need to create and maintain an environment in which users at any level of technical sophistication can interact with the ecosystem without intentionally or unintentionally creating a vulnerability.

A first step toward greater collaboration around cybersecurity should start, perhaps counterintuitively, with an eye toward simplification. Application of AI can be effectively integrated into a cognitive cyber strategy instead of being added as another bolt-on effort. In one analysis, cybersecurity teams were using, on average, more than 80 security products from 40 vendors. Moreover, they were using fewer than 20 percent of the features in those tools because of integration and complexity challenges.[8] Enterprises should seek to combine incident case management, automation and human know-how in a comprehensive response, including myriad notifications, regulatory filings and shutting down impacted systems across the enterprise, a process commonly called "orchestration."

Orchestration starts inside the organization but should move as quickly as possible beyond the notion of an isolated enterprise system to a multiparty security ecosystem. While some enterprises maintain that "threat data" should be proprietary, emerging high-trust technologies such as blockchain can allow collaborators and competitors to work together closely with less fear that sensitive data is being compromised.

Because incidents affecting one enterprise can quickly spread, connected enterprises should participate in or lead the broadest possible orchestration of cybersecurity, attacking threats with the largest available database of incidents, responses and knowledge. Working collaboratively in pursuit of "community immunity" could not only eliminate redundancies, but also accelerate learning and more effectively address systemwide vulnerabilities that otherwise would not be addressed by any individual enterprise.

Consider the national utilities grid. If each power company only considers risks immediate to itself and pursues an individual strategy accordingly, it may develop a false sense of security. Attackers intent on disrupting the power grid don't care which specific utility they break because any breach can drive a ripple effect through the entire network.

Elsewhere, banks and financial institutions have collaborated effectively for decades to maintain and help secure high-performance industry platforms, such as financial markets or payment-clearing networks, while pursuing competitive advantage in other areas. On business platforms, especially those that interoperate with other platforms, a concrete way to earn the trust of customers and continue to earn the right to access, store and utilize their personal data is to reduce the vulnerability of single players across the ecosystem.

To learn more about how IBM can help, visit **ibm.com**/security.

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