Capgemini

Data-powered Innovation Review

Wave 1 | 2020

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Editor's note

It may be a matter of the hammer and the nail, but these days the vast majority of technology-driven innovation seems to revolve around data, analytics and AI. We see it reflected in the topic agenda of our Capgemini Research Institute, and in the vast amount of innovation initiatives we embark on together with our clients and technology partners.

There is an obvious appetite for innovation indeed, as it has been rapidly promoted by the pandemic crisis from an optional player behind the curtains to the star performer at center stage. Seemingly overnight, every business became an innovative technology business. And every technology business clearly needs to be powered by data.

The evidence – and inspiration – is in this very first edition (or 'wave') of the Data-powered Innovation Review; a magazine we intend to release twice a year. In it, you'll find 15 different topics that have been selected to activate your innovation muscles. They range from musings about how data is pivotal to business change, via exciting developments around Artificial Intelligence, all the way up to the merits of a data-powered organizational culture.

The articles have been crafted by Capgemini experts, on several occasions together with key technology partners and analysts. Don't hesitate to contact the contributors, they'll be most happy to discuss further and help you on your way to plotting your own data-powered innovation route.

There is an ocean out there of opportunities that not only will help you to create a better, more innovative technology business; it will also drive you forward in fulfilling the organization's societal purpose – building on a better society in the year to come.

Let's sail that ocean, together. Bon voyage!

Ron Tolido
Chief Technology and Innovation Officer,
Insights & Data Global Business Line, Capgemini

COVID-19 and unlocking the **true potential of data**

Zhiwei Jiang,

Chief Executive Officer, Insights & Data Global Business Line, Capgemini

COVID-19 has proven to be an undeniable accelerator to data-powered innovation and digital transformation. But relying so much more on data also puts much more pressure on having the right data available at the right time for the right purposes. A systematic approach to dealing with this data paradox ensures the data-powered enterprise can unleash its full potential.

Crises are often catalysts for change and COVID-19 is no different. The pandemic has increased our reliance on digital technologies and dependency on data on a vast scale, leading to years of innovative transformation taking place in just a few months.

> Organizations need to address how their data is sourced, stored, and used so that they can accelerate their digital transformation with the future in mind

Article originally published on Business Chief EMEA

But this has also presented a data dilemma.

On the one hand, data has underpinned every aspect of our response to the pandemic, helping international bodies and national governments to understand the spread of the virus and the best route to recovery; for example, the search for a vaccine thrives on the free flow and sharing of data. Also, enterprises rely on data to adjust as well as they can to the reality of a highly virtualized, yet volatile and unpredictable business environment. On the other hand, data-informed decisions are being met with skepticism, with citizens and academics often failing to believe in the quality and accuracy of the virus-related data presented. And the situation is nothing much better within the corporate boundaries, even with data being pivotal to key business processes.

This isn't anything new. Both public health bodies and businesses have been trying to create insights for years based on broad and generic data sets that are often incomplete, inaccurate or don't have the necessary granularity to enable an effective leverage.

Understandably, this has led to scrutiny of and questions about the way data is sourced, used, and activated, making people doubt its very reliability.

When used correctly, data is an organization's most valuable asset. To unlock its true potential, we must look at how organizations are utilizing data and how they can adapt their data practices to an evolving situation. But first, this means correctly identifying and removing some of the roadblocks that still stand in the way of a truly resilient and innovative data-powered business.

The data paradox

Organizations know that data delivers much-needed intelligence and insight – yet COVID-19 has highlighted fundamental areas of weakness and as such, where data is failing us.

Restricted access to information, lack of delegation, confusion over what exists and how to extract insight, combined with the inability to manage data in real-time has meant many businesses are struggling to handle the basic elements of digital collaboration, business continuity and data management. This means that any decision made based-off of that data could set them up for failure and leave way for competitors to take the lead.

To understand end-to-end data processing in a more efficient way, businesses need to identify where blockages are holding them back, causing performance and latency issues, and understand the root causes responsible for this. To do so means engendering an agile data strategy that meets current demands – looking at how data is sourced, stored and governed, and how to maintain a strong, highly automated, data ecosystem that leaves little to no room for error.

Here are four keys strategies that businesses need to employ to first untangle the data dilemma and then set them up for a successful, innovative data-future in a (post) COVID world:

1. Re-architecting outdated processes

Gaining access to the right data to pilot the business through a crisis is typically hindered or blocked by existing IT landscapes and processes; and this has been in general true for innovation initiatives for a long time. By re-architecting outdated applications to next-generation, automated solutions, it not only increases ease of access and enables the right management to eliminate inefficiencies during data processing, but it also accelerates scalability, agility, performance, and visibility. In turn, this facilitates greater understanding of how to activate data while improving existing data processes both from a compliance and performance perspective.

2. Focusing again on data hygiene

The automation of decisions is dependent on having massive amounts of data to train algorithms. Currently most organizations don't have very good hygiene levels when it comes to data management, nor the skills to enable this level of independent intelligence, leading to bottlenecks and inefficiencies. To unravel this data puzzle, organizations need to address how their data is sourced, stored, and used so that they can accelerate their digital transformation with the future in mind and evolve with clear visualization, contextualization, and agility.

3. Reimagining the data ecosystem

A "fail fast" approach is needed to adopt innovative data-powered initiatives, exploring new data sets and usage rapidly to see if they contain untapped value. The importance of this lies in helping organizations better anticipate future scenarios, even when they are mindbogglingly diverse and highly unpredictable. Organizations should embrace agility, encourage experimentation, and treat failure as a lesson rather than something to be

feared. Through ongoing testing – aligned to wider business goals – organizations will quickly create data-powered processes that produce informed outcomes and enable more intelligent, more automated, more innovative decision-making.

4. Building a data culture

Business leaders have a rare opportunity right now to entrench data-powered decision making into business processes to create a real data culture, rethink their business models and adopt new ways of working. Employees must feel that they can rapidly access the data and algorithms they need – as and when they need it – and while the demand for data-powered processes rises,

having the right culture in place to embrace this will much further increase the impact.

Ultimately, these unprecedented times can be seen as an opportunity for organizations to activate the wealth of data they have, gaining the capability to know more about their competitors, their customers, and the world in which they operate – but this relies on the accurate and fair management of data. Only by unlocking the full value of data, in the right way, will this lead to innovative insights that help predict market dynamics, anticipate social trends, identify consumer-preferences, and manage risks.

Data-powered Innovation
Takeaways

Never waste
As bitter as it may be, the pandemic crisis has proven to be a powerful accelerator to digital transformation and data-powered innovation.

Balance Act
As we rely much more on data for our transformation and innovation purposes, it also comes more under scrutiny in terms of its availability, quality, security and ownership.

Gang of four
4 key strategies underpin solving the data paradox: re-architecting outdated processes, focusing again on data hygiene, reimagining the data ecosystem, and building a data culture.

Thriving on Data:
Data-powered innovation and TechnoVision

Ron Tolido, Chief Technology and Innovation Officer,
Insights & Data Global Business Line, Capgemini

TechnoVision is Capgemini's proven framework, which provides a yearly update of key technology trends across the entire Technology Business landscape. Having a look at the trends, it is obvious that data and algorithms have an innovative impact on the majority of topics in TechnoVision. But what does TechnoVision say about innovation in the data domain itself?

Capgemini's TechnoVision series – now in its twelfth year provides a yearly update of key trends across the entire breadth of the Technology Business landscape, from infrastructure and applications, process management, and user experience all the way to distributed, collaborate technologies and a set of accompanying design principles. Ostentatiously in the middle, we find "Thriving on Data": the container for the five trends that directly pertain to the world of data, algorithms, and AI. Together with "Process on the Fly," which covers intelligent process automation and management, this container functions as the "spine" for innovation, connecting the externally focused areas of user experience and collaboration with the foundational areas of infrastructure and core applications.

Let's have a look at the five trends that are part of Thriving on Data in TechnoVision 2020–2021:

1. Crazy Data Train

With enterprises jumping on the bandwagon of data being the corporate gold, it's more crucial than ever to understand where it comes from – not only from internal but also from external and maybe even as synthetic, generated datasets. This requires a sharp market eye that is typical for procurement to get the right data. It needs an R&D-like vision to design how it will produce value. And it taps into the external mindset of marketing to envision how to market and monetize data, internally and externally. And if data can be put on the corporate balance sheet, it will even activate the CFO and CEO perspectives. All aboard

2. Power to the People

In a data-driven organization, everybody needs to be a bit of a data scientist and data engineer. The best insights are created in proximity to the business and to do that that, data must be discovered, prepared, analyzed, and visualized right there. But real skills are rare; and secure, high-quality access to the right data is far from a given. AI and automation fuel a new category of easy-to-use, augmenting tools that provide high productivity to a much wider range of people. It offloads the pressure on central delivery while democratizing access to data and algorithms. Data for all, right on.

3. Data Apart Together

The single source of truth in corporate data is like the Holy Grail – great to pursue yet destined not to be found. Many different sources, uses, and perspectives of data typically exist both inside and outside the organization. Why not fully embrace that diversity and create a federated business take on data? Advanced tools – more and more enabled by AI – help to keep a grip on a variety of data sources, data stores, definitions, and consumption patterns, wherever they are and whoever owns them. It empowers local units to mind their own business with data yet, be an integral part of the organizational robustness and direction. The best of both worlds, really.

4. How Deep is Your Math

Much of the current love for AI arguably comes from deep learning on neural networks. These are essentially brute force, pattern recognition machines that – if provided with enough training data – can go where more traditional data science (often based on statistics and mathematics) stops. Deep learning can be combined with other technology-enabled approaches, such as reinforcement learning, in order to provide even more raw, unmatched problem-solving power. Its simplicity is appealing, as it functions as a black box that simply needs lots of training data to become accurate. But as we live in a world of tools, it is now more than ever a matter of finding the right balance between human and machine powers.

5. Good tAImes

With all of us increasingly relying on data and algorithms in both personal and business lives, it's not that simple to just leave our cares behind. Consumers are much more open to products and services if they trust that their privacy is respected, and security is guaranteed. Workers will embrace support from AI earlier when its mechanisms are transparent, its training data is unbiased, and it augments them in their daily work. Regulators will demand AI solutions that can be audited and explained. And all of society expects ethical AI, driven by compelling purposes for positive futures. So, it's about doing AI good, but also doing AI for good. Such a funky perspective.

Learn more

TechnoVision is a living and breathing framework, so for more, up-to-date content regularly check www.capgemini/com/technovision. Every trend has an accompanying "Expert in Residence" mentioned. Do not hesitate to reach out to either of them to further discuss data-powered innovation.

Data-powered Innovation
Takeaways

Crazy Data Train

If data is the corporate asset, treat it as such – by deeply understanding its sources and mastering all ways of the enterprise to leverage it.

Power to the People

A lack of specialized skills, the need to leverage data close to the business – and some powerful AI – are igniting the self-service data revolution.

Data Apart Together

If the organization is distributed and data is everywhere, it is best to manage data in a federative way – balancing local ownership and a central platform drive.

How Deep Is Your Math

Challenge everything you've tried so far with analytics and algorithms – AI brings alternative, awesome ways to solve problems.

Good tAImes

AI solutions require privacy, security, fairness, transparency, explainability, auditability and ethics to hit success – with the very best AI radiating the company purpose.

Data-powered innovation
in COVID times

M o n i s h   S u r i, Innovation Lead, Insights & Data Global Business Line, Capgemini

As ironic and bitter as it may be, the pandemic has proven to be an accelerator to digital innovation – with no industry sector unaffected. Data, analytics and AI are at the very core of this wave, in areas as diverse as DIY business intelligence, touchless user experiences, social distance monitoring and real-time analytics dashboards. And more is to come, as new, data-powered business models are rapidly emerging.

The pandemic crisis, a quintessential Black Swan event, has come with a set of new business challenges for organizations. As consumers are advised to avoid crowds and companies increasingly rely on online channels for revenues, existing business models are collapsing. With people asked to work from home and shop more remotely, organizations are struggling to engage employees and customers. The biggest impact has been on supply chains, with 94% of Fortune 1000 companies witnessing supply chain disruptions.

As organizations prove their resilience and find ways to respond to this pandemic, they will also prepare for the renaissance, look to scale-up again, and adopt new business models, possibly AI-first, digital-focused, or even completely hands-free.
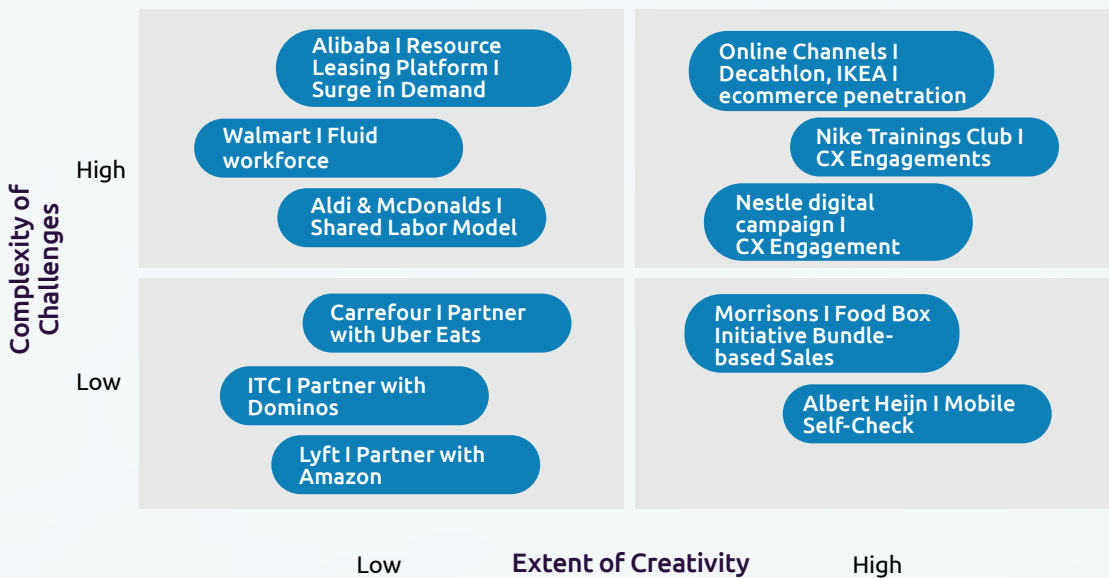
Making real-time data available to the organizations will be key to making informed, fact-based decisions. This is vital – if nothing else - to keep the business simply going, but also to maintain efficiency and, ultimately, profitability. Artificial intelligence and intelligent automation, DIY, 'democratized' access to data and analytics, and cloud modernization gets the spotlight as a result. And it shows in many different areas. AI-based crowdsensing and social distance monitoring solutions reduce the risk of exposure to the virus. Contact tracing analytics solutions are helping manage COVID outbreaks by isolating (pre-)symptomatic cases. Blockchain solutions and real-time data help supply chain management with increased traceability, transparency and security. Online payment platform Alipay has created a blockchain-based solution that enables charitable organizations to collaborate transparently by tracking donations of relief supplies and allocating them more efficiently. Carnegie Mellon University is working on a data science model to better understand Pennsylvania's public health and economic status. This dashboard with advanced visualization capabilities will enable the use of data for societal good and help inform state decision-makers during the pandemic.

Reimagined Business Models

Nothing is permanent and this pandemic will eventually go away. As organizations prove their resilience and find ways to respond to this pandemic, they will also prepare for the renaissance, look to scale-up again, and adopt new business models, possibly AI-first, digital-focused, or even completely hands-free.

Several innovative business models thus have already emerged.

| | Extent of Creativity |
| Complexity of Challenges | |

High:
- Alibaba I Resource Leasing Platform I Surge in Demand
- Walmart I Fluid workforce
- Aldi & McDonalds I Shared Labor Model
- Online Channels I Decathlon, IKEA I ecommerce penetration
- Nike Trainings Club I CX Engagements
- Nestle digital campaign I CX Engagement

Low:
- Carrefour I Partner with Uber Eats
- ITC I Partner with Dominos
- Lyft I Partner with Amazon
- Morrisons I Food Box Initiative Bundle-based Sales
- Albert Heijn I Mobile Self-Check

Extent of Creativity: Low ←→ High

Source: Internal Analysis + Capgemini Research titled "The Consumer and COVID -19"

According to the recent "The Consumer and COVID-19" publication by the Capgemini Research Institute, there are several examples of business model innovation in the CPRD sector.

Shared-labor models - In this model, "idle" employees from other sectors are temporarily hired by retailers to meet the surge in demand for services such as online deliveries. Germany's discount supermarket chain Aldi has leased staff from McDonald's in the current crisis. Alibaba introduced a "resource leasing model" designed to share manpower and is developing a digital platform to manage shared manpower and integrate the resource leasing model into their ongoing operations. Such platforms can be used for flexible, COVID-related personnel matching purposes, particularly, in cases where one sector is looking at a surge in demand, wherein other sectors people are redundant.

Bundle-based sales - Selling fixed bundles of the most commonly purchased products not only helps to manage logistics but also ensures easy billing. In the UK, Morrisons has introduced a food box initiative, where shoppers pay one price for a box full of essentials.

Delivery partnerships – In France, Carrefour and Uber Eats partnered to provide home deliveries. Users were able to select a Carrefour convenience store on the Uber Eats app or website to order the products of their choice, including everyday grocery shopping as well as hygiene and cleaning products, and get deliveries at home within 30 minutes on average by a delivery person using the Uber Eats application. In the US, ride-sharing firm Lyft partnered with Amazon for package and grocery deliveries. India-based consumer product firm ITC partnered with pizza-delivery Domino's.

Additionally, retailers have scaled adoption of digital and contactless payment services and are focusing on innovative and personalized customer engagement through virtual apps. For example, Nike has developed a training app to engage its customers. For Nestle India, their entire innovation funnel is changing. Nestle has accelerated digital engagements across key parts of its portfolio and has put out innovative digital campaigns to engage with consumers. There is also a surge in

e-commerce. If you look at the e-commerce channels in the US, what took 8 years in terms of penetration was achieved in 8 weeks.

According to the "COVID-19 and the financial services consumer" publication by the Capgemini Research Institute, in the financial services sector, the pandemic is driving a surge in digital payments and digital channel adoption (such as through chatbots) has accelerated. The tourism industry in China is finding new ways to engage customers through touchless payments, self-check-in, check-out with facial recognition, robot delivery of goods from outside the hotel. Also, live streaming of wild life site has attracted thousands of viewers. Off-course, data, analytics and AI are playing a key role in delivering these business model innovations.

Landscape questions

The pandemic challenges C-suite executives to think creatively and ask key questions about their innovation maturity and current data, AI & analytics landscape:

- What does a digital picture look like that addresses my new business challenges?
- How can I accelerate my innovation agenda with data, AI & analytics?
- What data-powered innovation uses cases should I address first?
- What does a framework for continuous, scaled innovation look like?
- What is the potential for reimagined business models, powered by data, AI & analytics?

Companies need to pivot to an even more innovative, creative mindset, particularly around the use of data, analytics and AI. Innovative applications of technology, around the use of AI for crowdsensing and social distancing, contact-less user experience, digital and online channels for growth, frictionless fulfillment of supply chains, workforce analytics, video analytics and image recognition, all powered by data, are emerging. Innovation and creativity under constraints posed by this pandemic will differentiate the winners, going forward.

Data-powered Innovation
Takeaways

Viral accelerator: Painful times as it has brought, the pandemic also proves to be an accelerator to digital transformation initiatives that until now have been stalling

Real-time, really: The availability of real-time data - also to feed analytics and algorithms at the edges of business – is pivotal to deal with many pandemic challenges

Ready to reimagine: Powered by data, analytics and AI brand-new opportunities emerge for breakthrough 'mid- and post-COVID' business models

Landscape view: Executives need to assess their current digital and data landscape on its readiness for data-powered innovation in COVID times

Rapidly warming up to Data Monetization

Cyrus Daruwala,
Managing Director, Financial Services and FinTech, IDC

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It has been nothing less than the holy grail to many companies: seeking new sources of value and revenue from their data assets. But freeing up the data that is needed for this, proved to be cumbersome in practice. But the times, they are changing: new ways of living and working and standardization of rules and regulations, combined with breakthroughs in technology provide all the tailwind needed to get serious with monetizing data.

When the industry coined the now over-familiar saying "data is the new oil", it was drawing attention to the immense, untapped nature of this asset. While the potential of data was indeed immense, only a few people really understood it back then – and hardly anybody knew how to tap its revenue-earning potential.

When the industry coined the by now all too well-known phrase 'data is the new oil', it was referring to the immense, untapped nature of this asset. It undoubtedly had vast potential but was not accurately apprehended by many. Data is way beyond that point now, so far beyond that even regulators directly get involved in every aspect of the (citizen's) data lifecycle.

Less common still, however, is its classification and use as a revenue-generating asset. The lackadaisical approach was attributed to struggles related to unleashing the right data sources, ensuring data quality, the disparate nature of storage, tools and techniques to analyze it, and finally 'who-own's-this-data' type management support. Data monetization has been on the wish list of many corporate strategists for some time now, but seldomly managed to deliver fully on its promises.

The good news? All of this has changed rapidly, accelerated partly by the unpreceded new way of living and working we have quickly seen emerge, and partly due to the maturity of technology, platforms and frameworks that are now available.

Solving the monetization puzzle

Technological progress has been a major contributing factor in rejuvenating the focus on Data Monetization. Due to the inherent nature of certain industries, however, there exist huge variations in what technologies have been employed in the pursuit of this goal. Data lakes, for example, were touted as a significant step towards Data Monetization efforts in Financial Services; Artificial Intelligence and Machine Learning found large-scale use in Telecoms, to process real-time data to find emerging customer patterns; IoT is used in all sorts of industries ranging from retail to insurance to collect large amounts of customer data. A close analysis of the three examples given above reveals a very intriguing insight – each industry, by leveraging a specific technology, is addressing one part of the Data Monetization puzzle – Retail is solving the 'data collection' puzzle using IoT; Financial services is solving the 'data storage' puzzle with Data Lakes; and Telecom is solving the 'data processing' puzzle with AI/ML.

Now, imagine an organization that can bring together all of these; imagine the outcomes it would be able to drive.

While technology addresses feasibility, business models address viability. Despite their strategist's convictions, business's enthusiasm for data monetization initiatives

has always been lukewarm, up until now that is. So, what changed?

To understand this, one needs to comprehend how the likes of Alibaba, Google, Facebook and other tech giants grew to be among the most profitable organizations in the world. Access to cutting-edge technology and top-notch talent is only part of the equation. The other part, the less appreciated one, is that they were able to find avenues to employ the technology and talent to create tangible business value. Most data monetization business models currently seen in the market can be considered as a part emulation of the two major strategies quoted above. However, the degree to which any organization can drive it to success depends on the extent and effectiveness to which they can contextualize it to specific industry contexts and needs.

Frameworks, such as IDC's Data Monetization Maturity framework, can drive a systematic approach to find and exploring data monetization opportunities across different perspectives and business models.

Trailblazers in Financial Services

The financial services industry was marred and inhibited with various regulations around data ownership, data privacy and data sharing. But, in 2019 and 2020 all that changed dramatically. Data sovereignty (where data resides) was the first of the draconian rules to be scrapped, replaced instead with PDPA and GDPR. Next came the magical phrase "Opt-In": if the banking/insurance customer understood her / his data privacy rights and opted in to be served better, the institution that owned the primary data had the right to collaborate with various (related) third parties, acting in the interest of the customer. This paved the way for accelerated Data Monetization.

UBank, for example, an independent digital bank owned by NAB Australia, wanted to lead the Australian Home Loans market. It did so with a very simple Data Monetization plan, harnessing API's and Open Banking technologies, now a mandate by the Australian regulator. Images of homes and apartments were geo-tagged using Google APIs. These images – only if the customer opted in - were analyzed and verified consuming the Governments Property Registration API's, cross-referenced against the NAB's customer Marketing Customer Information File (MCIF) database (to ascertain any outstanding loans or credit facilities), and an offer for a very competitive loan was made to the customer. The success of this "real-time-magic" campaign is in the 3-5% range, which is amongst the highest take-up rates worldwide. Data Monetization – ascertaining what business wanted to achieve and apply the most effective technologies and frameworks – at its best.

Data-powered Innovation
Takeaways

Play by the rules: rules and regulations around the use and ownership of data are – when proactively applied – enablers to monetization, rather than inhibitors

What's in it for them: create data-driven value propositions that deliver clear benefits to all involved, particularly the owners of data

Thrive on technology: innovative technologies enable much better and faster ways of exploring, accessing, sharing and analyzing data for monetization

Solve the entire puzzle: address data collection, data storage, and data processing by learning from different industries

The Quest for
Autonomous Enterprises

R "Ray" Wang, Principal Analyst and Founder, Constellation Research, Inc.

What does an enterprise look like in which human involvement is eventually optional? What AI and automation technologies drive the journey to become such an autonomous enterprise? What stages can we expect, and when? In this guest contribution, Ray Wang from Constellation Research provides a crystal-clear framework to understand the very edge of where data-powered innovation will bring us.

The pressure to reduce margins, technical debt and investment in core systems creates tremendous incentives for the automated enterprise. Customers seek cognitive-based approaches to build a true foundation for automation and artificial intelligence-driven precision decisions. The immediate benefits include less staffing, reduced errors, smarter decisions and security at scale. The long-term benefits include decision velocity, dynamic feedback loops, and sentient systems. The quest for an autonomous enterprise starts with a desire to consider what decisions require intelligent automation versus human judgement.

While the human brain may take minutes to make a decision and it takes hours for a decision to work through an internal organizational structure, in the digital world machines and artificial intelligence engines can decide in milliseconds.

Organizations Demand Intelligent Automation of Processes and Precision Decisions

Almost every organization has sought the ability to intelligently automate their processes as part of critical operational efficiency initiatives. From campaign to lead, order to cash, procure to pay, incident to resolution and hire to retire, no department is immune, and no business process is exempt. While these efforts to automate often start with cost savings, they can evolve into something more. The advent of artificial intelligence (AI) components such as natural language processing, computer vision, machine learning (ML) and neural networks present opportunities to instrument fully autonomous capabilities that have strategic and long-ranging impacts. Seven forces drive the quest for autonomous capabilities in the enterprise:

1. **Post-Pandemic Priorities Emphasize Agility and Business Continuity.** Organizations expect to increase their investment in agility and business continuity

2. **EBITDA Pressures Drive the Autonomous Decade.** The ongoing battle to address short-term, quarter-to-quarter profitability and the scarcity of top talent gives companies an incentive to invest in automation to augment the labor force. Every organizational leader must determine when to trust the judgment of a machine, augment a machine with a human, augment a human with a machine and trust human ingenuity.

The Four Most Important Questions in the Autonomous Decade

1. When do we trust intelligent machine automation?	2. When do we augment the machine with a human?

Symbiotic Trust

3. When do we augment the human with a machine?	4. When do we trust human judgment?

Source: Constellation Research

3. **Declining Population Dynamics and Rising Labor Costs Lead the Automation Push.** Many industrialized countries face a declining population dynamic. Meanwhile, rising labor costs and regulations drive up labor inflation for both services and manufacturing.

4. **Risk Mitigation and Compliance Move Leaders to AI-Based Solutions.** One compliance fine or privacy breach caused by human error could lead to hundreds of millions to billions of dollars in losses.

5. **Automation and AI Enable a Future of Precision Decisions.** Successful AI projects seek a spectrum of outcomes. The disruptive nature of AI comes from the speed, precision and capacity of augmenting humanity and achieving autonomous enterprise status.

6. **Autonomous Enterprises Combat Deep Fakes and Deliver Cybersecurity at Scale.** In this world of relativism and enhanced technologies, humans can no longer discern authenticity. Autonomous systems will effectively combat deep fakes and cybersecurity attacks at scale.

7. **AI Preserves and Shares Institutional Knowledge.** Autonomous enterprises capture the informal and people-centric institutional knowledge from processes, leading best practices on decisions and nuance in decision-making.

Decision Velocity Will Determine Winners and Losers

At stake is the notion of decision velocity. Any organization that can make decisions twice as fast or one hundred times faster than its competitors will decimate them. While the human brain may take minutes to make a decision and it takes hours for a decision to work through an internal organizational structure, in the digital world machines and artificial intelligence engines can decide in milliseconds. Whomever masters these automated decisions at high velocity will have an exponential advantage over those who don't.

Cognitive Applications Power Autonomous Enterprises

The convergence of solutions from robotic process automation, process mining, business process management (BPM), intelligent workflow, journey orchestration and microservices management attempt to address the growing need to automate and apply AI to enterprise-wide capabilities.

However, a new class of best-of-breed applications has emerged to address the market deficit. Constellation predicts that the total market for this autonomous enterprise market, including cognitive applications, will reach $10.35 billion by 2030.

Recommendations

Early adopters have prioritized business processes using the Constellation business hierarchy of needs. Align candidates to the five categories of regulatory compliance, operational efficiency, revenue growth, strategic differentiation and brand. Keep in mind that AI enablement requires a strong data strategy, deep data governance, mature business process optimization and a data-driven design point.

The Bottom Line: Expect Level 4 Autonomous Enterprises to Emerge in 2023

Constellation identifies five levels of autonomous enterprises and predicts when these cognitive apps will deliver full autonomy:

Understand the Five Levels of Autonomous Enterprises

Level 1 Autonomous Enterprise: Basic Automation
At this level, the system can provide basic tasks and workflow automation.
- **When?** Today.
- **Includes:** Basic process automation tools such as BPM, manual instrumentation and control, and intelligent workflow automation
- **Who's in control?** Humans are still in control and guide many manual steps.

Level 2 Autonomous Enterprise: Human-Directed
Level 2 enables the human-directed automation of business processes.
- **When?** The current state of the art
- **Includes:** Robotic process automation, process-mining tools, journey orchestration tools, ML algorithms, natural language processing.
- **Who's in control?** Humans direct major decisions; minor decisions are automated over time with some effort in training.

Level 3 Autonomous Enterprise: Machine Intervention
Level 3 delivers automation with occasional machine intervention.
- **When?** The next big thing in 2020.
- **Includes:** Cognitive applications, neural networks, GANs models, contextual decisions and next best actions.
- **Who's driving?** Humans still on standby but can be hands-off for periods of time

Level 4 Autonomous Enterprise: Fully Autonomous
Level 4 presumes that the machines can deliver full automation but not sentience.
- **When?** Sometime in 2023.
- **Includes:** AI-driven smart services, full automation, self-learning, self-healing and self-securing.
- **Who's driving?** Machines are fully automated.

Level 5 Autonomous Enterprise: Humans Optional
Level 5 achieves full sentience and humans may no longer be needed.
- **When?** 2030.
- **Includes:** Fully autonomous sentience, empowering precision decisions at scale.

Data-powered Innovation
Takeaways

Technology drives autonomy: AI components such as natural language processing, computer vision and intelligent automation present opportunities to instrument fully autonomous capabilities within the enterprise

Autonomy has value: There are many benefits on the road to becoming an autonomous enterprise, including less need for staffing, reduced errors, smarter decisions and security at scale; the long-term benefits include decision velocity, dynamic feedback loops, and even sentient, 'emphatic' systems

It starts with balance: The quest for an autonomous enterprise starts with a desire to consider what decisions require intelligent automation versus human judgement.

7 Forces: Various levers drive the quest, most of them as a key response to the uncertainty and velocity of today's business and societal context

5 levels: There are clearly defined maturity levels on the way to becoming an autonomous enterprise

Decision alchemy for the self-driving enterprise

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Not quite ready to experience a self-driving car? Well, you ain't seen nothing yet. Soon, AI may be behind the steering wheel of your core enterprise processes – sensing crucial events, analyzing key data, making optimal decisions, and taking ultrafast actions, all seamlessly and automatically and all while learning and improving every single day. There may be a few bumps in the road and an occasional detour, but the self-driving enterprise is definitely in our future.

Every facet of business life is driven by decisions: tens of thousands of them. Some decisions are fundamental in their impact: for example, a merger or the creation of a new business line. Others steer a course correction in response to unforeseen external stimuli. Others again provide the day-to-day direction that maintains a healthy business operation.

As individuals, we have to simplify problems where the problem space is too complex for us to effectively process. We can't work directly with the massive datasets of a typical enterprise. We simplify by creating hierarchies of increasingly abstract summaries

Consider how sales and marketing drive revenue growth, how supply chains increase efficiency through optimized production, distribution, and inventory, and how finance balances the budget, manages cost and drives profitability. Each of these objectives is fulfilled through complex processes, numerous systems, and an ecosystem of third parties.

Overlaying this setup is an organizational structure that places human teams to process, analyze, and manage the activities of all these collaborating entities. It's here that all the major decisions are made.

Dissecting decisions

Every decision is fueled by data: data that starts at the lowest levels of granularity and includes business transactions, production and logistics data, and customer feedback, among other types. At this level, with billions of data points, the overall complexity is enormous. It is not a computable space for a decision-maker, without the augmentation power of technology.

As individuals, we have to simplify problems where the problem space is too complex for us to effectively

process. We can't work directly with the massive datasets of a typical enterprise. We simplify by creating hierarchies of increasingly abstract summaries. We use the aggregated output from systems, supplemented by dedicated business intelligence from data warehouses or lakes, or create the summaries manually via the ubiquitous spreadsheet.

These elements can then be combined into sets of quantitative and qualitative data points that can inform our reasoning. In many ways, it's like panning for gold. We look for the nuggets – the trends and patterns – that help us develop a metamodel of the situation we are assessing. The metamodel is supplemented with the experience that we use to replicate or extrapolate an appropriate course of action.

The challenge, though, despite all the investment in technology, is that much of the decision-making process remains manual. It's driven by teams requesting specific insights, looking for correlations, hunting for those nuggets that might help them reason more effectively. So often, decision-making to steer business operations is done retrospectively. What happened last month guides what's going to happen tomorrow. This is generally suboptimal and is where AI is required to move to a much more predictive regime.

Working capital to capital working

Let's take an example. It is commonly recognized that working capital is the cheapest form of cash. However, optimizing working capital is a huge challenge for organizations and in particular CFOs. It is relevant to all the finance and supply chain functions impacted by liquidity: payables, receivables, inventory, and treasury, and all of the systems and variables that those functions use. But the upside is significant. Getting it right improves invested capital leverage, which can ultimately increase shareholder value.

Given the complexity of optimizing working capital, what kind of approach is required to gain access to the right data at the right time, and to find patterns and use them to recommend a way forward? Furthermore, how can those recommendations be converted into automated actions?

Looking for signals

Let's consider the generic decision-making architecture of autonomous vehicles (or indeed intelligent systems in general). There is a world model that defines the environment and its operational characteristics; there is sensory processing to interpret the input data; there is a value judgement that emphasizes goal-seeking; and there is behavior generation that decides how to respond in line with the world model. This is the domain of AI.

Perhaps unsurprisingly, humans follow in step with this architecture. We each have our world model fed by our senses which, when combined, allows us to make value judgments leading to decisions. It is the decisions that generate our behavioral responses.

Imagine applying basic architecture to an entire organization. We can then build new resilience into decision-making, moving beyond optimization. This world, by necessity, needs to be powered by AI, but brings humans and AI closer together, resulting in an advanced hybrid model for decision-making and responding.

In many ways, this describes the evolution of the digital twin. A digital twin focuses on modeling business operations, harvesting data from operations, using AI to make value judgments, and suggesting behavioral actions (complete with an explainable rationale) for human decision-makers to select, approve, and direct into an automated action.

From signals to the self-driving enterprise

This approach to cognitive automation is already being pioneered. Companies like Aera are bringing AI and human decision-making together. They are advancing the efficiency and value of business operations by understanding, predicting, recommending, and acting. Linking decision-making to automated actions – something that until recently was a technology gap – is unlocking an advanced wave of autonomous business operations.

Aera has created a platform that enables the "self-driving enterprise." Its approach combines a variety of techniques that fuse data acquisition, processing, and analytics into pre-prepared insight relevant to specifically defined skills domains: for example, working capital highlights for finance, or inventory optimization schemes for the supply chain. The insight is based on an array of AI algorithms that establish correlations and multilevel aggregations and apply multivariate analyses to the harvested data. The skills codify experience of

business operations, which in turn can enable automated actions as they embed knowledge of how to act in various business situations.

Today, the effectiveness of decision-making is becoming more and more dependent on AI augmentation. Very soon, this dependency will become a necessity. Automated and accelerated decisions will drive more responsive actions.

Connecting actions into processes and systems for execution is the final element that will drive the kind of frictionless hyper-automation that a next-generation organization requires.

Just as autonomous vehicles can sense, judge, and act to enable self-driving, so too will modern business operations. Welcome to the self-driving enterprise.

Data-powered Innovation
Takeaways

Too much to handle: The data that underpins every business decision is getting so complex – if only in its sheer volume and diversity – that technology-augmented decision-making is a necessity

Human obstructing: Despite the help of technology, many key data-powered decisions are still made manually, limiting both scope and responsiveness

The AI digital twin: AI systems that sense, capture, analyze, and act on data points are a virtual copy of a human in a business context

Looking ahead: The ability to predict and recommend, combined with the automation features to execute based on these insights, makes AI truly augment the human element in enterprise processes

Learning how to drive: Provided with enough training data and real-life experience, AI systems can stepwise become more proactive, and execute within a growing number of enterprise processes and activities

Hands off: The pinnacle of combining AI, intelligent automation, and the IoT is a fully autonomous, self-optimizing, self-learning, self-driving business

Knowledge Graphs: Adding the human way to understand data better

Robert Engels,
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Although artificial intelligence capabilities are improving daily, it is not always easy to put the AI rubber on the road – especially when it comes to understanding AI's contextual data and problem-solving approaches. How about bringing in some "real" intelligence? Graphs are a typically human way of navigating and accessing data, and when combined with AI they bring out the best in human/ systems symbiosis.

Artificial intelligence (AI) is a dragon with many heads. An increasing number of products include some kind of intelligence and nearly all businesses are trying to find out where to push more intelligence into their products and services with the promise of increasing market share and quality of decisions.

Recent advances in knowledge representation in distributed systems show promising results.

Advances are based on using graph representation for capturing semantics using logic and making the results available as machine-readable contextual information.

We often perceive AI as the artificial equivalent of human intelligence (although it can be more than that), which consists of at least the ability to learn while applying problem-solving capabilities. In practice, most of the AI-related solutions and products that exist today are exclusively performing some kind of machine learning (ML) to classify, categorize, or predict data and events. And sometimes with great success.

However, although these ML-based algorithms do a great job in classifying, categorizing, or predicting events based on historic data, transposing their outcomes into the real world for informed decision-making often proves to be problematic. As shown by certain AI failures, for example in the context of self-driving cars, trading bots in the financial market, automated recruitment, or self-learning chatbots, AI is not flawless by default. A correctly scaled AI application in production may require something more.

Even the latest and greatest ML algorithms only perform within a relatively limited context and setting, and the quality of their decisions tends to fall sharply when coming outside of their "area of competence," which is sharply defined by the examples provided for training and model evaluation.

Since it is virtually impossible to cover all the situations that an applied ML model might have to handle in production, problem-solving capabilities could be added. "Problem-solving" refers to the ability to use contextual information and reason based on logical rules, analogy, and similarity with learned or remembered facts. In contrast with ML, which depends on large datasets, logical reasoning can be performed on single facts and observations alone, if required.

Putting ML and problem-solving capabilities together provides a very powerful combination for tomorrow's data-powered enterprises where context and adaptiveness are key. Contextual knowledge plays an important role in increasing the quality of decisions made in the data-powered enterprise, as it extends AI's area of application. In practice, this means including knowledge about specific relationships such as company structures, connections between products, knowledge about the real world, physical laws, country laws, or simply complex information from other parts of the organization.

By making more knowledge available about the context in which decisions are made, problem-solving will become better informed and easier to explain. Recognizing whether ML models are applied correctly, or that there might be contextual information to consider, will ensure you keep your competitive edge.

The rise of graph technology

Currently, we are seeing a rise in global awareness around such issues in the field of AI. Recent advances in knowledge representation in distributed systems show promising results. Advances are based on using graph representation for capturing semantics using logic and making the results available as machine-readable contextual information.

Image Source: Exploring Knowledge Graphs on Amazon Neptune Using Metaphactory

Graphs have the additional advantage that they can be navigated fast. If equipped with the correct level of semantic representation, they can also be used to integrate knowledge coming from different sources in an automated and elegant manner as a basis for reasoning.

So, graphs are a good way to represent contextual knowledge for use throughout the business and are well suited for publishing reference data in a solution-independent and future-proof way. Advantages include:

- Independence: Reference data/ master data/ golden records should be governed,

maintained, and published in representational formats that do not put unnecessary constraints on their use (which is difficult to foresee in a dynamic and rapidly changing world), preferably using open standards and protocols.

- Flexibility: Graph models are less rigid than more traditional scheme-based methods, allowing virtually costless extensions to data models when new information becomes available.

- Identifiability and merging: Representing reference data as knowledge graphs make

them easily merged and aligned with other datasets which are based on knowledge graphs, due to their identifiable and reusable object representations on a global scale.

- Accountability and trust: Knowledge graphs, when implemented correctly, make it possible to trace knowledge back to its origin, even when it is aligned into a "mesh" dataset.

- Visualization: Human beings are known to be very visually oriented in their knowledge interpretation and processing, and knowledge graphs can be easily visualized in interpretable network representations.

Thought-provoking as it is, the development of data-powered enterprises will benefit greatly

from mimicking human ways of storing and processing information. Graphs help to achieve exactly that.

At the moment, we are only on the brink of a development that is hard to foresee, and that presumably will exceed all our current expectations. Globally, we see the main actors in knowledge-intensive workflows in life science, manufacturing, financial services, the public sector, and retailing – they are all increasingly investing in upgrading the ways they represent contextual information and awareness. This boosts automation efforts through ML and ultimately will enable AI to realize its true potential.

Data-powered Innovation
Takeaways

Narrow focus: Increasingly powerful as their capabilities maybe, AI systems are restricted by the scope of the learning data they are provided with.

Only human: Graph systems are based on the typical human way of navigating, accessing, and understanding data.

Culture tool: Graphs are an effective, intuitive way to explore and discover data, helping the organization to improve its data culture.

Dynamic duo: AI systems become more understandable, and more effective in their problem-solving capabilities when combined with graph technologies.

Say What? Natural language generation is getting real

Viswanathan Rajeswaran,

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Breakthroughs in AI have resulted in systems that seem to understand natural language far better than even their most recent predecessors. Translating from one language to another has, for example, improved significantly. But there is more. Remarkably powerful language models underpin the ability to generate language, for instance, to finalize an email, create a relevant summary of a complex document, or even produce a full article or marketing text from scratch.

The current pandemic has made it much more important – if not downright essential – for enterprises to shift their business focus to virtual, digital channels. There is a sharp increase in online commerce and consumption of online information across the globe, as enterprises struggle to engage employees and customers alike. A study by the Capgemini Research Institute on conversational commerce clearly shows the benefits of adopting voice assistants and the ascendance of conversational, intent-driven systems in a context that becomes more digital every day.

Advanced NLG capabilities potentially have a big impact, for example in the areas of social media and marketing, where AI-generated text could be competing with human-curated text used by companies about their products and services.
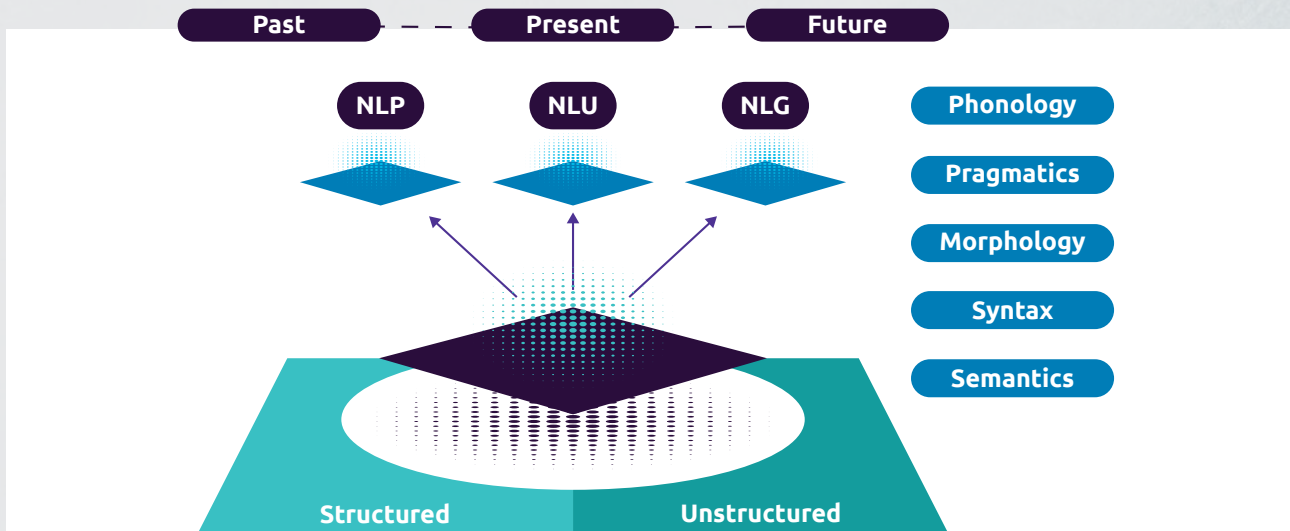
AI-driven processing, understanding, and increased generation of natural language are the critical components in this evolution.

NLP

Natural language processing (NLP) has been around for some time: Computers have achieved human-like performance levels in many standard natural language-related tasks such as part-of-speech tagging, query expansion, and more.

The introduction of the Transformer neural network architecture in 2017 has affected the field of NLP dramatically. Very large datasets are being used for AI learning, and powerful models including Bidirectional Encoder Representations from Transformer (BERT) and Generative Pre-trained Transformer (GPT) have become commonplace for typical NLP tasks.

Notably, GTP-3 – from the OpenAI research laboratory – has shown compelling improvements in areas such as text summarization and text generation. The surprising fact is that the model has mastered language without using any labeled data. It instead shows the promise of morphology –the study of words, how they are formed, and their relationship to other words in the same language. Using this radically different approach, GPT-3 can do language translation much better than any existing state-of-the-art models, and it thus looks to be highly influential on the future of NLP.

A recent publication by the Capgemini Research Institute on customer-centric AI shows that customers' trust is increasing when they are dealing with AI. This is because the content used to train the AI is created and curated by humans.

However, new language AI systems (particularly those based on the Transformer models mentioned above) are becoming more and more capable of performing natural language generation (NLG). They move towards further understanding the phonology, pragmatics, morphology, syntax, and semantics of languages by training deep learning models with a high-volume corpus and by using clever innovation in network architectures. The result is a set of language-generation capabilities that would have sounded like science fiction only a short while ago.

Illustration

The following text is written by an AI NLG algorithm, provided only with the topic "impact of natural language generation."

The first thing that we noticed is that it does not take many words to generate the same effect as a human. We also tried to create an algorithm that would generate the same effect as a human, but with more accuracy and with a smaller amount of words.

We quickly found that it is hard to get the same effect with several words.

The solution we found was to use a "system" that generates simple sentences that are likely to be used in a natural language conversation. That system is called a "sentence-generation engine."

We created an algorithm that predicts the next sentence without reading it. This algorithm has many disadvantages: it is not very fast, and it is hard for an algorithm to understand the context in which a sentence is being generated. But, we found that it is not that difficult to make our system as fast as possible. We used the word-based approach in order to get a good performance. We tried to make it as fast as possible.

We created a system that generates sentences in natural language.

As can be observed, AI is getting quite convincing. A recent, much-published article in The Guardian was completely authored by GPT-3, and eloquently made the case for involving more AI bots in creative areas.

Advanced NLG capabilities potentially have a big impact, for example in the areas of social media and marketing, where AI-generated text could be competing with human-curated text used by companies about their products and services.

Ethics

However, ethical considerations quickly come into play. Having AI systems generate textual content without humans in the loop presents risks, due for example to inherent bias or wrong assumptions and facts that the training data may have contained. Currently, when using any search engine, for every page of content an organization creates there are 95 pages of content not created by those companies. This ratio of 5:95 will get more skewed once "clickbait" players generate huge amounts of text with AI.

Next-generation natural language AI systems allow companies to implement more helpful chatbots that

understand the context and intentions of questions much better and as a result, provide a much more satisfying user experience. Text summarization allows companies to comprehend vast amounts of data from various sources and to provide their knowledge workers with the most relevant content available. R&D departments are able to follow trends and updates using sentiment tracking and topic modeling. Producers of textual content – whether for example in legal, life sciences, marketing or other contexts – find their productivity drastically improved, allowing more time to be spent on creativity and other non-routine activities.

Executive challenges

The issue that enterprise executives will face is to embrace the new technology without putting their brand name at risk while also keeping the enterprise's Emotional Intelligence ("EQ") at a healthy level. They have to ask key questions about the adaptation of AI for natural language tasks such as:

- How can we augment AI with humans in the loop, or vice versa, to get the best of both?
- With so many quick improvements in natural language models, how can we benefit more from (self-service) conversational systems and improve customer and employee satisfaction?
- What are the most impactful use cases that address our key business objectives?
- How can we ensure compliance with ethical guidelines?
- How will human role descriptions shift as generative AI covers more work previously done by humans?

Above all, with language being our prime and preferred way of communicating, the potential impact of generative, natural language AI systems cannot be overstated. Take our word for it.

For more information, please contact the author, who heads up the AI Centre of Excellence in India – driving innovation for Capgemini Insights & Data. A real human will respond!

Data-powered Innovation
Takeaways

Deep language: Breakthroughs in applying deep learning – as an alternative to more established approaches – have significantly improved the abilities of AI systems to understand and process natural language.

No loss in translation: Natural language AI systems can thus be applied to build better, more emphatic conversational systems – such as chatbots and voice assistants – and have more effective language translation applications.

Search you right: Natural language AI systems enable more intelligent, highly personalized search and knowledge provisioning.

Content generator: Natural language generation (NLG) systems now enable the fully automated creation of increasingly passable textual content, from simple tweets to full-fledged documents, brochures, and articles.

Ethical conundrum: NLG systems pose crucial ethical challenges for enterprises, especially as the creation of natural language always has been considered the exclusive forte of humans, being in full control of the content.

Edge AI: Intelligence enters impenetrable nooks

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Close to the edge is where the exciting things always tend to happen. This is certainly the case for Edge AI: putting increasingly powerful AI capabilities at the very boundaries of the IT estate and network, integrated with all sorts of devices outside, in the field, and on the working floor. Edge AI enables immediate detection of relevant data and events followed by real-time responses. And that is a capability that is proving to be even more crucial in the era of the pandemic.

While AI as a concept has existed since the 1950s, the real applications of AI in solving business problems started in the early 2000s, riding on advances in big data and cloud computing. The next two decades saw AI-driven mainly from central data centers, rich in computing power, to perform processor-demanding cognitive tasks.

However, in recent times, AI has made its way into software, where predictive algorithms are changing the way these systems support the business. AI has moved to the outer edges of networks.

Edge AI is rapidly expanding, powering every device from smartphones and smart speakers to automotive sensors and security cameras. AI is the most common workload in edge computing. As the internet of things (IoT) implementations have matured, there has been an increased interest in applying AI at the point of data generation for real-time event detection and responses.

What is Edge AI?

Data is created everywhere. It originates in the environment that we interact with. IoT appliances that transmit real-time data to the cloud from anywhere – factories or homes or even parks – are on the rise. As IoT appliances increase, it becomes vital to have intelligence rendered at the endpoint, for instant actions. For example, a camera set up at the entrance of office premises needs to know almost instantly whether someone trying to enter is an employee or not to determine whether they should be admitted.

However, transmitting such large volumes of data from nooks and corners to the cloud, and vice versa, for every action (identifying an employee, in our example) can be expensive.

AI processing today is mostly done in cloud-based data centers with deep learning models that require heavy computing capacity. However, with Edge AI, AI processing is now moving part of the AI workflow to a device and keeping data constrained to a device. To simplify this further, Edge AI is taking pre-trained AI algorithms that previously ran on data centers in the cloud and embedding them in edge devices to enable inferences that determine action. This allows the processing of the data collected within the device within a few milliseconds, generating real-time information.

Why Edge AI is now relevant

Let's start with current projections of the number of connected devices around the globe. Experts estimate

that there are between 15 and 30 billion IoT devices today. It is projected that by 2021, this number will grow to 35 billion. To fully reap the benefits of this scale of connectivity, it is imperative that this works in a fully enabled network ecosystem. This isn't possible with centralized intelligence running on the cloud.

Increase in data-intensive content: The information collected by IoT devices is data-intensive – for example, high-definition videos. Edge AI can deliver results instantly rather than having to move such large data sets to and from the cloud.

Latency-sensitive applications: The need for instant action with most use cases has customers at the center, giving very little room for delays.

Forced digitization due to COVID-19: Indeed, the pandemic has fast-forwarded the need for Edge AI, with rapid digitization during this period.

Additionally, with the evolution of IoT devices and 5G connectivity, the adoption of Edge AI will be the new normal in the near future.

Use of Edge AI

Edge analytics is increasing its footprint across sectors with multiple opportunities and applications. Some evolving ones are:

- **Video/image analytics:**
  - o Surveillance and monitoring: Locally process-captured images to identify and track multiple objects/people on the edge node.
  - o Autonomous vehicles: A smart automotive camera can analyze image/video streams locally.
  - o Real-time PPE adherence monitoring for workers in the workplace/factory setup.
  - o Remote monitoring of tracks and trenches.

- **Audio analytics:**
  - o Audio scene classification can help understand a location to trigger features.
  - o Audio event detection: Detecting sounds such as a gunshot can trigger action, including notifications or location detection via triangulation.

- **Inertial sensor/environmental sensor analytics:**
  - o Self-check and diagnostic of the router and setup boxes.
  - o Predictive maintenance in factories: AI performed locally can infer the state of

the equipment, potential anomalies, and early indications of failure.
  - o Body monitoring: Wearable devices collect a lot of data about an individual's activity, location, and heart rate, among other things.

Roadblocks on the way to Edge AI

1. **Diversity:** The sheer range of imperatives and use cases (i.e. the interactions between people, businesses, and things) is an overarching and unique challenge for edge computing.

   Mitigation: Enterprises need a strategic plan or, at least, a strategic approach to edge computing to navigate diversity and ensure efficient deployment of edge computing, such as enabling distributed AI.

2. Location: Managing the scale of many novel pseudo data centers that need to be administered with low or no touch (usually with no staff and little access).

   Mitigation: A programmable software platform will be required on edge computing nodes.

3. Protection: Edge computing significantly enlarges the enterprise's attack surface outside traditional data center security, information security visibility, and control.

   Mitigation: When evaluating offerings, data-at-rest encryption must be considered mandatory, with hardware-based protection of keys.

4. Data: The amount of data at the edge will grow rapidly. However, a great deal of the data is noise, requiring pre-filtering or basic analysis.

Mitigation: Data ascertained to have no value should be considered for disposal.

The edge completes the cloud

Although the cloud itself does not, by definition, require centralization, the economies of scale it offers are maximized when it is operated centrally at hyper-scale. Until recently, edge computing was considered a low priority by cloud vendors and planners, due to modest expectations of applications at the edge and the widely dispersed communication nodes assisting in the delivery of Infrastructure as a Service. However, implementation realities (such as bandwidth and latency limitations, the economics of backhauling massive amounts of data, and high cloud data ingress/egress expenses) have led hyper-scale vendors and believers to conclude that a balance of both centralized cloud and distributed edge is the way to go.

People Counting
Count customer entering & exiting in an area

Social Distancing
Alert the social distancing violation within premise

Capacity
Alert id there are more people than allowed in an area

Intrusion Alert
Detect & alert entry into restricted area

Facemask Detection
Facemask detection in public places to ensure safety

PPE Detection
PPE Detection- Helmet, Vest etc.

Figure 2: Capgemini Vision AI : Use cases

Vision AI: applying Edge AI

Though there are quite a few factors driving AI to the edge, the key drivers have been real-time analysis and offline availability – both of which are needed even more in the context of the pandemic crisis. Capgemini's Vision AI solution is specifically architected for enablement at the edge to deliver real-time decisions and actioning in areas as diverse as social distancing, face mask detection, and capacity monitoring. Several algorithms are built as part of this solution platform, each of which is containerized and can be pushed to edge devices and technology, depending on need. Several other solutions, including a telematics capability and audio detection, are being developed and prepared for edge enablement. And there's much more to come, with the edge getting more and more connected and accessible and AI capabilities growing by the day.

Data-powered Innovation
Takeaways

Data galore: A large proportion of potentially crucial, yet unexplored, data is created in real-time by devices that are connected to the network through the internet of things.

An algorithm in a box: Advances in AI technology enables to download data-capturing capabilities and algorithms to devices, enabling real-time inference and actioning.

Pandemic accelerator: Many applications of Edge AI are particularly beneficial in the pandemic context, where location-specific, real-time insights matter most.

Hybrid is best: Central cloud capabilities form a natural match with decentralized Edge AI.

More to come: Edge AI provides a fertile platform for a continuous flow of new, smart, embedded applications.

AI for Good:
Saving sperm whales

M a r c e l   B e r g m a n n ,

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Data-powered innovation becomes particularly rewarding when it is used to create a better, more inclusive, more sustainable world. A compelling illustration of this is Capgemini's collaboration with biologists to use state-of-the-art AI to better understand and protect sperm whales. This collaboration also proves that doing good with AI easily goes hand in hand with building deep, reusable skills and leveraging the latest technologies.

A sperm whale is a very peculiar type of whale: Its head makes up as much as 30% of the length of the animal. That is why researchers named it "Physeter macrocephalus," which translates to "the big-headed blower." Unfortunately, the majestic sperm whale has been listed as vulnerable on the International Union for Conservation of Nature (IUCN) list since 2008, mainly due to the extensive whale hunting which occurred during the whaling era between the 18th and 20th centuries. Due to this and other more modern threats such as naval sonar and ghost fishing gear, it is more important than ever to protect this species.

To provide the necessary protection, prohibiting whale hunting is not enough. It's necessary to study these animals and track where they go, highlighting important migration routes, to ensure protection of the whales' natural habitats. For the scientists who have dedicated their lives to tracking and monitoring whales, it is vital that they are able to identify individual whales reliably and accurately. This identification helps to better understand and protect sperm whales as well as gain insights into their social structure.

An individual sperm whale can be identified by its fluke, which shows unique markings and structures depending on how the whale has lived, therefore acting like fingerprints. This unique aspect is why scientists take photos of the fluke, documenting key information about the time, area, and other important aspects of the observation, and then compare those pictures with existing ones and use statistics to work out details about local whale populations and behavior.

However, in order to do this, researchers must match new whale pictures with historical ones, which is far

from easy. In fact, it's quite tedious and labor-intensive: "I have to manually assist the program to pick out the contour for each half of the fluke," says Lisa Steiner, marine biologist and a renowned sperm whale researcher in the Azores. "If the photos are good, this process doesn't take very long; however, if there isn't a lot of contrast between the fluke and background or there is a lot of glare on the edge of the fluke, I have to follow the contour manually."

Global Data Science Challenge

One of our Capgemini colleagues experienced that cumbersome approach herself when she volunteered for an expedition led by Lisa. This colleague subsequently highlighted the work as a use case for 2019's Global Data Science Challenge (GDSC). In this internal Capgemini-wide competition, hundreds of employees from all over the world compete in small teams against each other to solve a set AI-related task.

Together with Lisa, she brainstormed on how to help and improve the current approach to fluke identification through AI.

It was clear that with the advancements made using AI in the field of image recognition over the last few decades,

All pre-processing steps in the pipeline use a combination of common open-source libraries and are therefore easily maintained and extended while deploying it as a lightweight service using AWS lambda functions ensures straightforward scalability.

it really could make a difference, allowing Lisa to have more time for other important tasks. Her dated legacy software (which was developed in the early 90s) was proposed to be replaced, harnessing the power of image processing capabilities to help to eliminate the need for manual matching. That is how sperm whales became the star of 2019's GDSC.

After several months, the winning team presented their solution, consisting of a pre-trained deep neural network (ResNet 101) that had been fine-tuned with roughly 4,500 pictures containing flukes of more than 2,200 individual whales. The training took approximately three hours and was performed on a GPU-based AWS cluster with Amazon SageMaker. After this, AI was capable of automatically cropping a new picture (removing unnecessary parts of the photo, leaving only the fluke in the center), comparing it to all other pictures in the database, and finding matches for a given sperm

whale with 97.5% accuracy.

In order to achieve that performance, the team had to come up with different ideas on how to process the given pictures, from flipping them horizontally to artificially extend the number of "individual whales" for the AI, to applying a multitude of photo adjustments such as changing brightness, contrast, or saturation (and many more) to help the AI generalize better. After more than 50 iterations on the GPU cluster and countless trials run on their own local machines, they were able to perfectly fine-tune their approach to achieve the top score in the competition.

Using real-world technologies

The outstanding performance of the model was the most important success factor, but not the only one. The team also focused on implementing techniques that are future-proof and can be deployed and used in real-world scenarios. That's why the different parts of the algorithm were implemented using state-of-the-art deep learning frameworks (Tensorflow and PyTorch). All pre-processing steps in the pipeline use a combination of common open-source libraries and are therefore easily maintained and extended while deploying it as a lightweight service using AWS lambda functions ensures straightforward scalability.

This not only makes it easy to operate and improve the AI model for the sperm whale use case but also makes it possible to transfer the approach to similar but different problems. The architecture follows a very modular design and uses pre-processing techniques that are common and useful for any kind of picture recognition task. This means the AI model can be retrained with pictures of other endangered species so that the application can be used for a wide range of problems in the field of wildlife conservation.

Looking ahead

With the AI performing well and matching flukes with such high accuracy, there was now a highly-functioning solution, so, as the next step, a user interface needed to be designed which wrapped everything into a web-based application that Lisa is now actively using for her work. All she needs to do is upload new pictures and wait a minute or two for the automated processing pipeline to complete, then she can enjoy the results: "I look forward to using it in the future and maybe even finding some matches that I missed the first time around [with the old tool]," says Lisa.

The work with Lisa continues in order to improve usability as well as encourage other researchers to try out the application. The long-term hope is that this easy-to-use tool will have people from all walks of life who have the pleasure of spotting a sperm whale out on the Atlantic (not only limited to marine researchers)

upload their pictures. This will scale up the research capabilities and maybe lead to finding new matches and discovering surprising new insights about these beautiful creatures.

Capgemini's collaboration with the United Nations at the AI For Good summit – where it joined as partners in AI for Good – reinforces our firm belief that AI can be used to benefit the world. Using AI ethically and sustainably will be even more relevant for the industry in the future, as stated in the recent report AI and the Ethical Conundrum by the Capgemini Research Institute.

Finally, planning for the 2021 GDSC is already underway, with an exciting new project focusing on the world's oceans, and how climate warming and other stressors caused by human activities contribute to changes in the ocean's environment. More Goodness is on the way.

"

I look forward to using the AI solution in the future and maybe even finding some matches that I missed the first time around," says Lisa.

Lisa Steiner
Marine Biologist, Whale Watch Azores

Lisa is a senior researcher who studies the movements of sperm, blue and humpback whales and has earned much appreciation globally. She is associated with Capgemini for the Global Data Science Challenge 2020 to create AI that automates the task of identifying specific whales & enabling Lisa and team to work with the government to formulate protection policies for the whales.

Data-powered Innovation
Takeaways

AI does good: AI has many different applications in many different fields, but it certainly shines most where it helps to create a more inclusive, sustainable future.

Unleashing human energy: The best uses of AI are created in a close, collaborative alignment between the human and technology sides of the equation.

Good for skills: Using AI for Good not only delivers benefits to society but is also an excellent catalyst for building the differentiating technology skills of the future.

Transfer period: Models that have been developed for a certain subject matter area should always be considered for transfer to other, adjacent areas.

Data train running: A successful AI algorithm largely depends on the supply of suitable training data, if possible even crowdsourced to the general public.
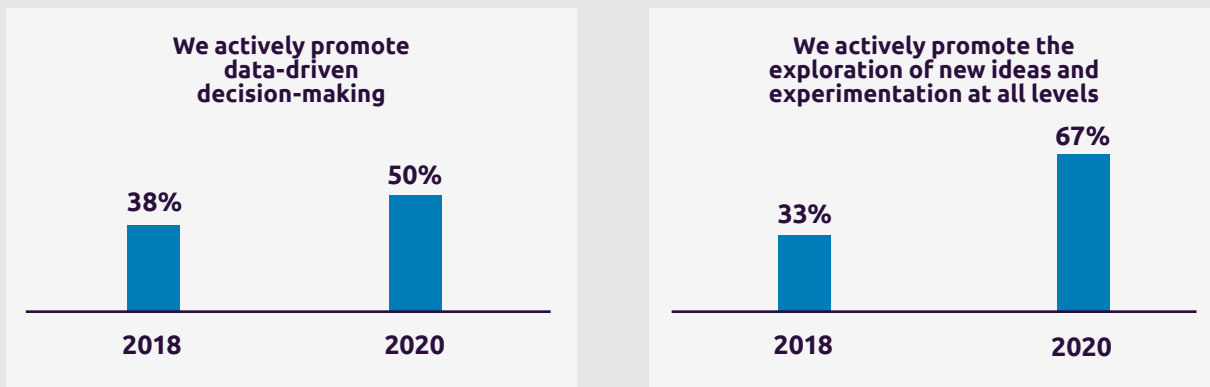
Today's innovation culture
is data-powered

Nancy Manchanda,
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Manager, Capgemini Research Institute

More and more organizations are aiming to innovate with data, as evidenced in the past few years by the findings of the Capgemini Research Institute. And this proves to be even more true amid the pandemic crisis. But what exactly are the areas that harness data-powered innovation? Learn from the research experts.

In today's age of disruption, organizations look at data as their most powerful asset for creating superior customer experiences, optimizing operations, and discovering new and disruptive business propositions. Organizations are increasingly using data as a basis for innovation and decision making. Back in 2018, that was not always the case: research we conducted then found that only 38% of organizations were actively promoting data-driven decision making. But today, the approach has shifted, with the majority – 50% – putting data at the heart of decision making (see Figure 1). At the same time, today we find that over two-thirds of organizations (67%) say they actively promote new ideas and experimentation at all levels – a huge jump up from 2018's 33%.

Figure 1: Organizations powered by data and a culture of innovation

We actively promote data-driven decision-making

2018	2020
38%	50%

We actively promote the exploration of new ideas and experimentation at all levels

2018	2020
33%	67%

Source: Capgemini Research Institute, "Understanding digital mastery today," N=750 organizations, July 2018; Capgemini Research Institute, "Organizational transformation agenda survey," N=1000 organizations, June 2020; Capgemini Research Institute, Data-powered enterprises survey, August 2020, N=1,004 organizations

Data for product innovation

"Product innovation" refers to introducing new products or enhancing existing products through new features. Today, leading organizations are not just able to collect vast amounts of data, but are also mining these data troves to drive innovation:

- **New product (feature) introduction**

  Through the social business analytics platform of its global "People Data Centers," Unilever has launched an AI-powered insights service that uses consumer data from social media, searches, and online reviews across all its business lines. These capabilities helped detect emerging consumer interest and preferences in "ruby chocolate" (i.e. pink chocolate, as opposed to white or dark, for example). This allowed Unilever to launch one of the first mainstream products in this space ahead of its competitors.

- **Increasing speed to market**

  Leveraging its database of over 80,000 oral care formulas – along with intelligence about recent market trends – Colgate-Palmolive drastically reduced the time needed to develop and market a new formulation. Through the use of predictive analytics, the company successfully narrowed 896 candidate recipes down to 23 and cut the time to market for a new toothpaste from several years to six months.

Data for business model innovation

A data-powered business model can convert data and insights into monetizable assets. Although businesses that are primarily data-powered – such as Uber, Airbnb, and Netflix – have driven significant revenue streams from their platforms, many examples are emerging in more traditional sectors.

Rolls-Royce was an early pioneer in this area, having successfully introduced a subscription model many years ago called "Power-by-the-

A data-powered business model can convert data and insights into monetizable assets. Although businesses that are primarily data-powered – such as Uber, Airbnb, and Netflix – have driven significant revenue streams from their platforms, many examples are emerging in more traditional sectors.

Hour." Any charging system based on usage requires a robust way of collecting and storing usage data plus the ability to analyze it in a timely and accurate manner With this model, rather than an airline buying an engine outright, it pays only for the operating hours of the engine. Michelin has drawn on data-powered customer analysis to provide tires as a "product-as-a-service" offering based on distance traveled. Volvo's subscription model, "Care by Volvo," where owners secure their chosen model on a subscription basis rather than outright purchase, has seen significant interest. Just four months after announcing the program in the United States in 2018, the automaker had sold its complete portfolio of subscriptions for the first 12 months of the program.

Data for social innovation

Many organizations are also using data to tackle social and environmental issues:

- **Fight against human trafficking**

In the US alone, 150,000 escort ads are posted on an average day. Lying hidden in this massive number of ads is data relating to child-age victims who are bought and sold online.

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[1]*Capgemini Research Institute, "The AI-powered enterprise: unlocking the potential of AI at scale," July 2020.*

[2]*Call transcript, "Colgate-Palmolive Co at consumer analyst group of New York conference," February 21, 2020.*

[3]*LEAD Innovation blog, "3 famous business model innovations and what you can learn from them," April 2018.*

[4]*IoT world today, "A look at Michelin's product-as-a-service strategy," February 2020.*

[5]*Autoevolution, "Care by Volvo is so successful in the United States, there's even a waiting list," November 2018.*

[6]*NY Times, "Hacks that help: Using tech to fight child exploitation," November 2017; Amazon AWS, "Thorn uses AWS to help law enforcement identify child-trafficking victims faster."*

[7]*Google Blog, "DeepMind AI reduces energy used for cooling Google data centers by 40%," July 2016; Tech Wire Asia, "Has Google cracked the data center cooling problem with AI?" May 2020.*

Spotlight, a tool developed by a non-profit organization, Thorn, helps law enforcement find trafficking victims sooner. The tool condenses escort information appearing online into a format that can be used to identify people easier and faster. Using machine learning, and deep learning-based image and video analysis, the tool has helped officers in the US identify 31,197 victims of human trafficking – 9,380 of them children.

- **Energy savings in data center operations**

Data centers need to be kept cool – excess heat must be removed to keep the servers running. The cooling of the components is a major cost driver. To date, solutions for tackling this cooling problem have even involved relocating data centers to locations with cooler climates.

To solve this cooling problem, Google, along with DeepMind, Alphabet Inc.'s subsidiary, leveraged an AI platform known as AlphaGo, originally developed to challenge the world's best players of the Go board game. After applying this approach, Google realized a 40% reduction in costs related to cooling after applying this approach to its data centers.

In today's disrupted and fast-changing markets, innovation is not a "nice to have" – it is a "must-have" to stay relevant. With the proliferation of data and the use of artificial intelligence, organizations now have a rich opportunity to drive ambitious innovations at scale. But this will not happen if organizations look at data-powered innovation in silos. Maximizing impact means embedding a data-powered innovation culture within the fabric of the business and making this approach a critical capability and practice in the enterprise's innovation system.

Data-powered Innovation
Takeaways

An era of acceleration: As evidenced by research, organizations are increasingly using data as a basis for innovation and decision-making, further accelerated by the pandemic crisis.

Data for business model innovation: A data-powered business model converts data and insights into monetizable assets, and this is no longer just the domain of disruptive startups.

Data for product innovation: New products are introduced and existing ones enhanced through new features built on data and algorithms.

Data for social innovation: Data and algorithms can be leveraged for a more inclusive, more sustainable world.

> Access Capgemini Research Institute's
> **'The data-powered enterprise'** report here

Intelligent data-driven
change management

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The human dimension is without a doubt the most critical success factor to any change or transformation initiative. But human beings can no longer deal with the ever-increasing complexity and speed of change that is nowadays the unescapable business default. Data and Artificial Intelligence come to the rescue in a unique way, bridging the two apparently different worlds of emotions and empathy on one hand, and data and algorithms on the other hand.

Transformation is not new to organizations or to its employees. And despite continuous efforts to improve its success rate, studies consistently indicate that roughly 75% of large-scale transformation programs fail. Indeed, while a lot of analysis has been dedicated to explaining this high failure rate, we believe that the root cause must be addressed first. Acknowledging that the context of both transformation and technology has drastically changed, we conclude that a new, truly different style of managing transformation is needed. It´s time to equip employees with powerful data- and AI-driven change management tools that support their continuous improvement and reskilling. And despite the reliance on technology, the EQ of both the involved employees and the organization will only benefit from it.

In the past, the purpose of detailed planning was to define the target state, scope, and direction that a transformation would take. Today, transformational initiatives have become increasingly dynamic, continuously evolving, with an unpredictable trajectory that is influenced by multiple feedback loops coming from customers and employees, even further exacerbated by unprecedented uncertainties in business and society as a whole.

In addition, companies often run multiple concurrent initiatives covering a wide spectrum of themes. These can range from customer journey innovation to monetizing data and process automation to introducing new and breakthrough technologies.

The result is a continuous flow of alterations in processes, tools, roles, and ways of working. Humans are simply not equipped to cope with this level of change, and Capgemini research shows show that multiple business challenges can result in:

Increased efficiency and productivity:

Some employees use up to 35 job-critical applications, switching screens more than 1.100 times a day, causing tremendous inefficiencies and affected productivity.

Securing talent and skills required for business strategy:

Ninety percent of companies are lacking sufficiently qualified employees, given the newly evolving needs
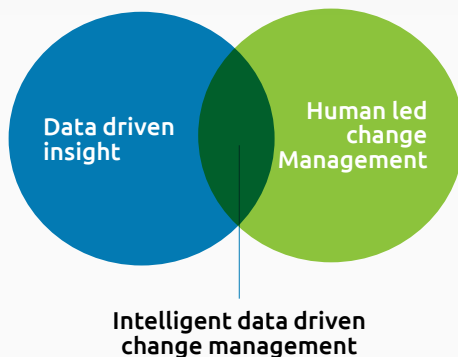
Increased transformation success rate:
Employees tracking the progress of complex transformations with digital tools are 2.6 times more successful

Organizations should thus focus on a human-centered design approach to transformation and change, but have this augmented by powerful data-driven insights and AI. Capgemini expects corporate change management functions to quickly embrace this approach, which we call Intelligent Data-driven Change Management (IDCM).

Using data to decipher transformation

IDCM lies in the sweet spot of human capabilities and data-driven insights. It leverages the unique strengths of human emotional intelligence, such as business acumen,

Intelligent data driven change management

empathy, the ability to manage conflicts, and the power of inspirational leadership to influence others. This is achieved using actionable insights that are enabled by data, algorithms, and AI.

This approach, which builds on state-of-the-art technological capabilities, requires a new type of digital platform that goes beyond the capabilities of digital tools as we know them today. As well as putting people at the center, that platform must capture key data and events at a very fine-grained level. This makes it possible to detect complex patterns not apparent to human eyes and minds, which in turn makes it easier to learn from successes and failures. Through AI-generated recommendations, the platform empowers employees to optimize their individual impact on the transformation.

A compelling employee experience

Today's employees expect the same individualized, compelling experiences with technology that they enjoy as

consumers. For example, data-driven personalization considerably boosts employee engagement in learning by ensuring that information and recommendations are relevant to individual interests. Employees' motivation and commitment to a transformation can be strengthened by being able to see their own tangible contributions to that

Employees' motivation and commitment to a transformation can be strengthened by being able to see their own tangible contributions to that transformation.

transformation.

At the management level, data can be used to help staff with benchmarking and continuous improvement objectives. It becomes so much easier to steer a transformation program once there is up-to-date, factual evidence about the maturity of capabilities and about different organizational units' success in absorbing change.

Clearly, the digital platform, data, algorithms, and AI are all vital, but the human aspect of change remains critical. Humans are social beings and will always be motivated by others: specifically, by leaders who can create a vision to inspire staff and mobilize the right stakeholders to drive change. No algorithm can provide that, but even these uniquely human leadership capabilities can be accelerated and amplified by technology. One way is to ask leaders to engage with the workforce via carefully selected social media platforms so that vital messages can be disseminated instantly.

Putting the approach into action

Capgemini Ventures recently invested in InsideBoard, a startup offering the type of data- and AI-driven, employee-centric environment described above. Its cloud-based, as-a-service platform enables organizations to boost transformation and technology rollout programs by connecting employees, measuring their individual progress, and increasing their engagement by recommending targeted content. Data-driven analytics and AI functionalities monitor and manage emotional intelligence, the undisputed key success factor for change.

Recent project metrics collected in the field prove that

tangible and substantial business improvements can be achieved, for example:

- €10m savings on training plus improved results
- 65% increase in CRM user adoption rate
- 90% increase in sales proposals.

Although IDCM is a new concept that relies on breakthrough technologies, platforms such as InsideBoard are already mature. Ready to be deployed for any transformation, InsideBoard can provide:

- **Increased engagement –** AI-recommended content boosts employee engagement.
- I**mproved transparency –** Near real-time metrics allows stakeholders to track transformation progress.
- **Lowered costs –** Automated digital workflows enable the delivery of training and communication initiatives at low cost, speeding up rollouts.
- **Measured capability maturity –** Certification of knowledge stages for

employees, together with aggregated metrics, provides a heatmap of the maturity of key capabilities.
- Demonstrable ROI– Measuring the impact of change initiatives improves buy-in as well as the accuracy of transformation planning.

Getting started with IDCM

Rolling out an IDCM platform such as InsideBoard is itself a change process, and needs to be executed in iterative steps. The starting point should be a pilot project that proves the concept, validates the technology, and demonstrates the business benefits.

After the pilot, the way forward lies in gradual scaling to aggregate more data from a wider range of business applications and organizational entities, accumulating more content and richer metrics each time. This way, the organization is motivated by finding itself progressively better equipped to cope with its dynamic transformation landscape.

Data-powered Innovation
Takeaways

Data to deal with data: Today's transformation programs generate a flood of data and that is hard to cope with, but that same data also brings new answers.

Employees are consumers: The data- and AI-driven personalization that is compelling for consumers also engages employees involved in transformation.

Transformation is learning: Over time, as more and more data is captured and processed about more and more transformations, each subsequent transformation becomes more successful.

AI ethics and IBM Watson OpenScale

Dr. Manish Bhide,
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With AI applications entering mainstream business use, the ethical dimensions of AI are coming under more scrutiny, driven by the critical perspectives of consumers, business partners, and regulators. Proper governance measures are key, but luckily innovative technology is coming to the rescue as well. IBM Watson OpenScale is a leading example of a software platform that will help to address the phenomenal challenges of AI ethics.

AI is a powerful tool for innovation and competitive advantage. Yet many organizations are struggling to put large-scale AI solutions into production.

A major inhibitor is distrust of AI models. Many business stakeholders simply do not trust AI. This is especially prevalent within regulated industries such as banking, insurance, and healthcare. "… because the AI model said so…" does not resonate particularly well with customers, business stakeholders, or industry regulators.

The perception of lack of AI ethics can damage brand image and lead to customer flight. Close to half of consumers believe that they have experienced the impact of an ethical issue. Nearly nine in 10 organizations globally have encountered ethical issues resulting from the use of AI over the past two to three years.

At the same time, we are seeing fines being levied by various regulatory bodies for biased treatment of customers and lack of transparency.

Clearly, addressing AI ethics is now a business imperative. Key elements that must be considered include:

- Explainability: Can I explain why the loan was turned down?

- Bias: Is the AI model outcome biased based on age, gender, or geographical location?

- Drift: Does the model output change over time? How can I detect this drift?

- Auditability: Allowing third parties to assess the inputs and verify that the AI output can be trusted.

Watson OpenScale

Validate and monitor AI models, deployed anywhere, to help comply with regulations, address internal safeguards, and mitigate business risk

Monitoring for compliance and safeguards
- Mitigate biased model behavior
- Explain model decisions
- Validate and control risk

Ensure that models are resilient to change
- Detect drift during runtime
- Generate specific model retraining inputs

Align model performance with business outcomes
- Correlate model metrics and business KPIs
- Actionable metrics and alerts

As an AI pioneer, IBM has been working on these issues for years, resulting in an open platform to accelerate the adoption of trusted AI: IBM Watson OpenScale. This platform can be used with many open-source models such as TensorFlow, scikit-learn, Keras, and Spark MLlib, and can run on Azure, AWS, Google, and IBM Cloud, as well as on-prem, taking advantage of Cloud Pak for Data.

Explainability

It's not enough to tell a customer that their loan application has been declined; we should also be able to articulate why. We need to explain, for example, that the current income is too low and the existing debt is too high for a loan to be approved. This is required not only at run time from a customer service perspective, but possibly also later as an audit and industry regulation requirement.

OpenScale will automatically detect drifted transactions at runtime, pinpoint data points that may contribute to drift, and call this out. This will allow better governance of the AI solution, ensure that the output stays on track, and free up personnel from monitoring tasks.

So how do we inject explainability into the solution, when the AI model is inherently a black box? There are techniques that can address this situation based on input to, and output from, the AI model. IBM Watson OpenScale can leverage this approach.

Fairness

We want our AI models to be fair, i.e. without bias.

A biased model may result in poor business decisions, create customer dissatisfaction and unwanted media attention, or warrant action from industry regulators. We have all seen horror stories in the media related to AI bias: employment opportunities skewed based on gender, and credit card applications denied based

on minority status.

No matter how carefully an AI model is designed, it is only as good as the data used to train it. Unfortunately, training data sets are seldom comprehensive representations of all real-world situations. The gaps in training data can introduce bias, which must be mitigated.

But what if the apparent bias is real? Even if applicants over 45 years old get their applications approved and applicants under 25 are refused, there may not be any age-based discrimination: The issue may be the income level of the applicants. OpenScale can flag possible bias and also verify if the bias is real. When a genuine bias is detected, the platform can help mitigate it.

Drift

Changes to real-life situations over time may result in changes in the AI model output or model drift.

Today, many enterprises have their data scientists monitor AI model output when developing AI solutions and then also keep an eye on the models in production. After a while, the data scientists will spend a disproportionate amount of time on maintaining existing models, so that the time available for developing new models is reduced. To alleviate this issue, AI models are increasingly handed over to operations staff, who do not have the data science background to identify bias or model drift.

OpenScale will automatically detect drifted transactions at runtime, pinpoint data points that may contribute to drift, and call this out. This will allow better governance of the AI solution, ensure that the output stays on track, and free up personnel from monitoring tasks.

Traceability

To accommodate internal auditing and compliance reporting, enterprises should be able to trace all decisions and predictions, and the lineage of all data and models used, in the process of making a decision aided by AI models.

Governance best practice includes maintaining an audit trail of AI model bias, model quality, and model drift. OpenScale helps address these requirements by keeping a historical record of all model input and output, and documentation of

all model metrics, ensuring that clients can explain the behavior of the AI model and prove to regulators that the AI models they use have not shown bias in the past.

Model validation

One of the biggest challenges for the banking industry, in particular, is the validation of AI models. Model validators are familiar with statistical models, but they are not as conversant with AI model validation. OpenScale helps model validators quickly validate an AI model by simply uploading some labeled data. It then generates an AI validation report in PDF format. This makes it very easy for model validators to assess AI models using criteria such as fairness, drift, and quality. This also helps in standardizing the work of different model validators.

Ultimately, IBM Watson OpenScale software provides innovative monitoring and management capabilities that help build trust, accelerate adoption, and put stronger control and governance structures around AI investments.

Enterprises ignore AI ethics at their peril. Addressing these issues makes sense from multiple perspectives, including business and brand, regulatory compliance, and AI operations cost.

Data-powered Innovation
Takeaways

AI showstopper: Despite all obvious business benefits AI can bring, a lack of overall trust in AI can bring even the most compelling AI initiative to a grinding halt

AI enabler: When properly addressed, AI ethics can drive successful adoption and acceptance of AI solutions by the target audiences.

Gang of four: Key AI ethics elements that must be covered in any AI solution are explainability, bias, drift, and traceability.

Platform to the rescue: Next-generation technology platforms such as IBM Watson OpenScale bring powerful enablers to deal with these key elements of AI ethics.

A new working era
demands new skills

Paramita Gupta,

Vice-President, Insights & Data Global Business Line, Capgemini India

Driven by advances in digital transformation and innovative, breakthrough technologies such as AI and Intelligent automation, jobs are rapidly changing – and so are the skills needed. This trend is further exacerbated by the new ways of working and collaborating that many of us have been so suddenly plunged into. In order to thrive in this digital revolution, the what, how, and who of skills need to be well understood.

The current pandemic has provided us with a unique lens through which we can see a world that is moving much faster in its digital transformation. Social distancing and lockdown implementations have inevitably led to a step-change in the use of digital technologies. A large section of the workforce around the world has almost instantly adapted to the work-from-home (WFH) model – and for many, it turned out surprisingly well. On the flip side, part of the workforce is currently underutilized in many organizations.

Overnight, the pandemic has changed not only the way companies work, but also the skills that the workforce requires to operate. Even before the current crisis, changing technologies and new ways of working were disrupting jobs and altering the skills employees needed to do them. In a September 2019 survey, the Capgemini Research Institute discovered that 39% of the overall workforce, and 50% of the millennials in the sample, felt they would have to switch occupation or acquire new skills in the next five years because of automation, artificial intelligence, and other new technologies.

But for the data-powered organizations, the challenge is more than just enabling remote working, or the role of automation and AI. The pace at which new technologies appear is dizzying. Staying on top of all the trends is difficult for even the most knowledgeable leaders.

The main question is how leaders can set up processes for reskilling, upskilling, and cross-skilling the workforce

to deliver new, dynamic, and resilient business models in the post-pandemic era. Answering this question needs a good look at the "what," "how," and "who" of the challenge.

How many times have we been first excited, then confused by the endless choices of courses and videos, and subsequently found our enthusiasm flagging before we complete the twenty or forty hours of training? Very few of us are motivated and self-actualized enough to stay consistently focused on our upskilling journey.

The what question pertains to the skills that the new or recovered business model depends upon – as organizations redesign their strategies to forge ahead in the future business environment, they will also have to rapidly identify the skills needed. Secondly, they must decide how they can design their upskilling programs to strike a balance between cost-effective scalability and focused interventions aimed at developing expertise. Lastly, leaders are spoilt for choice when it comes to learning methods and partners in this space. Understanding who will have the right holistic perspective is key to selecting the platforms and partners that make decision making easier.

What

As technology lifecycles continue to get shorter, the challenge of deciding which skills to focus on keeps getting harder to tackle. Firstly, there are hundreds of new tools and platforms entering the market every year. Keeping pace with the hard technical and digital skills needed in itself is difficult to do without harnessing technology. Then there are soft digital and management skills, such as agile ways of working, design thinking, and customer-centricity, which are crucial at every step of the product/service lifecycle. Being effective in the new normal also means a lot of focus on self-management,

self-actualization, diversity, and inclusion. The third dimension of complexity is introduced by rapidly evolving consumer and societal trends. Skills relating to sector insights evolve faster than is comfortable for most organizations today.

How

It's time to acknowledge that the overall skills landscape is incredibly complex to manage with human intelligence alone. We need a serious infusion of technology to solve the eternal problems plaguing resource management groups in most organizations: for example, which skills to hire and what quantities will yield the optimum balance between demand and supply. The skill-demand matrix needs to be automated and augmented with technology that provides deep insights to enable faster and more accurate decision making. AI will play a larger role here as many aspects of the insight generation methodology become too voluminous for human analysis.

Who

The past few months have witnessed a surge in fully digitized approaches to learning. Not only "EduTechs" teeming with online training programs, but many companies have also opened up their learning portals to the public – so now countless self-learning and training paths are available for people to re-tool themselves. However, how many times have we struggled with a plethora of learning choices? How many times have we been first excited, then confused by the endless choices of courses and videos, and subsequently found our enthusiasm flagging before we complete the twenty or forty hours of training? Very few of us are motivated and self-actualized enough to stay consistently focused on our upskilling journey.

The most scalable yet effective strategy is to have a combination of approaches, starting with online video-based courses about skills needed to transform oneself. Later, but in the foreseeable future, these can be augmented with a focused, expert instructor-led program for more critical skills. Here, the employees will benefit from a mentoring-led, discussion-based approach with experts who will bring the experience of, and insights into, both the sector and the domain. By complementing cost-effective, scalable online training with focused, expert sessions, organizations can create

greater personalization for learners – which means greater effectiveness.

The road ahead

How can organizations plan, design, and execute a robust and responsive skills program that is comprehensive enough to cover the ever-widening requirements of the entire workforce yet nimble enough to adapt to rapidly changing technologies? The answer lies both in the effective use of emerging technologies to help enable the skills planning process and in maintaining constant human touch with the process, with mentoring playing a much larger role than it has in the past.

The time is right for companies to adjust their talent strategy to take advantage of the current under-utilized talent and plan for medium-term benefits through them. This approach will bring purpose and stability in the near term while enabling the companies to become more efficient, innovate faster, and increase job satisfaction. In the medium term, the only way forward is to create an ecosystem of technology enablers and bring on board the right learning partners to produce and deliver digital content rapidly to a broad base of employees.

Tackling the upskilling challenge well now will benefit both the employees and their employers – not just during the pandemic, but also when this is all over.

Data-powered Innovation
Takeaways

New jobs, new skills: AI, intelligent automation, and other innovative, often data-powered technologies are driving an era of new jobs that demand new skills.

Say what ? A plethora of technical, personal, and industry-specific skills must be continuously monitored to keep track of what is and soon will be relevant.

Say how ? AI and data-driven technologies come to the rescue in understanding and mastering the highly complex landscape of demand and supply of skills.

Says who ? The new reality of working demands a different mix of learning methods and tools – and through that, other teachers and mentors may enter the arena.

Millennial Garage – Putting data-powered innovation into practice

Mukesh Jain,

Chief Technology and Innovation Officer, Insights & Data Global Business Line, Capgemini India

So many ideas and opportunities for data-powered innovation – so little time to bring them alive. Capgemini's Millennial Garage builds on best practices in applied innovation to create a vibrant place to test-drive new, breakthrough technologies around data, analytics, and AI. It comes without the complex governance and red tape that can often be passion-killers for innovation. And it is a compelling proposition for graduates and experienced professionals alike.

People who work in technology often come up with innovative ideas. That's true whether we have only just started on our professional journey or are already well on our way. And it's truer than ever nowadays, with data, analytics, and AI providing a constant stream of new possibilities. In fact, it is often the prospect of innovating in this way that initially attracts graduates and young professionals to a career in technology.

Unfortunately, though, we don't always have the chance to pursue our innovative ideas due to our other responsibilities, which typically have a strong operational focus. What's more, developing ideas takes people, infrastructure, guidance, execution capabilities, and, of course, time – all scarce resources. So after that flash of inspiration, it's all too easy just to go back to our daily routines and reluctantly put innovation on a back burner.

A new way to progress from idea to innovation

However, professional experience teaches us that when people are truly passionate about ideas, they always find ways to bring them to fruition. Capgemini's Millennial Garage provides a compelling illustration of this truth.

The first Millennial Garage location opened only last year in Mumbai, with the aim of making it much easier for our professionals to get involved in data-powered innovation. It offers an innovation platform together with a collaborative space where ideas are brought to life in a fun, accessible environment, and new technologies and platforms can easily be explored.

A Millennial Garage is enabled by up-to-date infrastructure and software and contains everything needed to get busy with the latest in data, analytics, and AI. In constructing the first one, we drew on vast experience gained from our client-focused Applied Innovation Exchange (AIE) network. This experience enabled us to rapidly create a learning, exploring, and experiencing engine for our people.

Whenever one of our professionals takes an innovative idea into the Millennial Garage, they encounter no barriers to moving it forward. They can partner with like-minded people to enhance their idea, and work with graduates and young professionals to develop it further and bring it to life in the form of innovation.

Exceeding our own expectations

When the first Garage location opened, we mainly had fresh graduates in mind as the target audience (hence the "Millennial" part of the name). However, we were soon pleasantly surprised to see more experienced professionals from operational practice units join in as well – even when client commitments meant they had to do it in their own time.

People from across the organization came in to learn something new, and at the same time quickly found themselves mentoring others. The Millennial Garage became the center of an ecosystem of people, ideas, training, and new technologies. And it was all driven by everybody's sheer determination to get hands-on with data-powered innovation.

Scaling it up

The Millennial Garage began with a single location and 10 pioneering staff. But by leveraging a standard model for collaborative working and a replicable blueprint for setup, we have grown the Millennial Garage exponentially in a period of little more than a year.

Now, 1,000+ employees work in Millennial Garage locations across India, Europe, Australia, and elsewhere. Together, they have already delivered more than 150 innovative assets.

To mention just a few of the many successes, people using Millennial Garages have:

- Gained in-depth experience of Azure Synapse, Microsoft's limitless analytics service
- Developed several AI solutions based on computer vision
- Built analytical forecasting models using Python and PowerBI, AWS Sagemaker, and Google Big Query
- Developed and deployed Machine Learning Operations ("MLOps") for our 890 by Capgemini Data, Insights & Outcomes exchange.
- Produced an HR Analytics machine learning model that predicts attrition with more than 80% accuracy – then made it available for our HR functions to use through the 890 exchange
- Built advanced analytics to understand people utilization across our business service lines.

Benefits that keep coming

Some Millennial Garage initiatives simply deliver a valuable learning experience for the individuals involved, with the thrill of test-driving innovative technology in an engaging and fun environment. That is exactly what we intended, and so we were surprised to find that other initiatives also created accelerators and even high-quality, full-fledged solutions that are ready to be implemented, potentially with many different clients.

In every case, crucial new skills are developed, and more of our professionals get exposed to innovative technologies – an opportunity they may not get from their daily operational duties. That makes the Garage a valuable tool for building data-powered innovation into the company culture.

Above all, a Millennial Garage is a place that radiates and reinforces excitement about being part of a profession that centers on data-powered innovation. A simple metric bears out this claim: Professionals who are involved in a Garage are five times more likely than others to stay with the company rather than look for a job elsewhere. And that is a key benefit in an industry that revolves around scarce – sometimes unique – skills and a never-ending battle for talent.

Millennial Garage
Technology is greatest when it brings people together

Data-powered Innovation
Takeaways

Keep it simple and applied: Although scaling innovation often needs governance, processes, and funding, you don't need much just to get hands-on with data.

Parallel worlds: To many people, a Garage is simply a fun place to spend time. It's totally different from their business-as-usual activities, yet available close by.

A culture tool: Getting more people involved in data-powered innovation in much easier ways, is a phenomenal way to build data-driven culture.

A people tool: Graduates, young professionals and their more seasoned colleagues are motivated by being involved in data-powered innovation.

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