



WAVE V | 2023

# DATA-POWERED INNOVATION REVIEW

# FOREWORD



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Being caught between a rock and a hard place is usually not seen as a distinct pleasure. But I feel quite different, very positive vibes when looking at the visual theme of this fifth edition of our Data-powered Innovation Review. It somehow unleashes the explorer in me, looking for new, uncharted ways to innovate with data.

The trail towards innovation can be intricate and mysterious. The still mountains hold thousands of years of knowledge, seemingly rock-solid and immovable – yet pounded by ever-changing conditions. They reflect sustainability like nothing else. And within, there is a strong core and an innovative layer that adapts, changes, and creates new evolutions. Navigating this time-tested environment, finding new paths towards unknown destinations is an exciting challenge.

That's why I am happy to invite you to join us in our journey of 'elevating data & AI' and 'serving sustainability' with the latest release of our innovation review magazine. Both main topics of this issue – carried by a great collection of articles – are near to my heart.

Becoming a true data master is a matter of leveraging data to the full extent, activating it as close as possible to business operations,

building more value on top of proper data foundations and uplifted data behaviors. It is about looking beyond the usual surroundings and be inspired by new ways to elevate data & AI. Just see the articles about 'serendipity', data mesh, human augmentation and even playing the data poker game to get a flavor of it.

Then there is the quest for sustainability and a better society – higher on the corporate agenda than ever before. Data plays an absolutely pivotal role in addressing some of the biggest challenges of our time. A variety of articles in this magazine – such as the ones about data and AI for Net Zero, the circular economy, battling river blindness, feeding the world, and the UN's 17 sustainable development goals – are all testament to this.

Let's go and explore. I sincerely hope you find this edition of the Data-powered Innovation Review rocks like always. Enjoy it!

## EDITOR'S NOTE



RON TOLIDO

CTO, Insights & Data,  
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To Capgemini's data-powered innovation movers & shakers this good-looking magazine is not the '42' answer to all questions of life. But it sure is a great catalyst to come together and brainstorm innovative topics, reach out to relevant top experts and technology partners, create unique content and then – after publication – surf a long wave of follow-up posts and events.

Now in its 5th edition, the Data-powered Innovation Review has supplied a steadily growing repository of innovative ideas and best practices, all geared around the breakthrough business potential of data, analytics, and AI. Looking at 2 ½ years of exploring data-powered innovation, we see certain topics rapidly entering mainstream, sometimes at blistering speed.

Just look at generative and creative AI – right from the first edition of this magazine identified as a likely disruptive technology trend. It now, in just a few months, has become commonly available and used through the likes of chatGPT, Dall-e, Stable Diffusion, and Midjourney. Also, an early trend such as data mesh has rapidly grown from early, exploratory posts to dozens of implementations we are currently involved in across the globe.

And what will be next? We have 19 articles for you to get a taste of it.

In the first section of the magazine – **'Data & AI Elevated'** – we bring yet again inspiring perspectives on how to activate data for on-the-ground, real-life business purposes. From innovative ways to rapidly start benefiting from cloud and edge computing, via best practices and use cases in the energy & utilities sector, all the way up to serendipity and augmentation as the drivers to next-generation user experiences. As we are entering 2023, there are

even some new year's resolutions for you. And what exactly has playing poker to do with becoming a data master...?

Whatever economic, technological, and geopolitical scenarios pan out in the new year; we know that sustainability tops the agenda of most organizations. Hence the second section of the publication – **'Sustainability Served'** – brings a flurry of innovative ideas on how data, analytics and AI can be used to create a better planet; and not 'only' in terms of the environment, but also in terms of battling diseases, feeding the world and even addressing the full scope of the United Nation's 17 sustainable development goals. Doing good things with data turns out to be a journey with benefits: building data mastery along the way sure makes organizations doing well themselves too.

The articles have been crafted by leading Capgemini experts, a bit of generative AI – and in collaboration with key partners such as AWS, Denodo, Databricks and Dataiku. Don't hesitate to contact the contributors. They'll be most happy to help you on your innovation journey. Also, look out for a series of follow-up activities, such as additional in-depth articles and live events featuring contributors and guest panelists.



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# DATA & AI ELEVATED

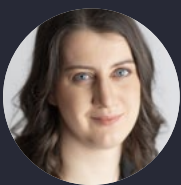


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# HONEY, I SHRUNK MY CLOUD

## – FROM CLOUD-NATIVE TO EDGE-NATIVE

The emergence of IoT devices, autonomous vehicles, wearables and AR/VR devices and the like, plus the ready accessibility of 5G networks, brings a new reality for the modern data platform architecture. And there, bigger is neither better nor faster. A new ecosystem of analytics and computational platforms is born on the edge.



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“Once these two cars make their way around the track – and Lando [Norris] and Daniel [Ricciardo] do it at 200 miles an hour – 300 sensors are producing a terabyte-and-a-half worth of information that we have to analyze to try and find the edge. And when I talk about edge, it’s milliseconds.” How shall we process and react to 1.5 terabytes of data within milliseconds? It is nearly impossible with the usual way of processing, by sending the data into a cloud or on-premises data center, processing it, and sending a result or an action back to the origin. This gets even more complicated when there is no possibility of a proper network connection, or if the

surrounding infrastructure or the bandwidth is just too small.

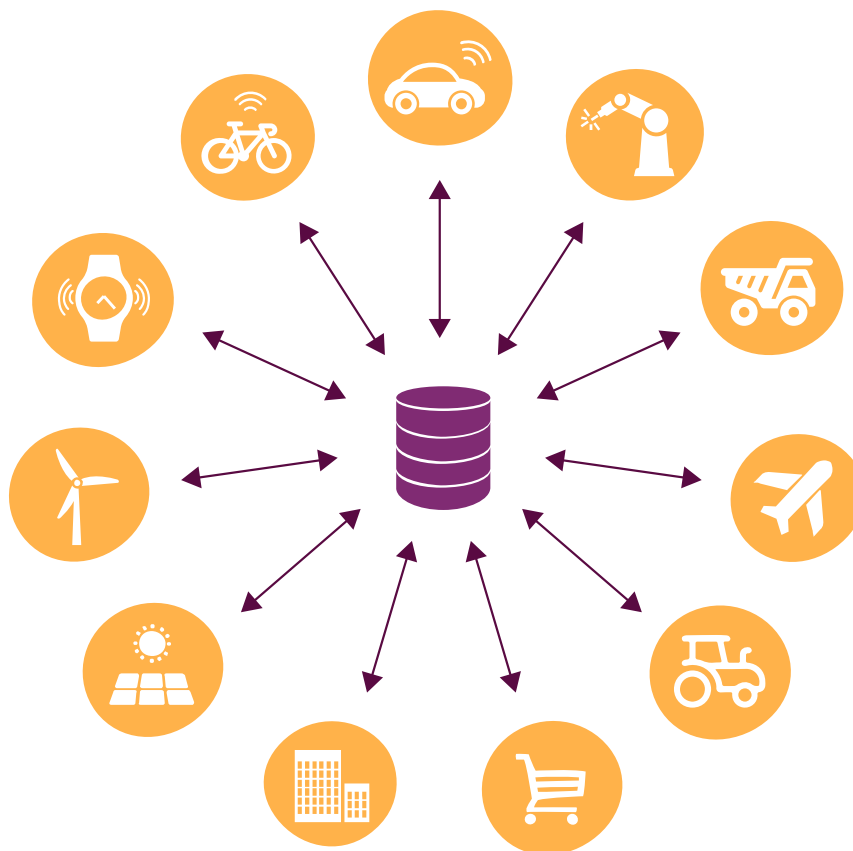
## What is edge computing?

Edge computing is an emerging computing framework that relies on the distribution of resource-optimized data storage and processing capabilities closer to the point of creation and/or consumption of this data. As opposed to traditional cloud computing frameworks, where data processing is centralized into a remote datacenter, edge computing seeks to relocate activities closer to

the user or the end device (the “edge” of the network). Edge computing is a necessary enabler for an increasing variety of critical use cases, ranging from telemedicine to autonomous vehicles and industrial IoT.

To sum up the definition: we are able to do more with the data at the place the data is being generated and where we need to take the action. That has not only a positive impact on our reaction time, but also allows data-led decisions to be made by autonomous devices.

*Figure 1: Examples of Edge Computing*





## What are the benefits of edge computing?

- No latency. Local processing means that data does not need to be sent to a centralized cloud for analyses. AI models deployed on the edge can deliver interpretation of the data on the spot, providing instant decision support.
- Lower data volume. Analytics capabilities at the source limit the need for the data to be sent and processed centrally. Only a subset on meaningful point can be communicated and stored centrally. Edge devices can ingest and process data on the spot, determining what data can be discarded and what data is valuable and should be sent to the data centers.
- Optional connectivity. By moving the storage and processing of the data to the edge device, the

requirement for stable network connection is significantly reduced. This reduces the bandwidth costs and network traffic, as the devices can store data and results locally, synchronizing with centralized clouds only on demand.

- Strengthened privacy and security. Local processing eliminates the need for private, sensitive data to be sent over the internet to a remote location to perform matching and recognition, where it could potentially be hacked or exposed.

As a result, edge AI brings high-performance computing capabilities to the edge, where sensors and IoT devices are located. This enables safe real-time analytics and autonomous decision making by creating insights almost instantly through running machine learning (ML) and deep learning (DL) algorithms.

*"The volume of data and the need for higher frequency and faster response to the changing environment raises the topic of edge computing and edge devices and pushes the AI and analytics capabilities out of the cloud and into the edge. Edge computing solutions in industrial settings are predicted to grow rapidly, driven by the need for real-time data analytics and localized action."*

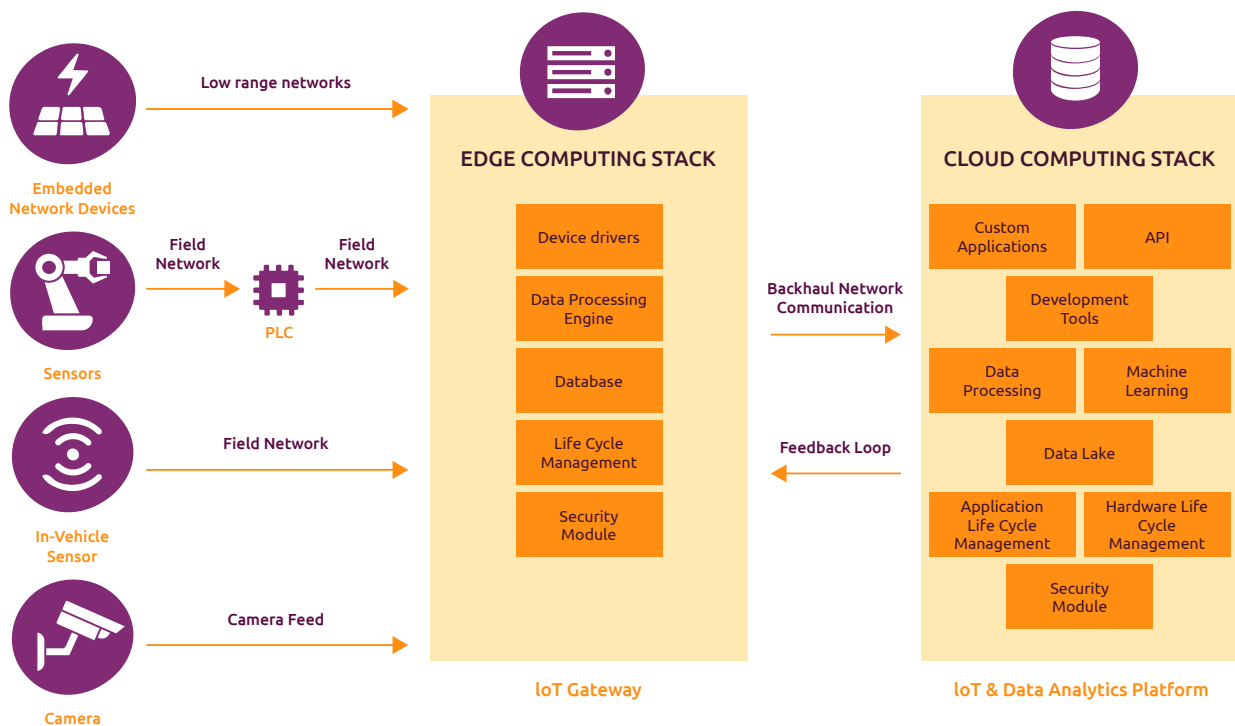


## What's in it for us?

Industrial organizations view edge computing as key to realizing the full potential of 5G. In 2021, the Capgemini Research Institute found that “close to two thirds (64%) of

organizations plan to adopt edge computing services within three years, while a small share (7%) of organizations are already using 5G-based edge computing services.”

Figure 2: Edge Computing Infrastructure Stack



There are already a multitude of technical solutions and offerings from Amazon and Microsoft, and options from niche suppliers are appearing on the market. Eneco, a producer and supplier of natural gas, electricity, and heating in the Netherlands, collaborated with Microsoft and used Azure IoT components to build a smart grid solution to communicate with the numerous energy meters located at households and industrial units, eliminating the need for manual inspection. The company achieved a 10-degree temperature reduction in its heat distribution network and lowered CO<sup>2</sup> emissions.

But these innovations happen in other sectors as well, such as consumer business. Apple announced crash detection in its recent smart watch, extending its already existing fall detection towards car crashes. It can detect a severe car crash and automatically initiate an emergency phone call. For this, a new three-axis gyroscope and “high g-force” accelerometer that samples up to 256 Gs of force are used in combination with advanced AI models.

With the rising adoption of edge AI solution like TinyML, new intelligent solutions are created. An important application of such technology is

found in the area of farming, where IoT data and AI models are used to lower the consumption of water and energy while saving operational costs. In another sector, oil and gas, continuous improvement in miniaturization and AI models is preventing pipeline spills, as these can be autonomously monitored.

The emergence of IoT devices, autonomous vehicles, wearables and AR/VR devices and the like, and the ready accessibility of 5G networks, brings data with frequency and volume never seen before. The computing capabilities of the cloud data platforms are not enough to sustain instantaneous storage, processing, and analysis of the results. The volume of data and the need for higher frequency and faster

response to the changing environment raises the topic of edge computing and edge devices and pushes the AI and analytics capabilities out of the cloud and into the edge. Edge computing solutions in industrial settings are predicted to grow rapidly, driven by the need for real-time data analytics and localized action.

This unparalleled increase in IoT devices and edge AI capabilities brings new challenges for data platform architecture and capabilities. We see a shift in technology and architecture moving away from monolithic to product and domain thinking, and to distributed edge, enabling autonomous decision-making.

# Innovation takeaways

#EDGECOMPUTING  
#EDGEAI #AI4GOOD  
#DATAPOWERED  
#INNOVATION

## REAL TIME WITH EDGE

Edge computing is a scaled down and distributed approach to cloud computing systems bringing the ability to capture insights from real-time data, without impacts from latency and network bandwidth.

## RESOURCE EFFICIENCY

Edge resources afford technical advantages over cloud-only processing and greatly improves scalability of systems, while optimizing network efficiency reduces the amount of round-trips to the datacenter.

## ACT NOW

It's now the right time to increase efforts in building edge computing solutions, leveraging the latest technologies to increase system resiliency and efficiency.



# HUMAN AUGMENTATION

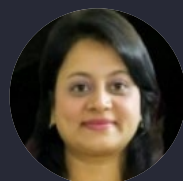
## – THE NEXT FRONTIER IN AI

Magic happens when humans and machines work collaboratively in a truly symbiotic relationship. They enhance and augment each other's capabilities to bring speed, ethical behavior, creativity, disruption, and innovation to how we do business. It is where AI goes next. Some examples illustrate this key evolution.



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AI is a transformational technology that helps to imitate the way human minds think and automate various complex, cumbersome, and banal tasks with precision and at a speed. If synergies are combined and AI is learning from human intervention and historical knowledge, it will completely disrupt the ways AI can transform the business, within constraints of humanity. Cooperation between human and AI, where human cognitive capabilities are enhanced by artificial intelligence technology with sensory or actuating technology, is termed "human augmentation."

Further technologies driving growth in human augmentation are: 5G, edge computing, quantum computing, IoT precision sensors, augmented reality, and so on.

Many industries are already leveraging this human and machine cooperation in sensory augmentation and augmented cognition, or in augmented action like prosthetics or exoskeletons uses in healthcare, gesture tracking, industrial applications, and 3D bioprinting.

There are ethical, people, process, and technical considerations though, when implementing this human and AI cooperation.

- Policy changes and regulatory adherence are needed to build an ecosystem in safe, accountable, ethical, and sustainable ways to embrace AI alongside humans.
- A massive amount of trusted data is required to model data and gain inferences, with the need to extract it from diverse, possibly siloed data sources .
- Delicate concerns need to be addressed in areas such as data privacy and reliability when sharing human personal data, to avoid negative corporate exposure or even fatalities.
- Technology solutions need to be selected and designed for the number of contact points and interfaces between humans and AI, for easy handshakes, scalability, and affordability.

## Market perspective

Market studies reveal that the human augmentation market is estimated to be worth more billion by 2026, at a CAGR of 21 percent. Growing demand for wearable human augmentation devices in the healthcare sector, the recent advent of AI-powered wearable devices, and rapid technological advancements such as the availability of fast processors, miniaturization of sensors, use of brain-computer interfaces, and the evolution of nanotechnology are some of the major factors contributing to the market growth.

Key players operating in the human augmentation market are Google, Samsung, Ekso Bionics Holdings, Vuzix, Garmin, Fossil Group, B-Temia, Casio, Magic Leap, Rewalk Robotics, Polar Electro, and P&S Mechanics.

Human augmentation technology has seen a significant influence especially in healthcare in terms of COVID 19 impact. Also, manufacturing, military, and defense industries are heavily investing in adopting human augmentation services.

## Solutions

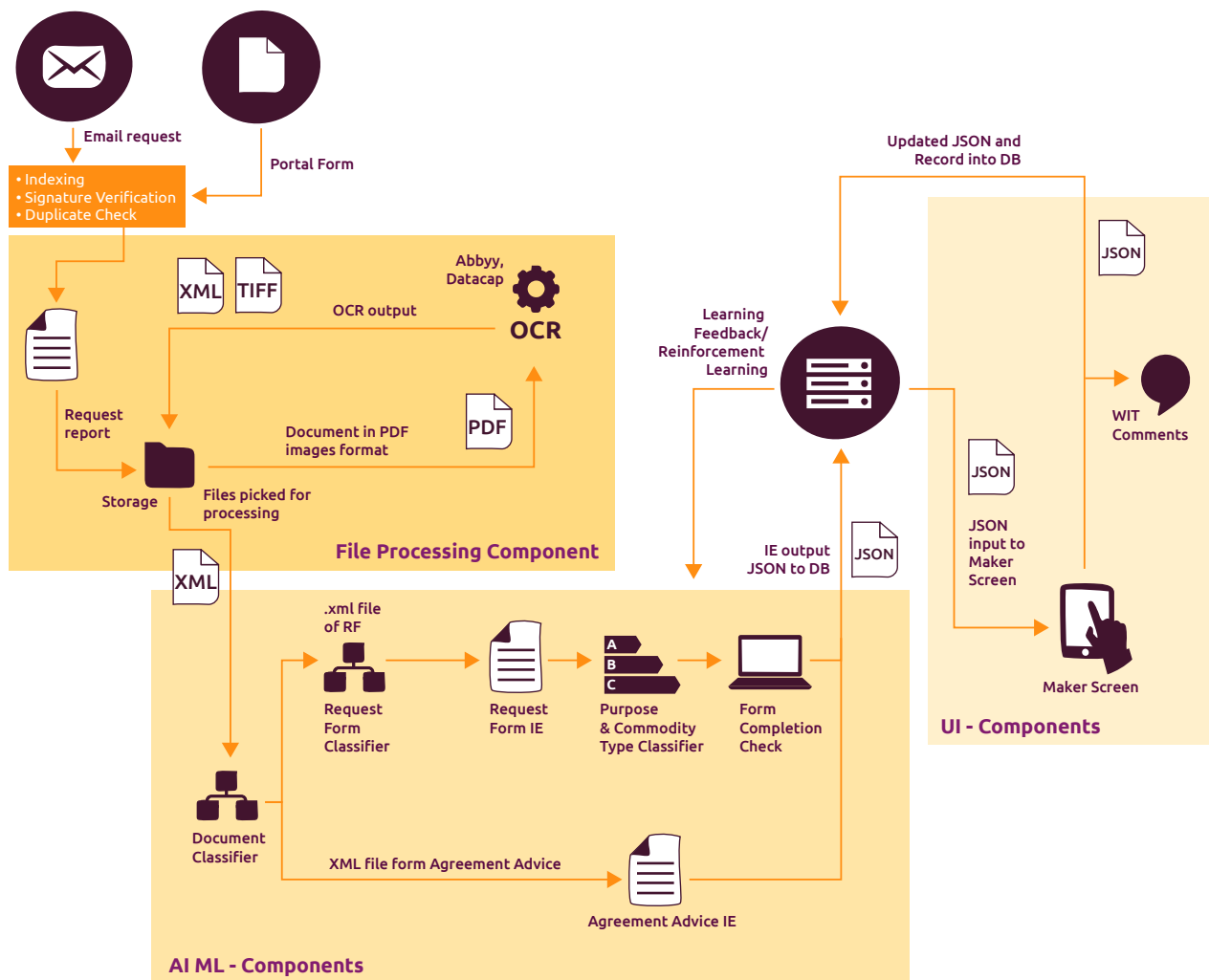
Let's see how human augmentation is making a difference in many fields.

### Human-in-the-loop reinforcement learning in the banking sector

One of the leading banks has automated and optimized its bank guarantee process via AI-driven automation with human intervention.

The success of it has led to enabling many more business functions like home loan, assessment, and document redaction.

#### Reinforcement learning in banking



#### Solution highlights:

- The AI/ML components included the classification of the incoming document, extracting requisite information from the agreement advice, and storing it for further usage.
- Since the system was new, it generated confidence in the system via a human-in-loop interface that enabled a maker to validate all the information extracted through an interactive screen and make any changes or updates in case there was an error.
- Any changes or updates made by the maker are captured again and fed back to the system for model retraining to ensure such scenarios are handled adequately in the future.



## Augmented AI for intelligent manufacturing

The combined efforts of intelligent machines and human beings – co-bots as they are called – are bringing efficiency and value to the

manufacturing lifecycle, meeting the goal of being competitive in market.

### AI/Human Augmented Factory



- Human Operators assisted by smart robots to make manufacturing operations lean, automated and agile resulting into improved quality and productivity
- AI helping to make factory operations green and sustainable
- AI augmenting demand sensing and improving inventory control

### Solution highlights:

- AI-enabled humans in analyzing the patterns in data. In a manufacturing scenario, the data patterns in temperature, vibrations, pressure, sound, vision, and electrical parameters like voltage, current, power etc., play an important role in controlling

the operational processes, maintaining assets, producing quality products, and ensuring safety of assets and personnel.

- The factory robots and equipment bring in many operational efficiencies. AI enabled by IoT data makes robots smart. Such smart machines are context sensitive and can take controlling actions in

the fast-paced manufacturing, hazardous process manufacturing, and extreme operating conditions.

- Techniques include computer vision-based visual inspection, process monitoring and worker safety, machine learning-based yield optimization, predictive maintenance, smart demand sensing, and inventory control.

## Conversational AI for enhanced customer experience

Every business requires conversations with its customers. AI can augment this.

- Conversational AI allows businesses to duplicate human-to-human interaction for human-to-machine conversations. These conversations are made possible via chatbots, voice bots, and virtual assistants, and hence can be referred to as “virtual humans.”

- Virtual humans can make conversations personalized and contextualized with humans. They will be able to create and remember experiences from their interactions with humans and will be able to respond to a wider range of situations.
- Digital human twins can interact and create customer-service responses like resolving queries, completing transactions, and tracking orders in a quite natural way.

*“The simple truth is that companies can achieve the largest boosts in performance when humans and machines work together as allies, not adversaries, in order to take advantage of each other’s complementary strengths.”*

— Paul R. Daugherty, *Human + Machine: Reimagining Work in the Age of AI*



## Augmented and virtual reality in operations

We are seeing increased use of AR/VR in wearable devices for internal industrial company operations, design, engineering, and field services. The key benefits are improved productivity and collaboration.

### Examples:

- Airline technicians use AR instructions for airplane wiring

schematics in their field of view, allowing them to be hands-free.

- Fieldworkers use AR and VR glasses to see concealed utilities lines under the streets in real-time.
- In automotive settings, VR is used to capture human movement during equipment assembly through motion sensors to re-engineer movement to decrease risk of injury and increase productivity.

We need to further exploit new ways of embracing AI and human hybrid intelligence to work together to bring in more disruptive advancements in various industries.

AI is considered a “self-learning” algorithm, so let us make it more intelligent by providing good quality data from human intelligence and experience over time to make better decisions and products. There are other technologies in the future with promises of big potential, such as genetic engineering and brain-computer interfaces. At the same time, the ethical, moral, and legal implications of human augmentation are complex and hard to comprehend. Early and regular engagement with these issues must be thoroughly considered.

# Innovation takeaways

#AI4GOOD  
#HUMANAUGMENTATION  
#DATAPOWERED  
#RESPONSIBLEAI  
#ETHICALAI

## COOPERATION IS KEY

Humans and AI can work together, as partners, to complement each other’s capabilities and achieve more, possibly with less.

## DISRUPTION IS THE POTENTIAL

Human and AI augmentation enables entirely new, unexplored ways of doing business, while keeping it safe, accountable, and ethical.

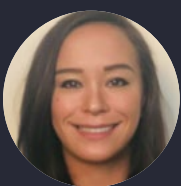
## AUGMENTATION IS EXPANDING

AI and other technologies (such as AR and VR) create yet further evolving opportunities to grow human augmentation.



# SERENDIPITY SYSTEMS: BUILDING WORLD-CLASS PERSONALIZATION TEAMS

The last best experience we have anywhere sets the bar for all experiences everywhere. Consumers don't want just personalization – they're demanding it. Delivering personalization is no longer bar-raising. Organizations need to move from providing personalization as a feature to delivering serendipitous experiences. The challenge then is serendipity at scale or obsolescence with haste. Without the right teams, organizations are speeding toward obsolescence.



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Great basketball teams and great personalization teams have a lot in common.

Imagine a shopping experience that's completely generic. Worse than generic, it goes out of its way to recommend things you don't want. It recommends actions that are the opposite of what you're looking to do. It's perfectly frustrating. How long will a business based on that sort of experience last?

Now imagine a personalization experience that knows you so well it's constantly providing you serendipitously delightful experiences. You're discovering things you never knew you wanted. But you're never allowed to use it, because the experience never sees the light of day. The MVP never becomes an available product.

Both scenarios are terrible. Unfortunately, a variation of the second is more common. Seventy-seven percent of AI and analytics projects struggle to gain adoption. Fewer than 10 percent of analytics and AI projects make an impact financially, because 87 percent of these fail to make it into production. What if we could flip the odds? What if rather than most recommendation projects failing, most of them succeeded? Cross-functional, product-centric, teams can do just that. It's how innovators like Amazon and Netflix were able to succeed so quickly and so often in their personalization programs. It's also been critical for the dozens of successful personalization programs we've delivered at Capgemini.







## Recommendation experiences

Everything is a recommendation. That insight came from Netflix: “the Starbucks secret is a smile when you get your latte, ours is that the website adapts to the individual’s taste,” said Reed Hastings, co-founder of Netflix. Recommendations weren’t features or algorithms. They were the experience; the means to delight, surprise, frustrate, or anger customers. At Amazon, Jeff Bezos’ original goal was a store for every customer. This wasn’t AI for the sake of AI. Both companies made personalization central to their experiences, and personalization enabled Amazon and Netflix’s visions for more innovative, delightful, and serendipitous experiences. Recommendation experiences (RX) were critical to customer experiences (CX). Experiences were the product.

Building products is hard. Josh Peterson co-founded the P13N (personalization) team at Amazon. He described the early days of Amazon as challenging because the company was siloed. Design, editorial, and software engineering were fragmented. “It was really hard to ever get anything all the way out to the site without begging and borrowing people from silos. The one time it was always different was when we did a product launch... So if there was a big enough effort like launching music or auctions then you had permission to borrow everyone to put together your team.” In the early days of Amazon, there were many engineering efforts around personalization. Even though these efforts were led by brilliant engineers, they saw limited success. It wasn’t until after the launch of Amazon Auctions that personalization made a real impact.

After Amazon Auctions, Peterson and Greg Linden looked to make

Bezos’ vision for a personalized store for every customer a reality. The goal was a team that could “own its whole space,” to break silos to create a cross-functional team to rapidly experiment and deliver. This was the first team, outside of the design organization, to have designers in their team embedded with web developers and technical project managers. This enabled a higher number of launches compared to other teams. The impact of their model was so successful that it became the basis of Amazon’s famous “Two Pizza Team” approach – essentially a team small enough that they could be fed with two pizzas. Small teams that were decentralized, autonomous, and were “owners” of the business could move faster and launch more experiments. More experiments would enable them to have more successful innovations.

## Experimentation

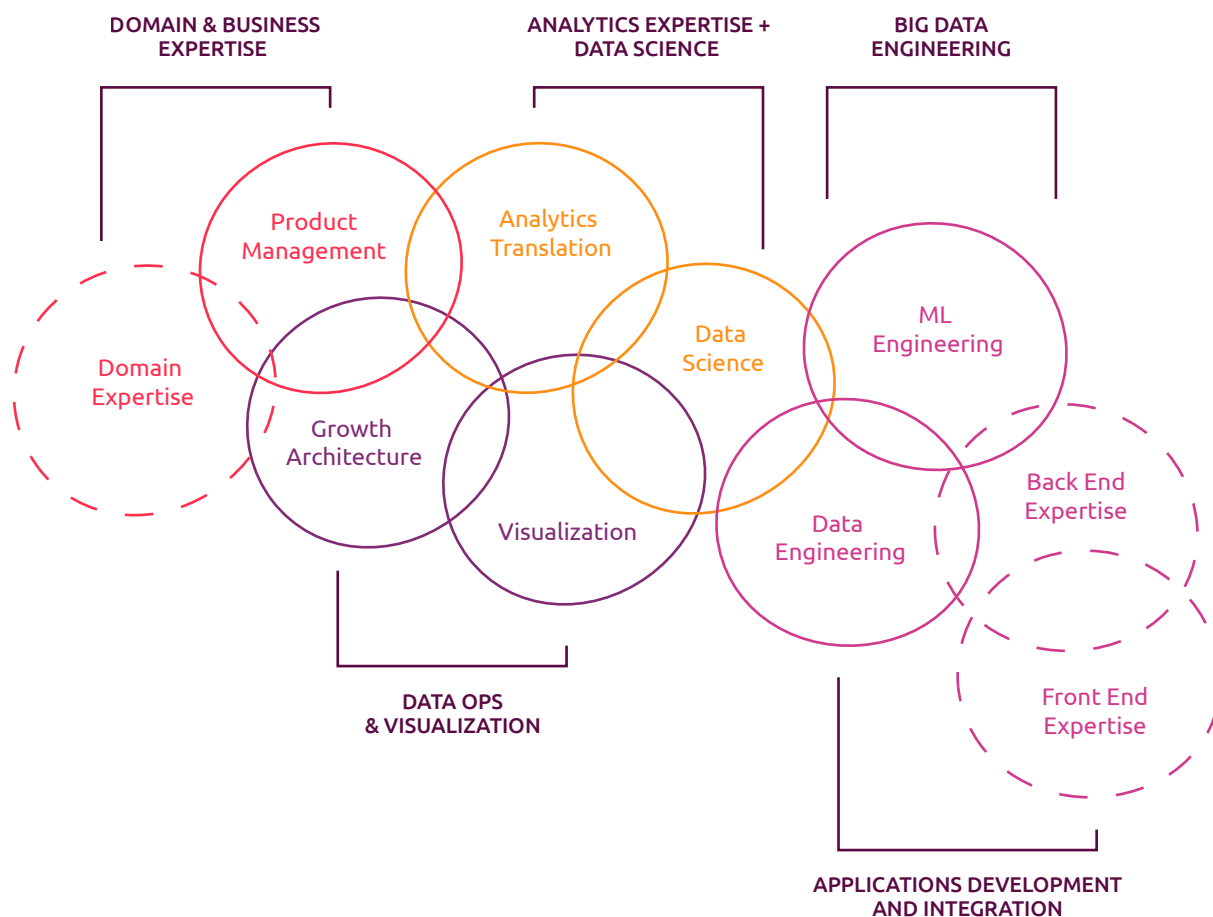
Successful personalization teams foster a culture of experimentation. Creating a culture of experimentation requires diverse, multi-disciplinary teams. Below we show the various skillsets and domains that are required for

modern personalization teams. The circles don't represent people, they represent skills. Great basketball teams and great personalization teams have a lot in common. In basketball, you need defense. You need offense, both close to the rim and from afar. You need diversity in skillsets. You could get lucky and

find a unicorn but fielding multiple teams of unicorns is not practical. Creating a team of all-stars sounds good on paper, but there are plenty of examples where those super teams fail to live up to expectations. A team without a diverse set of skills is unlikely to be very successful, and almost certainly not great.

### Team roles for personalization

Below are the types of roles that will typically be needed for Personalization Teams. Not all teams will need all of the roles. One resource may fulfill multiple responsibilities of these roles.





Small teams with most of the skills above are more likely to do end-to-end personalization well. No one person will have all the skills needed, but together they'll bring more experiments to the table. Early Amazon teams were engineering and data-science heavy. It wasn't until the addition of design, business expertise, and a product-centric approach that they were able to execute end-to-end and achieve Bezos' vision.

Velocity is a leading indicator. Successful personalization teams test many ideas. They break experiments into small chunks so no one failure is large enough to disrupt the business. They test and learn quickly. Testing a dozen ideas and refining them will be more efficient than trying to make one idea "perfect." Our intuition on what is going to work is often wrong. Testing many ideas allows the data

and results to guide us, rather than intuition. This requires personalization teams to develop many ideas end-to-end quickly.

What does the future hold? Cross-functional, product-centric teams are the beginning, not the end. Experimentation requires blending creativity and data. Practically, this becomes a blend of statistics, behavioral economics, psychology, marketing, and expertise in experience design. These teams need to track which features drive results to understand what is working and what is not. The goal is to achieve consistent and reliable serendipity from personalization efforts. The obvious is not serendipitous. Experimentation is needed to discover that which is not obvious and that which drives business outcomes. Without that, we can't scale serendipity.

*Experimentation requires blending creativity and data. Practically, this becomes a blend of statistics, behavioral economics, psychology, marketing, and expertise in experience design.*

# Innovation takeaways

#PERSONALIZATION  
#SERENDIPITOUSPERSONALIZATION  
#MACHINELEARNING #ARTIFICIAL  
INTELLIGENCE #INNOVATION  
#RESPECTFULPERSONALIZATION  
#DATAASAPRODUCT

## DIVERSITY LEADS TO SPEED

Speed leads to innovation. Diversity leads to innovation. End-to-end cross-functional teams with dedicated resources are more likely to successfully implement personalization programs and innovate faster than their peers

## A CULTURE OF EXPERIMENTATION IS CRITICAL

Velocity, variety, and volume of experiments are leading indicators of innovation. "Our success at Amazon is a function of how many experiments we do per year, per month, per week, per day." – Jeff Bezos

## SPEED IS A COMPETITIVE ADVANTAGE

Testing and learning iteratively as well as being able to deploy quickly contribute to faster speed to market. "Companies rarely die from moving too fast, they frequently die from moving too slowly." – Reed Hastings

# THREE STRATEGIES FOR BUILDING AN ADAPTABLE DATA ARCHITECTURE

The COVID-19 pandemic taught us many things, and one important lesson is the importance of being adaptable. With the uncertainties that organizations have faced in the last two years and with more disruptions on the horizon, being adaptable to rapidly changing market conditions and consumer behavior will be critical for success in the future. An agile and adaptable data architecture is key to achieving this.



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The companies that adapted quickly and innovated based on new data and insights were able to capture emerging market opportunities during COVID. We saw this firsthand with many cloud-native, high-tech organizations that thrived due to their ability to quickly reimagine specific parts of their business using new data and insights. When done right, a more agile and adaptable data architecture can increase resilience and accelerate the path to new insights and innovations.

Being adaptable means being able to quickly change and evolve to suit different conditions. An adaptable data architecture is a flexible foundation that can be modified and extended quickly. It is about enabling more rapid delivery of new capabilities and simplifying existing architectural approaches. But data gravity and legacy systems can be

significant hurdles when it comes to modernizing any data infrastructure. Here we offer three strategies that can help an organization on this journey to build a more adaptable and resilient data architecture.

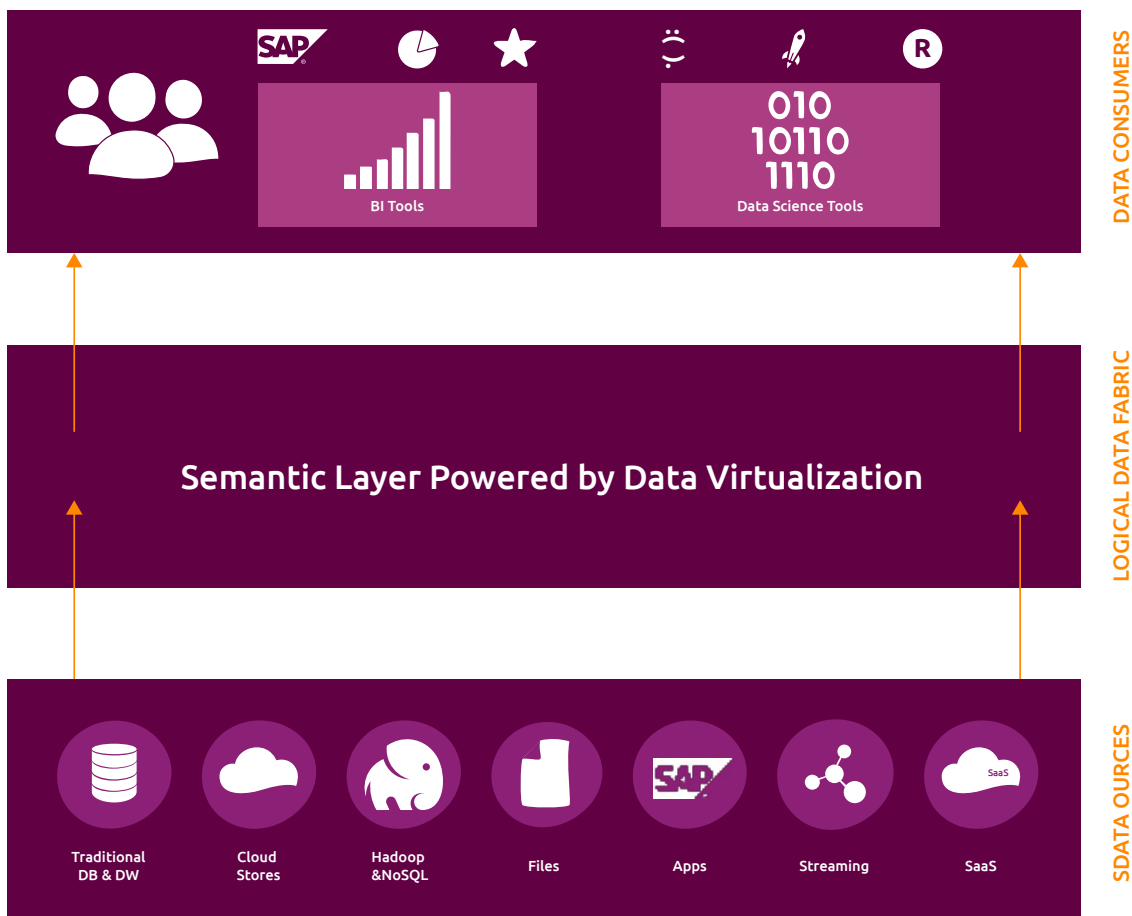
## 1. Decoupling data access from data sources

The best way to gain agility and adaptability is to minimize hard constraints and technology dependencies. The shift to objective-based file storage is the best example of the power of decoupling. Cloud-based object storage solutions such as S3 decouple file access from storage and bring tremendous agility and flexibility, and have formed the

foundation of numerous innovations in cloud technology.

With an increasingly complex data landscape, decoupling data access from data storage can bring the same types of agility and empower the data consumer to do more with data. By connecting data consumers and data sources through a logical layer, we bring additional agility and flexibility. The underlying data repository can be added and modified quickly without impacting the end-data consumer. By using data virtualization techniques and presenting a semantic access layer, it is also easier and quicker for the data consumer to connect to and access multiple data sources without needing to know the where and what of the underlying technologies that are evolving all the time.

*Data access de-coupled from data source and connected via a data-virtualization layer*







## 2. Focus on agile data provisioning

Being able to react and adapt to market environments that are changing constantly requires faster and more agile access to data. While lengthy batch ETL and warehousing processes were the norms and acceptable before COVID, rapid delivery of real or near real-time data quickly became the gold standard for data-driven decisions during and post peak COVID.

By focusing on connecting data instead of just collecting and replicating data, you empower data consumers and applications to quickly tap into all the data within the enterprise, regardless of where they sit. When you focus on an agile approach to data provisioning that is flexible and supports multiple integration styles (batch/real-time), you reduce time to data, time to insight, and, ultimately, time to market.

Technologies such as data virtualization today can provide just the connectivity layer that accelerates data provisioning and minimizes lengthy ETL and data pipeline hops. Not only can data virtualization accelerate data provisioning for batch-based

analytical requirements, but it can also be used to support real-time, operational requirements today.

One Australia-based educational organization, for example, leveraged data virtualization to connect to multiple data sources for COVID contact tracing reporting requirements. By leveraging data virtualization, it not only decoupled data delivery and insights across its extensive data ecosystem but also provided a unified data access layer that surfaced data in real time. The adaptable nature of the data architecture means it could integrate more than 50-plus complex applications in less than two weeks for the contact tracing requirements, something the team there claims would have been impossible without the use of data virtualization.

## 3. Data-as-a-Product

Provisioning data as a product means that data is easily discoverable, understandable, and reusable by everyone. Making data access modular and easily reusable increases adaptability and agility and drives collaboration across the whole organization.

An excellent example of this is the increasing adoption of data services based on REST or GraphQL. By focusing on the needs of application developers and making data access modular and API-driven, you enable seamless collaboration between the data teams and applications teams for data-driven innovation and data-led products. By leveraging product thinking and focusing on the needs of different data consumers, you unleash the value of data to a much broader team.

When the concept of Data-as-a-Product is combined with a data marketplace strategy, you further accelerate data adoption and self-service. Anyone in the organization should be able to visit a data marketplace and search for and find the data product they need in the form they want. They should then be able to derive new insights or build a new product with minimal help from a centralized IT or data team. This product-centric, self-service oriented approach to data is very much possible today and can lead to a truly data-powered culture.

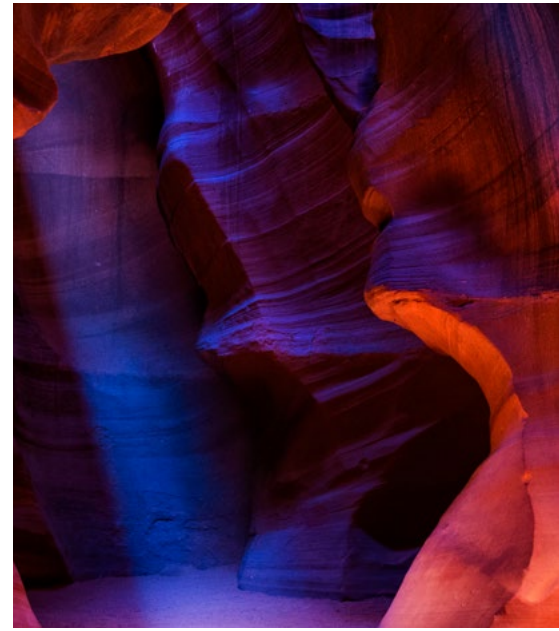
## Adapt and innovate

With the data and technology landscape evolving rapidly today, the traditional approach of building long-term data architectures can be both risky and inefficient. Therefore, the key is creating an adaptable data architecture that allows business leaders to rapidly evaluate emerging business requirements and quickly adopt new data and analytics technologies.

The successful companies of the future will not only have to innovate but innovate faster in highly disruptive and uncertain

environments. An adaptable data architecture based on the principles of data decoupling, agile data provisioning, and Data-as-a-Product will therefore be a critical component of any agile and insight-led organization of the future.

*“A more agile and adaptable data architecture can increase resilience and accelerate the path to new insights and innovations.”*



# Innovation takeaways

#ADAPTABLE #DATADECOUPLING  
#DATAVIRTUALIZATION  
#DATAASAPRODUCT  
#AGILEDATAPROVISIONING

## BEING ADAPTABLE

Having an adaptable data architecture can both increase resilience and drive innovation.

## DATA VIRTUALIZATION ENAGLES INSIGHTS

Data virtualization techniques can be used to decouple data access from data sources and integrate distributed assets across the enterprise

## CONNECTING OVER COLLECTING

By focusing on connecting data instead of just collecting and replicating data, you empower data consumers and applications to quickly tap into all the data within the enterprise regardless of where they sit.

## THINK PRODUCT

Data-as-a-Product combined with a data marketplace strategy can accelerate self-service and data democratization.



# YOUR 2023 DATA STRATEGY IN FOUR RESOLUTIONS

As the year winds down, this is a good time to assess personal resolutions you have for the new year and, as a data leader, it's also an opportunity to take a fresh look at your data and AI strategy. Following a volatile year in the market, you can get ahead of your 2023 plans and see where your organization can improve processes, bring on new tools, and set goals that make sense for your team.



**SABINA SHAIKH**

VP, Global System Integrators,  
Databricks





For the second year in a row, Databricks recently partnered with MIT Technology Review Insights to survey 600 CIOs, CTOs, and CDOs from large enterprises. The key result: CxOs and boards recognize that their organizations' ability to generate actionable insights from data, often in real-time, is of the highest strategic importance. All respondents agreed that companies must view AI adoption as mission-critical in order to succeed. But without effective data strategies, businesses miss massive opportunities to better understand their customers, offer high-value products, and streamline operations.

With such a significant link between effective AI strategies and strong data, not using the right AI tools or neglecting to leverage AI in the most effective ways can foil even the best-laid data plans. Here are four resolutions to make your data strategy pay off this year.

## 1. Reassess your data architecture

Most executives (72 percent) say that data, both fragmented and with poor quality, is likely to be the biggest issue when aspiring to achieve AI goals. The only way to better prepare for these challenges is to invest in a flexible data and computing architecture, like a lakehouse, that embraces open standards and can scale to meet the changing needs of the business. By creating a lakehouse, a company gives every employee the ability to access and employ data and artificial intelligence to make better business decisions. Many organizations that implement a lakehouse as their key data strategy are seeing lightning-speed data insights with horizontally scalable data-engineering pipelines. Walgreens specifically shared that a lakehouse enabled smarter algorithms and generated new types of reporting that help people understand the supply chain and store labor and productivity, patient vaccine scheduling, and prescription pickup processes.

## 2. Build your tech stack in the multi-cloud

Many data and technology leaders believe it's not enough to think about the cloud in the singular sense — instead, they think about building a multi-cloud environment. As the adoption of cloud-based technology grows, many look for solutions that can move across major clouds (such as those from AWS, Azure, and Google Cloud). In our survey, 78 percent of executives agreed that a multi-cloud approach ensures the most flexible foundation possible for AI development. It offers organizations easy integrations when bringing on new solutions or businesses that use other cloud providers, flexibility to run workloads anywhere, and the assurance that they can comply with

regulations down the road. Organizations that adopt a multi-cloud approach can also create new revenue opportunities and enhance customer experiences.

## 3. Invest in low/no code

Low- and no-code approaches are opening new pathways to innovation and lowering the barrier to entry for people who want to get quick insights from their data. Given how competitive it is to find the right tech talent in today's hiring market, low- and no-code tools are key to relieve some of the pressure on data teams, empowering less technical teams to build models — even with just a basic understanding of machine learning. No-code platforms make it possible to leverage AI without hiring expensive developers and data scientists, which means smaller businesses can more easily harness its power. Columbia Sportswear embraced this resolution and has seen more business units using the platform in a self-service manner that was not possible before. This has sped up the time to insights for all groups.



## 4. Embrace open-source AI and open standards

Open-source data lakehouses are quickly becoming the standard for how the most innovative companies handle their data and AI. It prevents teams from building tricky solutions in-house from scratch, which eats up resources. In our survey, 50 percent of respondents said that open-source standards and open-data formats were at the top of their dream tech stack list. Open source usually comes at little to no cost and, more importantly, it's tried and true — it's a community effort, and solutions have been adopted and

vetted by many, which equates to fewer headaches for your IT team down the road. On top of this, the commitment to open data standards fuels the open-source community, which helps create a large talent pool of data experts who are better equipped to move use cases to production.

It's easy to get overwhelmed with your new year's resolutions - especially the hard ones. Organizations must continue to stay inspired when they think about their data strategy. Our survey showed that a smart data strategy will ultimately provide better data value. Stay the course to be prepared for a happy new year!

*"Without effective data strategies, businesses miss massive opportunities to better understand their customers, offer high-value products, and streamline operations"*

# Innovation takeaways

#DATARESOLUTIONS  
#LAKEHOUSE #DATA  
#OPENSOURCE

## REASSESS YOUR DATA ARCHITECTURE

Invest in a flexible data and computing architecture, like a lakehouse.

## BUILD YOUR TECH STACK IN THE MULTI-CLOUD

A multi-cloud approach ensures the most flexible possible foundation for AI development.

## INVEST IN LOW/NO CODE

Leverage AI without hiring expensive developers and data scientists.

## EMBRACE OPEN-SOURCE AI AND OPEN STANDARDS

Take advantage of an open-source community and talent pool.



# FLY FASTER TOWARDS THE CLOUD

Organizations seeking to modernize their AI and data estate on the cloud struggle with many challenges. A solution is necessary to understand the friction in the modernization journey, so businesses achieve time to value. Modern accelerators can smooth the experience, helping organizations realize the value of cloud modernization faster and at a lower cost.



## AUROBINDO SAHA

Global Data Engineering & Cloud  
Architect Leader, Insights & Data,  
Capgemini





Whether an organization is looking to unleash the power of its data estate or liberate the full potential of its business through data and AI, faster realization of the value of modernization is necessary. This is because market demands are highly dynamic, and may change even before realizing the benefits of IT investment. Modernization is also a cultural change for an organization to become data powered. But the benefits are clear in terms of overall performance and financial parameters, such as revenue generation and profitability.

## Data mastery and the cloud

Companies which are data masters deliver an advantage of between 30 to 90 percent in various metrics across customer engagement, top-line benefits, operational

efficiency, and cost savings. There is 70 percent higher revenue per employee, and they are 22 percent more profitable than average organizations. Today, about 39 percent of such organizations are turning data-powered insights into a sustained competitive advantage. Data masters manage data as a strategic asset that generates additional revenues by providing new intelligent services and products, resulting in better customer engagement with personalized marketing. Insights are embedded into current processes, products, and services to make faster and better decisions to provide high value.

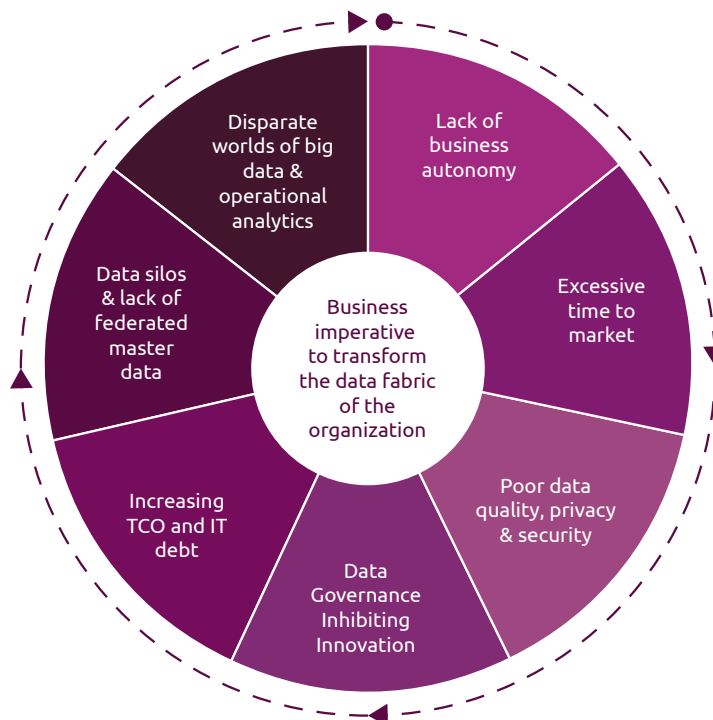
Many organizations are still struggling to modernize and migrate their existing data platform, particularly towards the cloud – let alone address pressing business needs

with the right agility through data and AI platforms. The technology of today often is unable to meet the agility and innovation required by the business and the varying customer demands of today and tomorrow.

There is a need for a framework of tools and processes that can:

- Empower the end users to make better, faster, more collaborative decisions
- Enable business and technology collaboration through data democratization, while maintaining the highest level of security, compliance, ethicality, and trust
- Prime the organization for data activation and data ecosystems with a flexible, modular approach.

### Reasons to transform the organization



## Accelerating the journey with IDEA

Enter Capgemini's IDEA (Industrialized Data & AI Engineering Acceleration): a new capability that helps organizations turn their data sprawl into a true strategic asset. It doesn't just help organizations do things faster, but also differently, by modernizing. This combines production-ready, out-of-the-box applications and modules that are also fully customizable – granting organizations speed, flexibility, and accelerations as they transform their data estate towards the cloud.

The IDEA frameworks help organizations to discover their current data estate, find the data inventory, and analyze complexity in

code at blazing speed, so the effort of months is reduced to hours.

- The Data Ingestion Factory provides a flexible, scalable architecture that federates data from many sources to quickly deliver business insights.
- Cross-platform code conversions, and the ability to create parallelized data pipelines with low-code or no-code skills, enable easier adaption of the modern solution. The use of OpenAI APIs such as GPT3 helps with Natural Language Processing to ease self-service.
- The ability to do data reconciliation on terabyte-scale data, track the data lineage, audit the data quality, and visualize them in real-time requires libraries

such as vaex.io. It can do statistical operations on an N-dimensional grid of up to 1 billion objects per second.

- The semantics and knowledge graph on collected metadata helps find interesting relationships about why a certain workload operation takes more time and money.
- The machine learning algorithms are federated and pushed down on edge devices so that privacy is preserved and distributed computes in local devices can work faster. The advent of 5G makes this cloud-to-device communication faster.





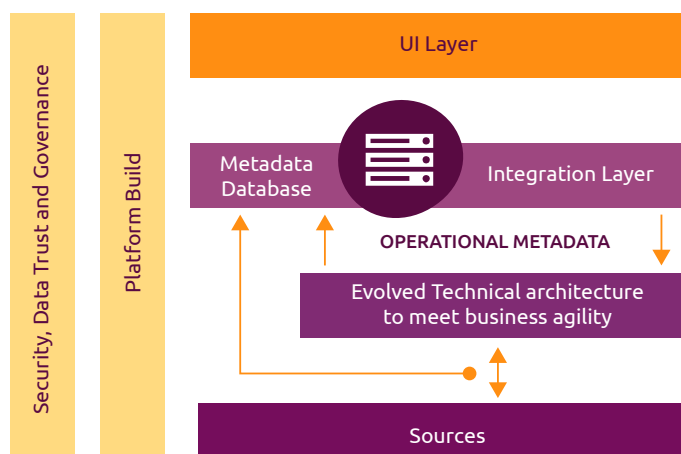


## How do the accelerators work?

The accelerators are built on some simple premises:

- Observe the pattern of repeated manual operations
- Extract the metadata associated with operations
- Automate similar operations in the future.

### Accelerator Powered Solution





This three-step approach helped a UK retail company set up a cloud platform and deploy warehouses in 25 minutes through infra code automation and DevSecOps; this was originally estimated as a two-month effort. A North American healthcare device manufacturer used accelerators to quickly demonstrate the value achieved from data federation from ERPs, Hadoop, data warehouses, and other applications in two months. A pattern-based data ingestion factory can validate the data schema, bring better data

observability, and manage complex pipeline orchestration.

Accelerators work like a catalyst, without changing the chemistry of the underlying architecture. With “light-touch” on operational metadata, it helps to accelerate the journey. This benefits from the faster adaption of modern technologies at a lower cost. This agility helps to beat the competition and achieve data mastery for facing current and future business competition.

*Accelerators work like a catalyst, without changing the chemistry of the underlying architecture.*

# Innovation takeaways

#DATAPOWERED  
#DATAMASTERS  
#INSIGHTS&DATA  
#CAPGEMINI  
#ACCELERATORS #AZURE  
#AWS #GCP #METADATA  
#ACCELERATE  
#DATAFACTORY  
#MACHINELEARNING  
#DATATRUST

## NEED TO BE NIMBLE

Modern business requires modern solutions to understand customers and requires addressing business change. Easy-to-use solutions need to scale to address this need. The accelerators require tailoring to fit the business ask and show more agility to customize for specific needs.

## ACCELERATORS CAN WORK AS A CATALYST

This fast-tracks the modernization journey by minimizing repeated manual tasks and bringing business and IT closer by providing intuitive self-service tools.

## WIDE-SPAN SOLUTION AT LOW COST

Accelerators enable experimentations and fail-fast methods at a lower cost, making the outcome more resilient and tested.

# EVERYDAY AI: NEXT-GENERATION SELF-SERVICE ANALYTICS

Organizations have been using the term “self-service analytics” for nearly a decade now, but for many companies it’s not a source of value generation. But businesses cannot afford to waste time or money spinning up or supporting a self-service analytics program that people aren't actually using or that's not generating tangible value. Self-service analytics in the age of AI needs to be about truly enabling people to ask infinite questions of their data and then empowering them to find or build trusted answers on their own.



**BRIDGET SHEA**

Chief Customer Officer at Dataiku





Imagine the smoothest self-service analytics experience possible at your organization today. It probably goes something like this:

- Business user looks at someone else's data product (such as a dashboard) built to answer some specific set of questions.
- Business user asks a question that is within the realm of possibility to answer with this data product (e.g., "How did sales perform last quarter?" or "How did my marketing campaign perform?").
- Business user gets a trusted answer without having to ask anyone in the middle, such as IT or a data team, for help.

## The future of self-service analytics is about empowering people

But what happens if this business user wants to ask new questions that are outside the realm of what that dashboard was built for? For example, the marketing manager sees her campaign did not perform well and wants to understand who she should target for her next campaign, potentially even with a score predicting who will be most likely to open her emails. Or a supply-chain manager has identified a pattern of shortages, but doesn't have the tools to dig in and get more visibility to address the problem. Most likely, every new question or business challenge is a new ask to a team to build a data product (dashboard) that provides answers from which they can self-service.

It's easy to say that the future of self-service analytics is about moving from descriptive to predictive (and even prescriptive) analytics. But it's more than that. It's about empowering people, especially



business users, to ask questions of their data and find or build trusted answers on their own, whether that means building a dashboard or a machine-learning model for themselves. This is where the term "citizen data scientists" comes into play and why, in the future, the concepts of self-service analytics and citizen data scientist will become somewhat intertwined.

Ultimately, putting the full power of data in the hands of the people

involved in the day-to-day business (we call this Everyday AI) is what will move self-service analytics from providing answers to providing impact and, with it, value. Yet, with great power comes great responsibility, so the key in the coming years will be for leaders to provide the framework that allows for this fundamental transformation.





## Building self-service analytics for impact

A world in which data is accessible and anyone can build data or AI projects and solutions to answer business questions might sound scary. To be honest, without the right tools, technology, and processes, it is scary and can devolve quickly into data chaos.

Seeing that risk, it's critical in this new world of self-service analytics that the initiative:

- Doesn't exist in a vacuum. When businesspeople have the data, their questions for IT come up a level and can be more impactful. For example, how can I automate what I've built so I don't have to update it every week with new data?

- Is built on trust. Leaders need to trust employees' ability to use data in a self-service context. Business users working on self-service analytics need to trust the data that they're working with. Managers and executives alike need to trust the insights delivered from self-service analytics projects. If just one of these layers is missing, it doesn't work.
- Has the proper governance built in, complete with appropriate guardrails. This can be as simple as proper permissions management at the dataset or the project level, but it goes all the way up to the macro level. How are data and models being used? Who is monitoring this to lower the overall risk to the organization?

For example, [Dataiku](#) customer GE Aviation implemented its own version of a self-service system that allows it to use real-time data at

scale to make better and faster decisions throughout the organization. Engineering uses data from these tools to redesign parts and build jet engines more efficiently, the supply chain team uses it to get better data insights into its shop floors and streamline supply-chain processes, finance uses it to understand key metrics, and more.

At its core, its self-service program equips everyone (with proper access rights) with the ability to discover and use data, prepare that data, and create a data product, including developing predictive models within Dataiku. At the same time, it also ensures projects pass a set of checks, balances, and governance measures.

## Next-generation self-service analytics technology

There are people in the business who have the ambition to go on their own data journey and will do it if the points of friction are reduced and they are enabled to do so. This is the essence of the next generation of self-service analytics and, as previously discussed, of citizen data science.

The idea behind the next generation of self-service analytics isn't that individuals can do and build

whatever they want with data (which would lead to data chaos). It's about empowering people, and choosing the right technology is an important milestone. The right technology should connect doers with data by bringing people of diverse skill sets together to work with data in a common ground.

Ultimately, it should be second nature for anyone in the business to produce new insights and to work with data in a way that is easily reusable. Individuals should benefit from the expertise of the many as timely new data products are created and maintained across the whole enterprise. That's where the value lies.

*"Self-service program equips everyone with the ability to discover and use data, prepare that data, and create a data product, including developing predictive models."*

# Innovation takeaways

#SELFSERVICE  
#CITIZENDATASCIENCE

## EMPOWER THE PEOPLE

The future of self-service analytics in the age of AI is intertwined with the idea of citizen data science – both are about truly empowering people.

## PROVIDE TRUST AND INDEPENDENCE

Businesspeople must be able to ask questions of their data and find or build trusted answers on their own.

## ALL ABOUT THE TOOLING

The right tools and technology are critical to enabling people while also maintaining the appropriate level of governance and control.



# THE REVITALIZATION OF DATA MESH

The great ambitions of the data mesh approach cannot be fully achieved with cloud-based or legacy-based thinking. The use of emerging technical concepts around decentralization and distribution – extending way beyond the enterprise – can provide the answers.



**BEVERLEY COY**

Senior Solutions Architecture,  
Insights and Data, Capgemini

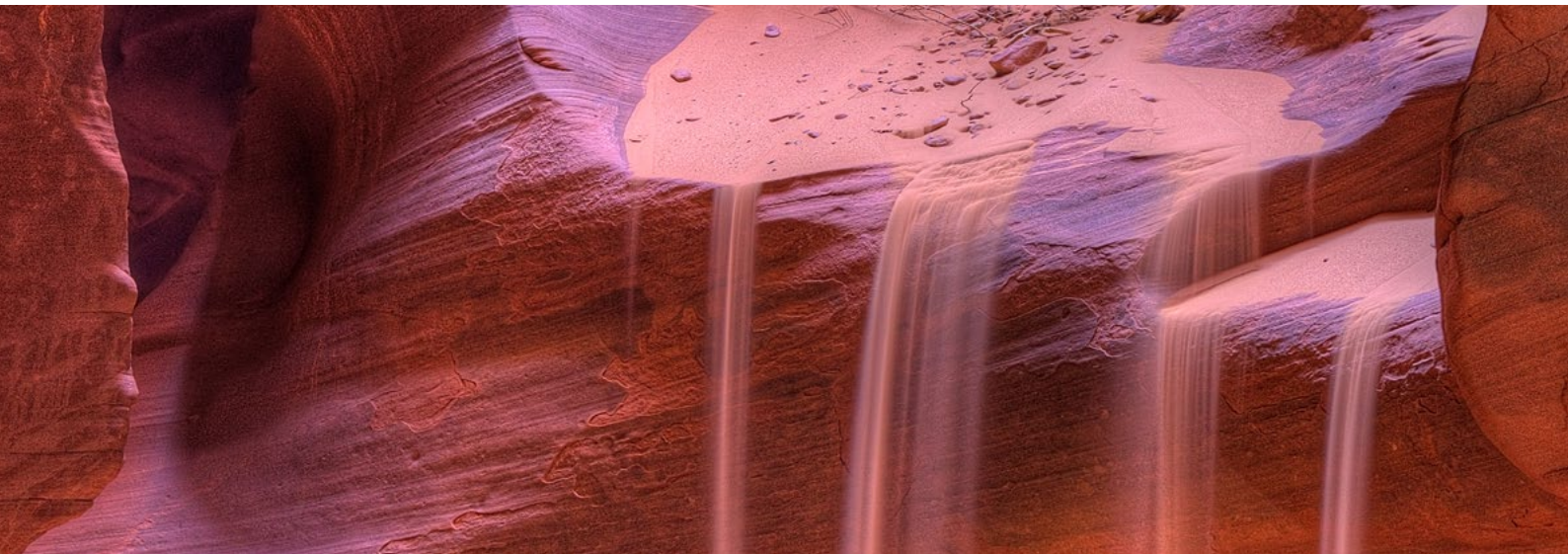


**NEIL PARKER**

Managing Solutions Architecture,  
Insights and Data, Capgemini







Data mesh is a new way of thinking. It is a concept proposed by Zhamak Dehghani in her introductory article, [published](#) in 2019, in which an organization's data-related capabilities are no longer organized into technically aligned functions. Rather, we see the data, process, people, governance, security, and other enterprise capabilities migrated away from monolithic, centralized functions and incorporated into the business domains.

Within a business context of exponentially growing data volumes, multiple customer touchpoints, just-in-time supply chains, and dynamic consumer relationships, business stakeholders need agility. They can no longer afford the time to navigate layer upon layer of technical teams to get answers to business questions. Rather, business users need to be empowered to create the data products they need autonomously, and without the constraints of centralization. This is the promise of data mesh.

Happily, the coalescence of cloud computing, serverless architecture, no-code platforms, DevSecOps, automated testing, semantic design, and other abstractions have reduced the technical expertise required to build a data product. Insight can be derived from data without coding or deep technical understanding of the underlying storage, compute, or network resources. Data mesh provides the overarching methodology for restructuring organizational capabilities across people, processes, data, and governance, such that these technical abstractions can be leveraged. Within the business domains, expertise is thereby connected with the ability to deliver data products.

However, the interconnectedness of people, processes, data, and technology means that if any of these elements are constrained by residual centralization, all will be compromised – and a decentralized data mesh will not be fully achievable.

## Dispelling myths

In the book *Sapiens: A Brief History of Humankind*, Yuval Noah Harari observed that human progress was initially constrained to tribal units. To enable cooperation at scale, humanity created certain myths, such as law, governments, nations, and currency. Within an enterprise, these myths manifest as complex functional layers, such as IT, legal, and finance, which sit between data producers and data consumers. To understand how these centralized functions constrain data-mesh adoption, it's easiest to ask the question:

"Imagine we have implemented data mesh. Is there anything which, if it ceased to exist or be valid, would prevent a business user from creating or consuming a data product?"

The answer to this question, based on current approaches to implementing a data mesh, would likely include items such as network access, licenses, security credentials, agreements with technology providers and use of their services, installed software, access to existing banking, clearing and payments, and others.

## A new paradigm

Our vision of a further evolution of data mesh is one which enables an organization to progress from partial decentralization to a fully decentralized and distributed approach. We therefore propose a future data mesh where the following can all be true:

- Any data product can use unlimited storage and any compute (no resource constraints)
- Any data product can be invoked using the services of any vendor, in an open marketplace, and this can be changed for each invocation without friction or disruption (no vendor constraints)
- Any data product can negotiate autonomously on each invocation, using programmatically defined, auto-executing contracts to access the most cost-effective storage,

compute, and other required services (no legal or relationship constraints)

- Any data product can be used by any trusted person within an industry or sector (no organizational constraints)
- Any data product can be created and accessed using only a browser and internet connection (no network or access constraints)
- Any data product can pay for the services it consumes without recourse to a centralized financial institution (no monetary constraints)
- Any data product can be used by any trusted person without prior granting of privileges (no security constraints)
- Every data product is self-describing and contains both data

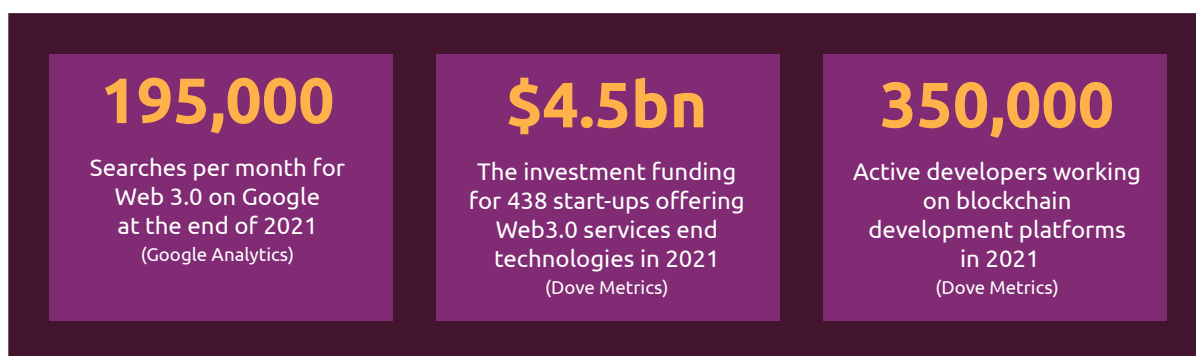
and metadata (no knowledge constraints)

- Any data product can negotiate with any other data product to determine who is master of a given data asset and owner of the requisite standards. Such negotiations will ensure there is always a master available, and all standards and metadata are correctly distributed across the data products (no governance constraints).

## Two worlds collide

While some of the points above are aspirational and are included to demonstrate thought-leadership in data mesh, many are already practical and achievable. This is due to an opportune correlation between our thinking and another emerging technical, social, and commercial paradigm: Web 3.0.

### Web 3.0 Statistics



The attributes of Web 3.0 work beautifully as enablers for our future vision for data mesh. Web 3.0 is designed around the ideals of:

- Distributed cooperation through peer-to-peer protocols, contracts, and transactions
- Frictionless participation using only a browser and internet connection
- Public or private interaction without a trusted (typically centralized) third party
- Open-source software, community maintained and technology/vendor agnostic
- Retained ownership, where the data product owner retains ownership of the content
- Inherent privacy, where data and transactions remain private and unconstrained or exploited by intermediary service providers
- Community governed without invasive centralized control.

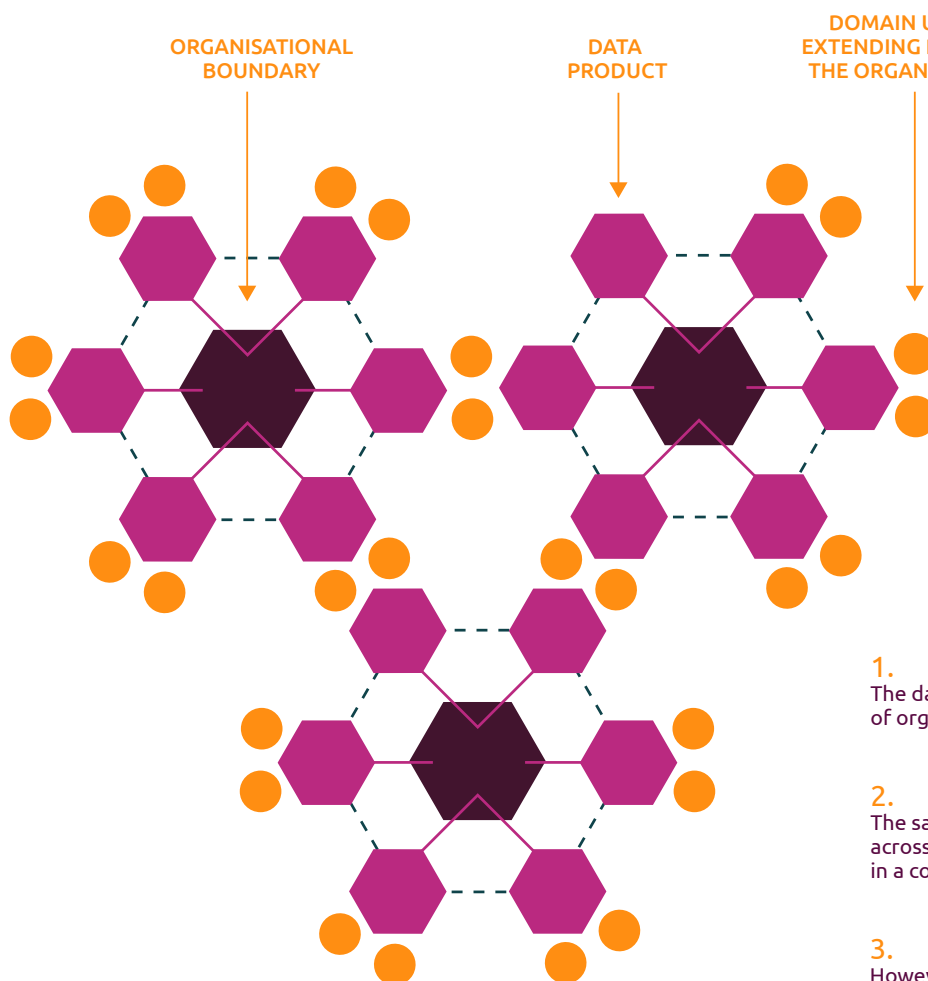


Web 3.0 services, based on the principles described above, are already emerging, including Distributed Ledger Technology

(DLT), cryptocurrency, digital tokenization (such as NFTs), and decentralized finance (DeFi).

Applying these concepts to a Web 3.0-driven data mesh can be shown schematically as follows:

### Fully Decentralised Data Mesh



1. The data products are independent of organisational boundary.
2. The same data product can be shared across multiple organisations that are in a contractual relationship.
3. However, each organisations interpretation of the sum of their contractual relationship is localised: these are the standards etc. represented by company specific metadata administered by the Data Product.





The creation and deployment of new data products follows the same philosophy: using open-source, vendor-agnostic frameworks, and leveraging no-code techniques, to deploy data products into a decentralized, distributed Web 3.0 architecture.

So, while much of this is still theoretical, and testing of the concept still has a long way to go, if you are asked how to implement data mesh the answer may well be – at least in the medium to longer term – to start with Web 3.0 thinking.

*“With the concept of data mesh, I can see the data engineer’s role becoming more of a high-level SME (subject matter expert) – being an advisor to the individual domains on the metadata, data catalogue, daily processing, and future requirements – rather than the bottleneck. I look forward to the day where I can be looked upon as a trusted advisor instead of a bottleneck!”*

Beverley Coy, Capgemini

# Innovation takeaways

#DATAMESH #WEB3  
#DECENTRALIZED  
#ARCHITECTURE #DATA  
PRODUCTS  
#DISTRIBUTEDLEDGER  
#DLT

## BUSINESS EMPOWERMENT

Data mesh is an important concept for empowering business users to create their own data products

## MYTHICAL CONSTRAINTS

The aspirations of data mesh cannot be fully met with current enterprise resource organization models as legacy centralized artefacts will still persist.

## A NEW PARADIGM

The emerging Web 3.0 paradigms offer a solution to enable a fully realized, distributed, and decentralized data mesh.

# PLAY DATA LIKE POKER

Every enterprise aims to find valuable business scenarios powered by data. However, there are many communication barriers between business people and data experts. Most of the currently applied approaches feel too traditional, not doing justice to the dynamics of data being closer to the business than ever before. The Lean Data methodology is a set of data-powered transformation activities and tools that integrate lean management, design thinking, and strategic planning methods. It has been successfully verified by many companies in the Chinese market. It includes the Lean Data Workshop, which use a unique card game.



**SHI KAI**

CTIO Insights & Data APAC,  
Capgemini





The Lean Data Workshop is a lightweight, active engagement session, having businesspeople and data experts “play” with data like it is a poker game. It makes full use of the concept of game thinking and combinatorial innovation, enabling businesspeople and data experts to fully embrace data-powered principles and use cases.

It creates an intimate, open, and free atmosphere for jointly developing and exploring a list of data-powered value scenarios. It then formulates a roadmap for data-powered transformation projects and implementation, to help enterprises use smaller input-output data strategies.

## A workshop in four parts

The workshop is divided into four parts: preparation, guidance, co-creation, and planning, as shown in Figure 1.

Input for the process is the business’ vision of its data-powered (digital) transformation. The output consists of blueprints, a list of data-powered projects and initiatives, and supporting activities and assets.

### Workshop phases



#### PREPARATION

Interview  
Research  
Design



#### 2. GUIDE

Vision alignment  
Concept training  
Technology  
empowerment



#### 3. CO-CREATION

Target  
decomposition  
Data blueprint  
Scene innovation



#### 4. PLANNING

Roadmap  
Projects list  
Action plan





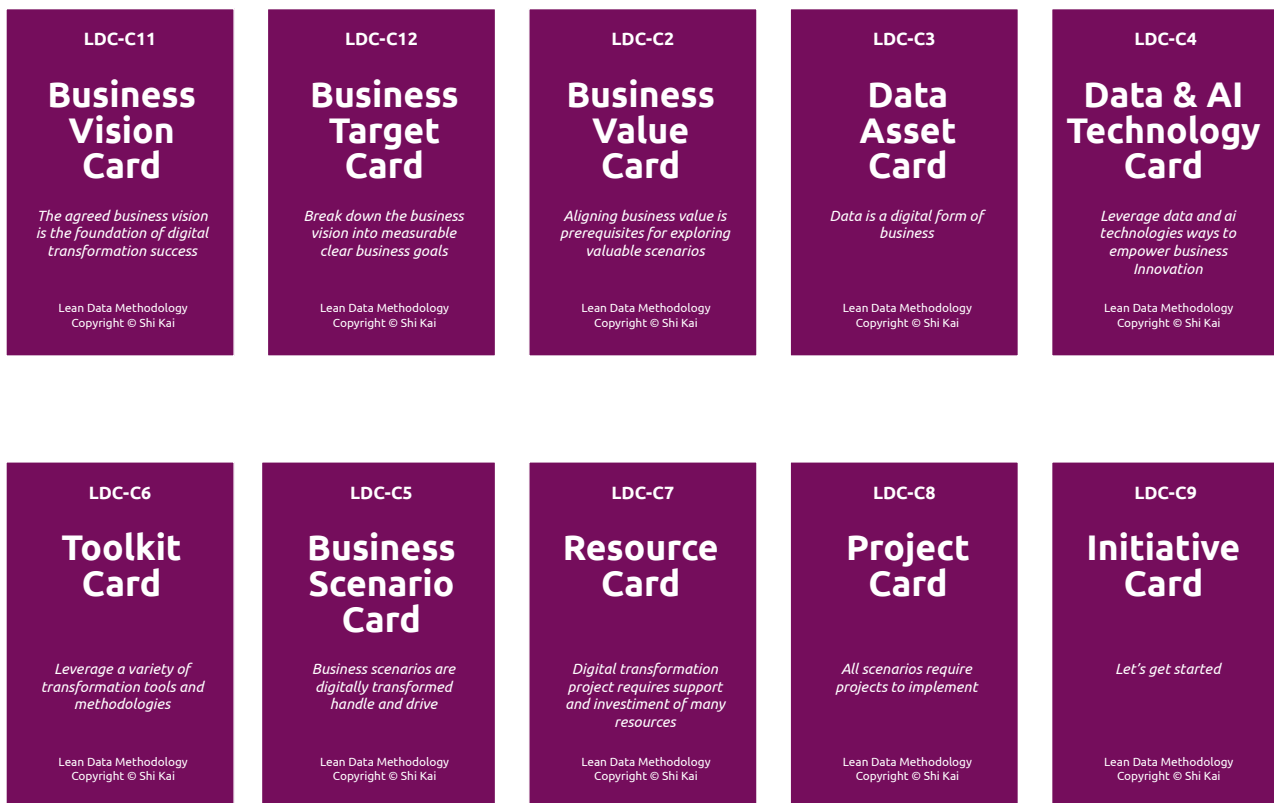
Throughout the workshop process, a set of Lean Data cards is used as props to allow businesspeople and data experts to jointly master

data-powered concepts and use cases, while playing a poker-like game. Highly valuable business scenarios are the key output,

ensuring no blind spots are forgotten or left behind.

The entire card deck includes 10 card types, as shown in Figure 2:

### Deck of cards



The workshop attendees play these cards following the facilitator's guidance, as follows:

- The Business Vision and Business Target cards are used to get agreement with all the attendees on the overall direction. The Lean Value Tree (LVT) is used as a conceptual tool to facilitate, share, and drive a company's strategy and vision across all levels and teams of an organization. This provides an excellent kickoff of the workshop.
- Then, various ways are used to populate the enterprise Data

Asset cards, arranging and combining them with the Data & AI Technology cards and Toolkit cards to form a Business Value scenario position. This process has multiple supporting rules, making it very interesting and compelling to participate in.

- Next, Business Scenarios are created through Value Cards, leading to Project cards, required Resource cards, and Action cards for steps to be carried out.

In this way, the deck of Lean Data cards translates the complexities and difficulties of data-powered

(digital) transformation into a compelling, engaging game that business personnel can easily understand and play – mastering the secrets of data for business in a relaxed, open, and creative atmosphere.

## Benefits

As simple as playing a card game may seem, the Lean Data Workshop helps enterprises obtain four major data-powered values:

1. Align businesspeople, data experts, and other stakeholders on a commonly understood, shared business vision
2. Jointly define and explore the Data Asset and Data Product blueprints of the enterprise
3. Break down the typical barriers between businesspeople and data/technology experts while exploring the full range of potential value scenarios, eliminating blind spots through permutations and combinations
4. Systematically prioritize value scenarios, based on a growing common understanding of the scenarios as they evolve.

*"The Lean Data Workshop pioneered the combination of cards representing business, technology, and data to generate business scenarios and make the hidden data value explicit. The use of data has played a very beneficial role in promoting. imagine that everyone draws out a user data card, and then draws a clustering technology card, and then the business personnel see the clustered sample card scene and then say 'We want to make use cases.' What an exciting scene!"*

Wang Guangsheng, chairman of the China Branch of the International Data Management Association (DAMACHina)



All of this comes together – even when initially in the midst of uncertainty and lack of understanding and direction – to establish the right data-powered activities and start transformation as soon as possible. And it's triggered by businesspeople and data experts, playing data like it is poker.

The democratization of data is a key trend for the near future, as data more and more becomes central to powering the enterprise vision and

strategy. It is necessary to endow every businessperson with the ability to understand and activate the value of data, analytics, and AI. For that, an end-to-end, lightweight, agile, and lean approach to becoming a data-powered enterprise is instrumental. Lean Data is such a new (yet already heavily field-tested) methodology. It contains many different activities, tools, and perspectives – more to be addressed in follow-up articles, posts, and a book. However, the

Lean Data Workshop particularly stands out as it brings together all key stakeholders in the data-powered enterprise with something as low-entry, playful, and joyful as a card game. It is truly the ace of spades for anybody seeking to get the most out of data.

# Innovation takeaways

#DATAPOWERED  
#LEANDATAMETHODOLOGY  
#DATADRIVEN

## POWER TO THE PEOPLE

Data and AI should not be mastered only by a few highly skilled data experts but should be fully utilized in the daily work of all businesspeople, realizing the democratization of data.

## DOING IT DIFFERENTLY

Data strategy and consulting activities should be carried out in a more engaging way, allowing businesspeople to express real and comprehensive needs in an interactive and immersive experience.

## LET'S PLAY CARDS

The Lean Data workshop approach lets businesspeople and data experts jointly discover data-powered business value scenarios while playing a poker-like card game – providing a fresh, innovative way of leveraging data.



# EMERGING TECHNOLOGIES ARE TRANSFORMING THE ENERGY AND UTILITIES SECTOR

The energy and utilities sector faces significant environmental and geopolitical challenges. To counter these, organizations are looking to take advantage of a flood of emerging technologies – from artificial intelligence to the Internet of Things (IoT) – to enhance efficiency, reduce waste, and facilitate regulatory compliance, while also inspiring new products and services and improving customer satisfaction.



## ISABELLE TACHET

Lead Data Architect For Energy, Utilities, Data strategy, Sustainable AI, Capgemini



## CAROLINE BALL

Innovation Ecosystem Lead For Southern & Central Europe, Capgemini



The challenges are not only significant, but also related. As the source of 73 percent of the world's carbon emissions, the energy and utilities sector has a central role to play as economies transition to net zero. Meantime, global conflicts in today's politically destabilized world have highlighted the fragile nature of energy security in many countries – driving up prices and making it more difficult to meet emissions-reduction targets.

Similar challenges face the members of this sector that are not directly related to energy. For example, water utilities also face pressure to reduce their impact on the environment while ensuring a reliable supply of clean water for their customers.

In this volatile environment, companies in this sector are embracing technology to address current challenges while also making their operations more resilient in the medium and long term. Here are some of the ways in which the energy and utilities sector is leveraging data-powered innovation.

## Modernizing the data estate

An organization's transformation starts by ensuring it's working with a best-in-class data estate. Many players in this sector have data ecosystems that have developed over decades. The result is a patchwork of systems, a mix of structured and unstructured data, and information locked in silos. Merging these into a single, easily accessible platform helps deliver additional value across the enterprise while making it easier to enforce proper governance.

As an example, Capgemini helped a water utility in eastern England modernize its data estate with a framework to consume, manage, and orchestrate information from smart meters and customer databases. The

benefits are numerous. The utility can now apply enterprise analytics to smart metering and other projects. Analytics provides useful insights to automate the creation of work orders to more rapidly fix leaks or replace failed devices. The new architecture allows the utility to onboard new datasets more quickly with reduced costs, enabling the organization to more rapidly turn insights into action. The new architecture improves how the utility produces regulatory reports, and reduces the risk of non-compliance with the General Data Protection Regulation. And the utility has introduced an application that allows residential customers to view their own water consumption and compare it to similar homes in their area, which helps customers reduce their water use.

## The power of SCADA and IoT

Because of the nature of the energy and utilities sector, companies operating in it manage a lot of physical assets. As consumers, all of us interact with these on a daily basis. Think gas pumps. Think electricity and water meters. Further upstream, these companies monitor and control a broad range of industrial equipment.

Integration of Information Technology (IT) and Operational Technology (OT) systems enable these assets to provide rich streams of telemetry data for next-generation supervisory control and data acquisition (SCADA) and industrial IoT. This in turn enables enterprises to make informed choices about when and how to maintain, repair, and upgrade assets.

Capgemini worked with another UK-based water utility to connect asset data with customer geospatial data. Now when there's a service disruption, this system can automatically alert customers in the

affected area through a mass-messaging solution. This reduces the number of service calls the utility must process – and by providing regular updates on progress and scheduled works in a timely manner the system has improved customer satisfaction.

*“Companies in this sector are embracing AI, machine learning, analytics, SCADA, IoT, and other technologies to address significant current challenges and make their operations more resilient in the medium to long term.”*







## Digital twins

Increasingly, organizations are exploring opportunities to leverage digital twins – virtual models of a physical asset that can be used to understand and optimize the asset’s performance or improve processes.

Sensors in the asset collect real-time data. Machine learning and AI can

then be applied to this data to recognize patterns, predict faults, and call attention to deviations from normal operation.

Capgemini helped an American petrochemical company apply AI, machine learning, and advanced analytics to its core chemical and polymer production processes. A new process improved efficiencies and optimized product quality. Meantime, a digital twin used real-time production data – including temperature, pressure, and feed rate – to accurately and reliably predict quality specifications for more than 20 products. The solution helped this customer achieve process improvements of up to 96 percent and generated more than \$50 million in costs savings and revenue opportunities.

Digital twins have numerous benefits for utilities operators, too. For example, they can be used to enable engineers to remotely

monitor the performance of wind turbines and provide better information to field-service personnel when an issue occurs.

## Find out more

TechnoVision 2022 – the latest edition of Capgemini’s annual look at key technology trends – describes how pioneering businesses leaders are leveraging technology to innovate, adapt, and achieve corporate and societal goals in a sustainable manner. The trends are organized into multiple themes – covering user experience, collaboration, data, processes, infrastructure, applications, and balance by design.

For more on the technology trends affecting this sector, read the [TechnoVision 2022 sector report on energy and utilities](#).

# Innovation takeaways

#DATAESTATE  
#SMARTGRID  
#DIGITALTWINS

## GET IN SHAPE

Emerging applications demand top-quality data – and lots of it. Modernizing the data estate and ensuring proper governance is the first step to unlocking the full potential of any organization’s data.

## USE YOUR ASSET ADVANTAGE

Any enterprise with physical assets can leverage data from them to enhance a broad range of business objectives.

## GET TWINNED

Digital twins are poised to leverage data to revolutionize everything from production processes to field service.



# SUSTAINABILITY SERVED



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# PUTTING AI IN SUSTAINABILITY

Could AI offer a route to net zero, while realizing we are already late? And can current initiatives and developments play a role in it? What can we do to ensure AI can be used responsibly in reaching net-zero goals, accounting for its impact on the climate and unlocking its full potential in the climate action ecosystem?



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The impact of climate change is very real, and organizations in both the public and private sectors should play a leading role in mitigating climate change. How? By embedding sustainable actions and social responsibility into their business models, and pledging to reach net zero in the coming years. Only when businesses are made accountable for reduction of the greenhouse gas (GHG) emissions they produce will we see change. The GHG protocol defines three scopes for this: scope 1 being direct emissions from organizational assets, scope 2 being purchased energy, and scope 3 being indirect company emissions across the supply chain.

Making companies accountable has little effect without enabling their sustainability actions with pragmatic solutions. Therefore, businesses investigate technologies such as artificial intelligence (AI) to help them reach their sustainability goals.

Google achieved its net-zero goal already in 2018 and now uses AI to predict wind patterns to improve windmill yields, creating direct impact on scope 1 and 2 emission reduction. Scope 1 and 2 seem to be

manageable for footprint reporting, as most of the related data and operations are known and often controlled by organizations themselves.

It is scope 3 reduction where it gets complicated. Not all the data is known, owned, or available for use. And scope 3 impact is often at least five times greater than the other two, so there is no path to net-zero reduction without incorporating it. This is no easy feat, due to a lack of transparency and standards on data collection in the supply chain and beyond.

So, how can AI support this? Model-driven prediction and simulation can help reduce all scopes by finding optimal choices in design, production, logistics, and life-cycle management. The lack of transparent data and implemented standards need to be dealt with. Digital twins bring together much of these needs in concise solutions

## The duality of “green” AI

Although vastly positive, the impact of AI on the climate is a two-sided coin as development of AI – its interaction with carbon-intensive applications and lock-in effects – has potential negative impacts on the climate. The duality of using AI for net-zero goals is reflected in the UN’s sustainable development goals (SDGs).

This set of 17 overarching goals has been described as “the world’s best plan to build a better world for people and our planet”. While supporting many of the SDG targets, the use of AI technologies also hinders some of them, highlighting that the fast development of AI needs to be supported by appropriate policies and regulation.



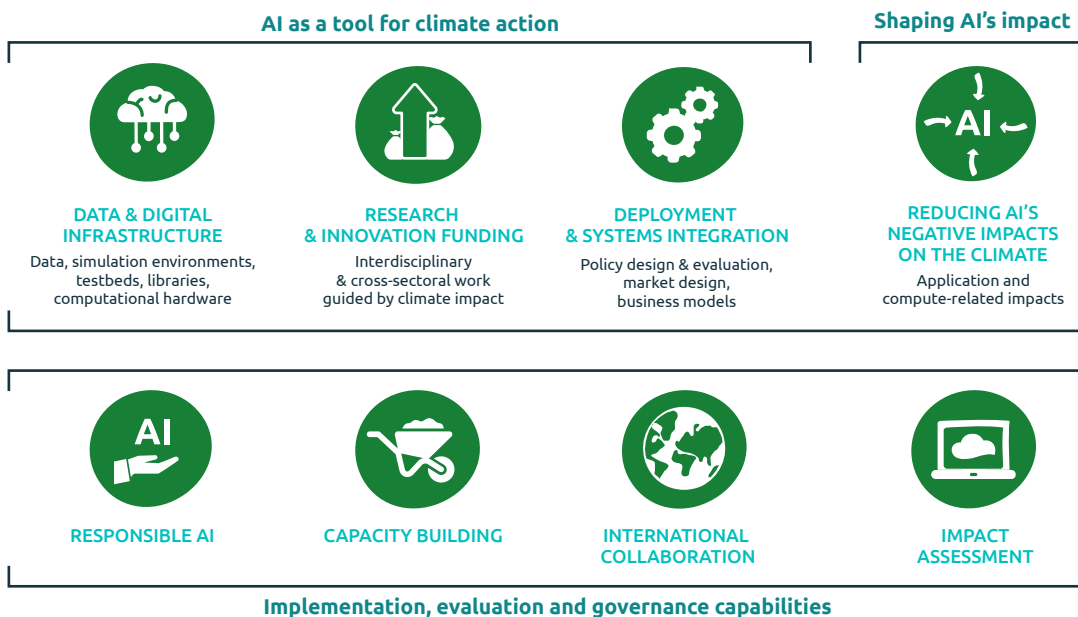


The footprint of AI is shaped by the responsible use of AI, capacity building, international collaboration, and impact monitoring at every step.

Impactful use of AI on net-zero goals depends on governments providing support in data and infrastructure, research and innovation funding, as

well as supporting new AI-based solutions.

*AI in sustainable action*

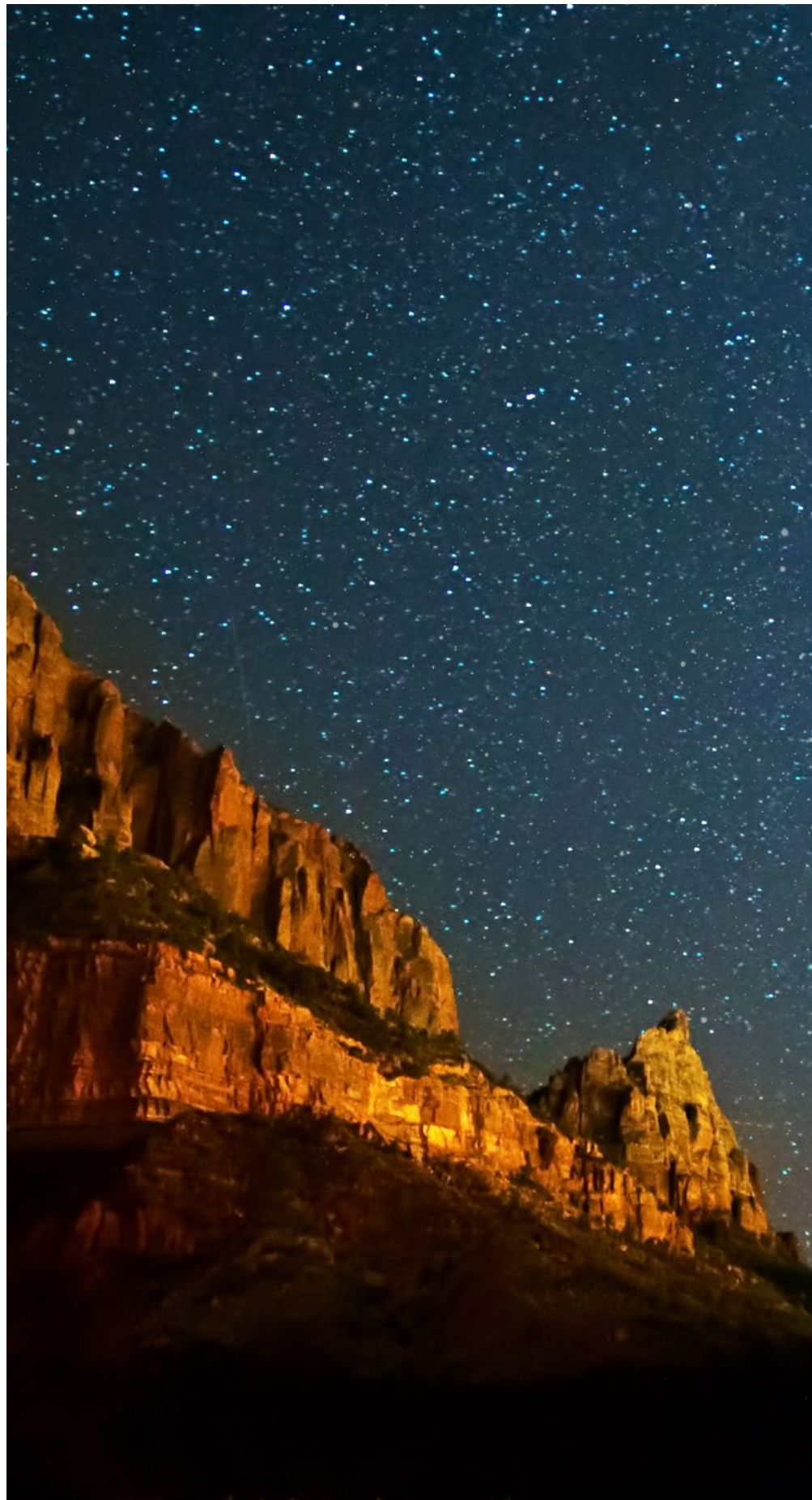




## Enable sustAInability

Focusing on using AI as a tool for climate action, data and the digital ecosystem are at its core. From a technical perspective, AI depends on data streams, applications, and processes. Pitfalls can be expected with data availability and quality. Representative data is difficult to come by and is often blocked through regulations or otherwise inaccessible to data-processing pipelines. At the same time, computing power and hardware are required for large-scale AI deployment. Companies and research institutions should be encouraged to create data portals for data sharing, establish data taskforces in climate-critical sectors, work on elaborate data standards, and provide affordable cloud-compute resources for AI development.

*NASA and ESA built a collaborative platform with computing capabilities, algorithms, and data for research and understanding of above-ground terrestrial carbon dynamics in the Multi-Mission Algorithm and Analysis Platform (MAAP), enabling efficient knowledge sharing and green computation.*



## Reduction of AI's negative impacts

Moving on to the reduction of AI's negative impacts on the environment, we need to consider the AI practitioner's responsibilities. Several aspects of AI require decisions which can make or break footprints. The choice of AI models and data pipelines is important for final emissions, as are the use of algorithm-optimized hardware (e.g., specific, energy efficient, task-specific processors), their location (e.g., local, cloud), the cost of data transport, and the type of energy used for computation. Given the

computational power needed for training, deploying, and executing AI models, this becomes crucial in scalable and responsible use of AI.

AI has a clear potential in driving positive climate action and helping companies reach their net-zero goals. But it is important to ensure this potential is not hindered by the negative impacts of AI on the climate. A responsible use of AI in lowering GHG emissions is supported through data sharing, collaboration, and the responsible development of AI models.

*The EU has established the European Strategy for Data, enabling the creation of data spaces that ensure data is available and standardized for use across industries. Combined with GO FAIR, this encourages accessible and usable data for AI models and data for net zero.*

# Innovation takeaways

#DATAPOWERED  
#DATAMASTERS  
#SUSTAINABILITY  
#GREENAI  
#AI4GOOD  
#SUSTAINABLE

## CONSIDER ALL SCOPES

Utilize AI to its fullest extent and lower all three GHG emission scopes.

## RECOGNIZE AND COMBAT

Measure, monitor, and bring awareness to negative impact of AI on the planet, making sure to take steps to lower it.

## SUPPORT AND EDUCATE

Educate on the positive impact of AI on the climate and support research efforts in this topic.

## COLLABORATE

Recognize partners and collaborate in the climate action ecosystem.



# FINDING THE CODE FOR A CURE

## CAPGEMINI'S FLAGSHIP HACKATHON ADVANCES THE FIGHT TO ERADICATE RIVER BLINDNESS

Capgemini's Global Data Science Challenge 2022 demonstrated the power of bringing together smart people and advanced technology, as more than 400 teams worked to help solve a health crisis that affects 20 million people worldwide.



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Data AI & Analytics Group Offer  
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**MIKE MILLER**

Director of AI Devices,  
Amazon Web Services



AI and machine learning have great potential to help address the many environmental and social challenges facing the planet. But to get the most out of these tools, it's essential that developers get hands-on training in their use. Capgemini's Global Data Science Challenge (GDSC) is proving to be an excellent way to enable this.

Launched in 2016, the GDSC has grown to become Capgemini's flagship hackathon. For each event, Capgemini Insights & Data team identify a challenge and a participating NGO to the sustainability of the planet and invite teams to develop a solution using artificial intelligence, machine learning, and other state-of-the-art data-science tools.

## The 2022 GDSC: Code for a Cure

For the 2022 challenge, GDSC organizers joined the fight against onchocerciasis, more commonly known as "river blindness." More than 20 million people worldwide live with this parasitic disease. Most of those people experience severe skin irritations but in more than one million cases, the disease has also caused permanent vision loss. The World Health Organization is leading a global effort to eradicate onchocerciasis, and several drug candidates are currently undergoing clinical trials. But evaluating drug efficacy is a slow, manual process.

The 2022 challenge, titled Code for a Cure, invited teams to leverage the power of AI to accelerate the efficacy trials and help bring these important drugs to market more quickly. (The Data-Powered Innovation Review Wave 3 described river blindness and the goals of this challenge in more detail.)

The response was spectacular. More than 900 people from 31 countries took up the challenge, forming into more than 400 teams. These teams

presented 8,457 possible solutions. AI-powered processes whittled down these submissions to five finalists and scored them using criteria such as code quality, documentation and approach, and sustainable resource use. These finalists then presented their solutions to a panel of six judges representing University Hospital Bonn, Capgemini, and AWS.

The judges assessed each finalist based on the effectiveness of the solution, how well the solution could be applied to other use cases, the team's contribution to the overall learning experience during the

*"More than 900 participants hacked their way to a better understanding of AI and machine learning. That's a huge win for these important technologies."*







hackathon, and how well the team presented its results.

We identified three big winners.

### The first winner is...

The 2022 winning team is untitled. ipynb (named after the default file created when storing a Jupyter Notebook, a popular tool used in data science). The team's four members – Abhijeet Gorai, Deepak Kumar Pandey, Utkarsh Prakash, and Prince Raj, all from Capgemini in India – developed a solution that leverages the unique strengths of two architectures:

- Faster R-CNN – a form of region-based convolutional neural network that can quickly and accurately predict the locations of different objects
- Cascade R-CNN – a multi-stage extension of a region-based convolutional neural network that uses the output of one stage to train the next. With increasing selectivity, this architecture can address problems such as close false positives in an image.

untitled.ipynb's winning entry detects worm sections in prepared images taken from nodules extracted from the patient, then crops these sections and classifies them using various criteria, including dead/alive, male/female, and adult worm/child worm. The results will help researchers determine the state of the worms and hence the effectiveness of the drug being tested.

Among its benefits, the team's model can be easily changed to train more than one class of objects, which enables the object detection model to be used to predict the class of the worm section. This means the approach does not require a separate classification model.



## The second winner is...

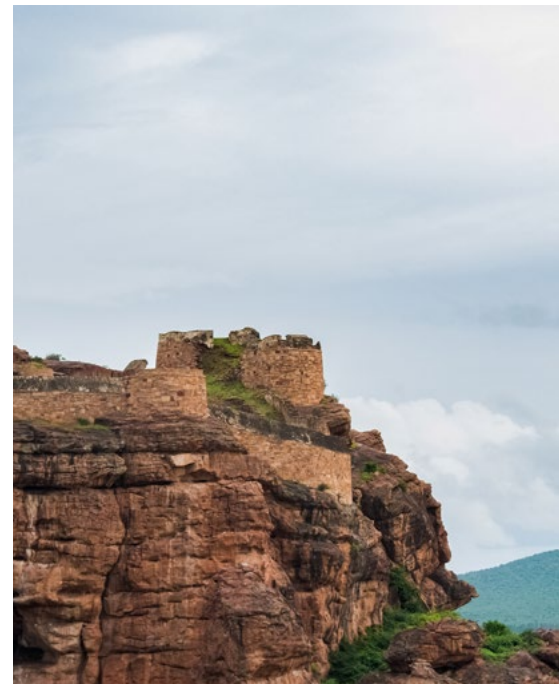
While only one team could place first, everyone who took part also won by gaining experience with advanced technologies. Participants invested more than 10,000 hours in learning about AI, including important tools such as Amazon SageMaker. This platform is used to both prepare the data used to train machine-learning models and develop algorithms that enable the model to decide what's interesting.

SageMaker lets developers and data scientists collaborate in a single space – and because it's cloud-based, it does not require a significant investment in computers or other on-premises equipment. This year's GDSC also introduced participants to

the idea of minimizing the cost of proposed solutions by measuring each entry's cloud compute time as part of the judging process – which is an important, practical consideration whenever building machine-learning models.

## The third winner is...

This hackathon is a great contributor to a brighter future – and not just for those affected by river blindness. Knowing how to use advanced technologies will be essential if we're to address the significant challenges facing our societies and our environment. At the 2022 GDSC, more than 900 participants hacked their way to a better understanding of AI. That's a huge win.



# Innovation takeaways

#RIVERBLINDNESS  
#DATACHALLENGE  
#CODEFORACURE  
#AWSSAGEMAKER

## REMEMBER THE PRACTICAL

Don't let them become barriers, but as people explore the power of emerging technologies it's important to consider practical issues such as "Can this be applied to other use cases?" and "How much compute time does this require?"

## THE POWER OF CLOUD

Cloud-based tools like AWS SageMaker are ideal for supporting one-off projects like hackathons because there are no special hardware requirements. This is especially useful if the project involves virtual teams, comprised of people distributed around the globe.

## LEARNING WITH A PURPOSE

The future needs data expertise – and GDSC 2022 enabled 10,000 hours of training in AI and machine learning by using a meaningful project to motivate people.

# CREATING A CIRCULAR ECONOMY THROUGH AI

Sustainability is a buzzword and it's becoming action. However, the current focus is on offsetting the impact of our actions rather than tackling the root cause. A cradle-to-cradle model is the paradigm shift that the current linear economy needs. And AI is the catalyst for this. Let us look at how AI can be applied to different stages of the circular economy: right from product inception to its regeneration, thus closing the loop.



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Let's say you bought a new phone, perhaps the latest iPhone 14, as a replacement for your previous one. Have you ever thought where all the old devices go?

Unfortunately, they end up in landfills, since we follow the "take-make-dispose" a.k.a. the linear economic model, wherein we extract raw materials, manufacture, and use products, followed by disposing the product at the end of its shelf life. Herein lies the big issue: the waste generated causes multidimensional ramifications on the environment and public health, best explained by designer Sophie Thomas, Director of

Circular Design at Useful Simple: "Waste is a design flaw."

Therefore, the failure of the linear economy in addressing issues like product wastage, raw material shortage, and carbon footprint has given rise to the need for an alternative model, one which is fundamentally circular, just like our nature cycles, and mitigates the harms caused by industrial waste. Here, the circular economy (CE) model seems promising in tackling problems caused by the linear economy model, since it mimics the Earth's natural cycles by applying similar principles to our economic system.

The fundamental premise of the circular economy is based on the 3Rs – Reduce, Reuse, and Recycle – that focuses on waste minimization along with optimum utilization and reuse of existing products, thereby ensuring resource circularity.

Moving forward, the question of practicality arises, as in how do we shift from a linear model to a circular one in a relevant and cost-effective manner? The answer lies in artificial intelligence (AI), which will serve as the major catalyst in enabling this paradigm shift. Here are some key AI-enabled phases that can drive forward this transformation.

## Potential AI solutions for a circular economy



### 01: Make it last:

Design circular products use iterative machine learning and AI suggestions that will prolong the product life cycle and tackle resource scarcity. With AI, you can predict product and carbon costs right from the initial design phase to ensure optimized scenarios. For example, you can source local products and reduce the carbon footprint associated with transport or product substitution during the manufacturing phase.

Chilean brand NotCo made an egg-free mayonnaise using plant-based substitutes with the help of an AI-based ecosystem. It deploys ML algorithm to identify new

plant-based foods and food formulas by detecting patterns at a molecular level and analyzing flavor molecules. This helps in quick testing, tasting, and providing feedback to ensure that the final product tastes as good as the original one.

Amazon created sustainable packaging designs leveraging AI algorithms to identify products which can be shipped in padded mailers instead of boxes, making packages lighter. This increases the number of packages dispatched per truck, thereby reducing the amount of packaging that needs to be recycled, eventually causing a decline in the carbon footprint per item along with slashing delivery costs.

*The fundamental premise of the circular economy is based on the 3Rs – Reduce, Reuse, and Recycle – that focuses on waste minimization along with optimum utilization and reuse*



## 02: Use optimally:

Use data-driven AI algorithms to develop innovative circular business strategies and frameworks for sustainable growth by combining previously recorded and real-time data from other stakeholders, including producers, manufacturers, suppliers, and consumers for process optimization and automated decision making.

Stuffstr utilizes AI for price setting, forecasting demand, and creating

trading platforms for secondary resources and products. Stuffstr buys and collects used products from consumers and sells them in secondhand markets. An AI algorithm helps Stuffstr to set competitive prices for the seller, while offering Stuffstr a good margin in the secondhand market.

H&M amplifies business solutions with AI to consider the environmental impact of its raw materials. It covers the entire value chain, looking at close to 5,000 H&M

stores. It uses AI to understand consumer needs to produce only the right products in the right amounts and allocate them to the right place. The framework had delivered immense business value by reducing time-to-market for use case development by 50 percent (i.e. from 12 to six months).



### 03: Recycle to close the loop:

Circular production ensures infrastructure is fully optimized and, by mathematical modeling, material flow is created for acquiring used products, assessing waste, and reprocessing.

AI is already helping in creating value for circular material flows and enhanced selection of materials and products by sorting post-consumer mixed material streams through visual recognition techniques.

Unilever and the Alibaba Group created an AI-enabled recycling system that automatically identifies and sorts plastic packaging. It aims to speed high-grade plastic back into the CE and move China's companies and consumers towards a waste-free world. Using AI technology, it automatically identifies the type of

plastic, sorts it and stores it, collects and returns it to recycling centers, and fast-tracks it for reuse rather than being left to degrade.

At Ikea, 15 percent of its returned items become waste. To tackle this, Ikea has adopted AI for handling returned merchandise. Ikea installed an AI platform developed by its partner Optoro in 50 locations across the US. It predicts the best possible destination for returned merchandise, whether it should be back on the floor, on the website, donated to charity, or sold to a third-party wholesaler. The algorithm determines this based on what makes the most sense for driving up Ikea's profits.

AI in a circular economy promises boundless opportunities in the future, however it is largely untapped. The current understanding of circular-economy

principles among businesses is limited to recycling, which is just one part of the CE model. Despite increasing awareness around sustainability, most organizations are not prioritizing the remaining two stages adequately.

Creating a broader awareness and understanding of how AI can be used to support a circular economy will be essential for enabling organizations' transition towards a truly circular economy. It will also play well with consumers who want to take responsibility for the environment.

Dr. Caroline Cassagnol, Siemens Technology, explains why this transition is imperative: "We grew up in a world dominated by the linear economy, and now we need to shift to a circular economy. That requires a completely different mindset. Everything we do must be questioned."

# Innovation takeaways

#CIRCULARECONOMY  
#SUSTAINABILITY  
#ZEROWASTE #RECYCLING  
#CLIMATECHANGE  
#REDUCEREUSERECYCLE  
#SUSTAINABLEDESIGN  
#CIRCULARDESIGN  
#ARTIFICIALINTELLIGENCE #AI  
#DATASCIENCE

## INSPIRE BY NATURE

The failure of the linear economy in addressing environmental and health issues has given rise to the need for an alternative model which is fundamentally circular, just like our Earth's natural cycles, and mitigates the harms caused by industrial waste.

## THE CIRCULAR ECONOMY IS JUST DEVELOPING

Currently, the understanding of circular-economy principles among businesses is limited to recycling. It is important to encourage awareness around design and circular infrastructure.

## #AISDGS

An AI-enabled futuristic circular approach is the key in accomplishing the majority of the UN's Sustainable Development Goals and generate goodwill among consumers for taking responsibility towards the environment.





# DATA SHARING IS CARING. OR IS IT A WASTE OF INVESTMENT?

How to ensure a sustainable and future-proof data ecosystem? The impact of the pandemic and geopolitical conflicts taught us to prioritize investments and demonstrated the relevance of connected products and digital services. Decision-makers face the challenge to invest wisely in the enablement of their IT landscape. Specifically, they need to reconsider the urgency of a collaborative data ecosystem approach.



**DANIELA  
RITTMEIER**

Head of AI Automotive, Capgemini





Everybody today is discussing digital transformation, data monetization, data analytics, and how to use artificial intelligence to accelerate core business or expand the current business. Five of the top 10 corporates in market capitalization – in sum \$8.245 billion market capitalization in 2022 – are global hyperscalers, platform providers, and game changers in the digital ecosystem. At the same time, the classical industry, so called old

economy is facing a challenge in the hardware-driven product development. They face the challenge of how to enable their data infrastructure to ensure a sustainable and future-proof data ecosystem.

Accompanied by the current economic pressure, the impact of the pandemic, and the challenges from international conflicts, investments in digital transformation are

prioritized and often focused on isolated data-driven use cases. As a result, the questions arise: to what extent is data infrastructure scaling sustainably, and is the data-sharing approach caring or a waste of investment?





## The relevance of a data ecosystem

Data is needed to generate value from data-driven use cases, no matter if we focus on customer, product, process, or context data. In the age of “sensor everything,” the type and capacity of available data sets are increasing exponentially. Automated data processing becomes affordable and high performing. For example, the cost to train an image classification system has decreased from 2018 to 2022 by 63.6 percent, while training times have improved by 94.4 percent. So, we can see the increasing industrialization and return on investment of mature artificial

Intelligence technologies like recommendation, object detection, and language processing. A cross-industry market potential of about \$12 trillion in annual data value for data analytics is projected.

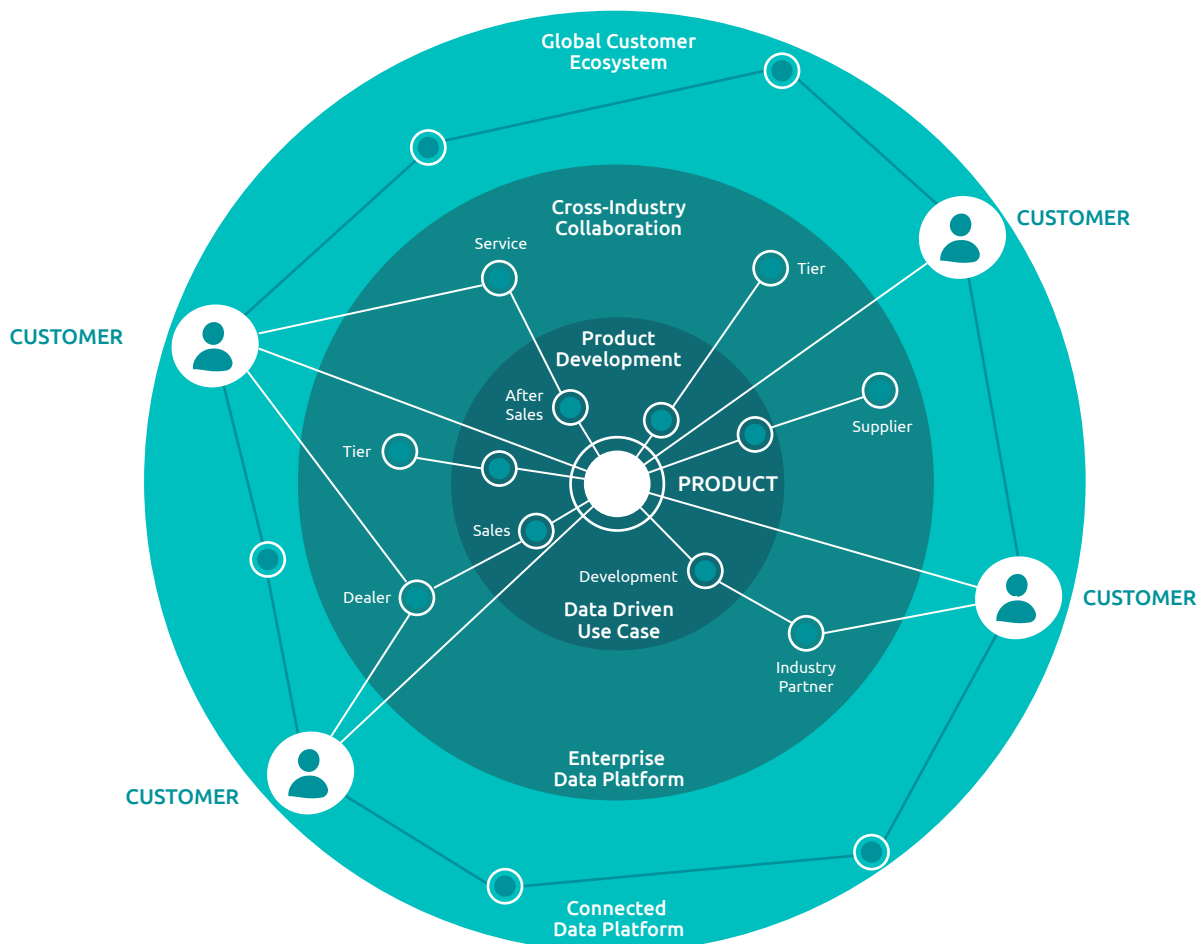
On the other hand, the rise of AI ethics and the critical questions about how to ensure human-centric developments are everywhere. Research on AI fairness and transparency has exploded since 2014, with a fivefold increase in related publications at ethics-related conferences. Researchers with industry affiliations contributed 71 percent more publications year over year at ethics-focused conferences in recent years.

Accordingly, the decision-makers in the classic, originally hardware-driven industry in particular face the question of how to enable the existing IT infrastructure and invest wisely in a future-proof data platform – to ensure the future viability in the digital ecosystem.

## Three core perspectives of data sharing and caring

From the client-side we can see various expectations based on three core perspectives.

### Three core perspectives of data sharing and caring

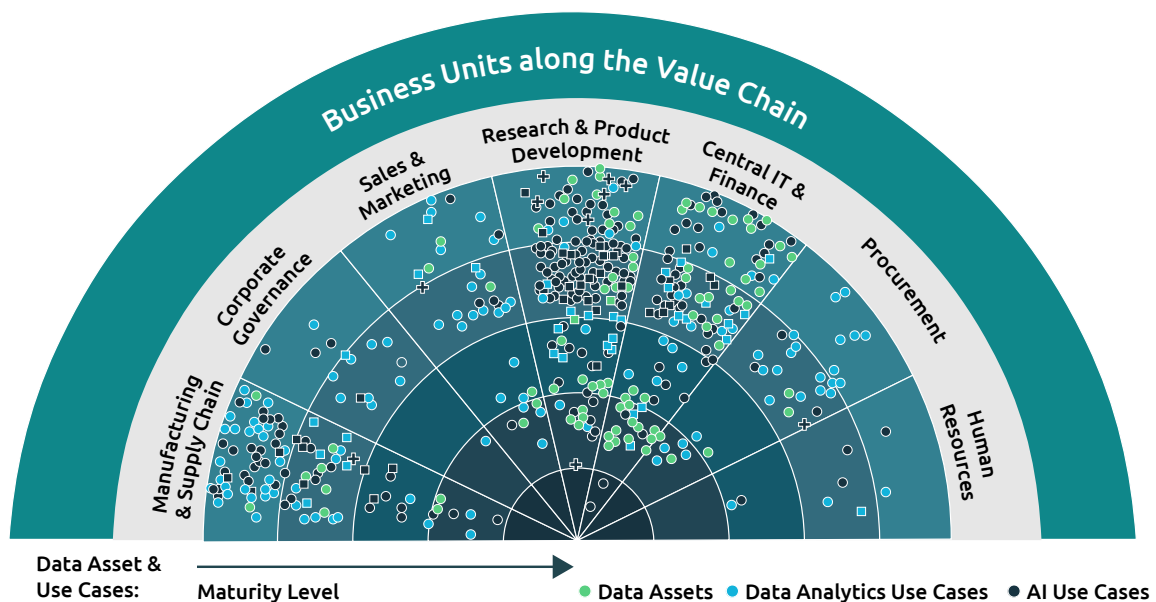


The first one is the focus on developing a data-driven use case, either to increase the efficiency of a business process or to go to market with an intelligent product or service. For successful deployment of the use case – let’s imagine an easy one out of the sales domain – you need to combine at least customer, product, and process data. We can assume that the data

ownership is distributed in various business units. To accelerate or automate the process by the data-driven use case, you need to share and trust the data of your internal business partner. The BMW Group Cloud Data Hub, for example, is an innovative reference of a single point of data entry, to access, source, and connect the relevant data and data stakeholders. The

collaboration platform was developed based on AWS Services and is [available open source on github](#). To represent, measure, and steer the innovation, data, and AI use cases along the entire value chain, Capgemini established the BMW D<sup>3</sup> Platform, which currently comprises over [600 data-driven developments](#)

### Data Asset & AI Use Case Portfolio



That is leading us to the second view, with a focus on a future-proof enterprise data platform. We still have our internal business partner in mind, so imagine the supply-chain domain. Across all industries, we have had to manage the impact of the pandemic and geopolitical conflicts in recent years. To predict or optimize the challenges of unexpected events and to deliver your products on time, you have to share data with your external business partner on an adequate platform. [Catena-X](#) is an example of a collaborative data-sharing

platform in the automotive industry with the focus on data trust and digital sovereignty. The data-value creation is based on the sharing approach along the entire OEM value chain, which is comparable to the ones of the data platforms of the five “tech giants.”

To participate and collaborate in cross-industry data platforms, you need to ensure your interface capability. [The Open Manufacturing Platform](#) accelerates manufacturing innovation at scale through the power of open collaboration. This

global alliance is solving data-powered critical manufacturing challenges.

The third perspective is the outlook of the future viability in the customers’ global digital ecosystem. Following up the automotive platform example, let’s imagine the future of mobility. We don’t know what the future will bring. It is not predictable yet when, where, and to what extent autonomous vehicles will be available. But we can expect that there will be multimodal mobility platforms, including various



public and private solutions like trains, planes, vehicles, or bikes. The customer expectations will be many, depending on the environment and individual preferences, like zero emission, time, or cost efficiency. So, no matter if you provide a hardware device or digital service, the customer expects a seamless integration in their personal digital ecosystem. To ensure your future viability, you have to integrate and connect your product and share related data sustainably in the customers' global digital ecosystem.

## Investment in a sustainable future viability

No matter if you are focusing on the development of a data-driven use case, the establishment of an enterprise data platform, or the integration of your product in the customers' digital ecosystem, data sharing is caring and every investment in a collaborative data platform is one in a sustainable future viability.

*Data sharing is caring: every investment in a collaborative data platform is one in a sustainable future.*

# Innovation takeaways

#DATASHARINGCARING  
#DATADRIVENDEVELOPMENT  
#DATAPLATFORM  
#DATAECOSYSTEM  
#DATAVALUECHAIN  
#SUSTAINABLEAI  
#FUTUREVIABILITY

## DATA SHARING = CARING

No matter if you are focusing on the development of a data-driven use case, the establishment of an enterprise data platform, or the integration of your product in the customers' digital ecosystem.

## LIFTING THE NEXT LEVEL OF DATA COLLABORATION

Invest in a stepwise transformation of your IT infrastructure to enable enterprise-wide collaboration, industry partnership, and product integration based on a data-platform approach.

## INVESTMENT IS SUSTAINABLE FUTURE VIABILITY

Five of the top 10 of market capitalization are hyperscalers and global data-platform providers. Invest in the seamless integration and scaling of your product in the customers' digital ecosystem.

# THREE DATA- FOUNDATION STRATEGIES FOR SCOPE 3

Scope 3 emissions pose one of the biggest dilemmas within corporate sustainability agendas. Our view is that a data-powered approach is the key to solve it. The good news is that getting a better grip on emissions data not only helps cope with mandatory regulations, it also provides additional business potential and builds data mastery. Here are three foundational strategies to get started.



**ROOSA SÄÄNTTI**

Head of Insights & Data Finland,  
Capgemini





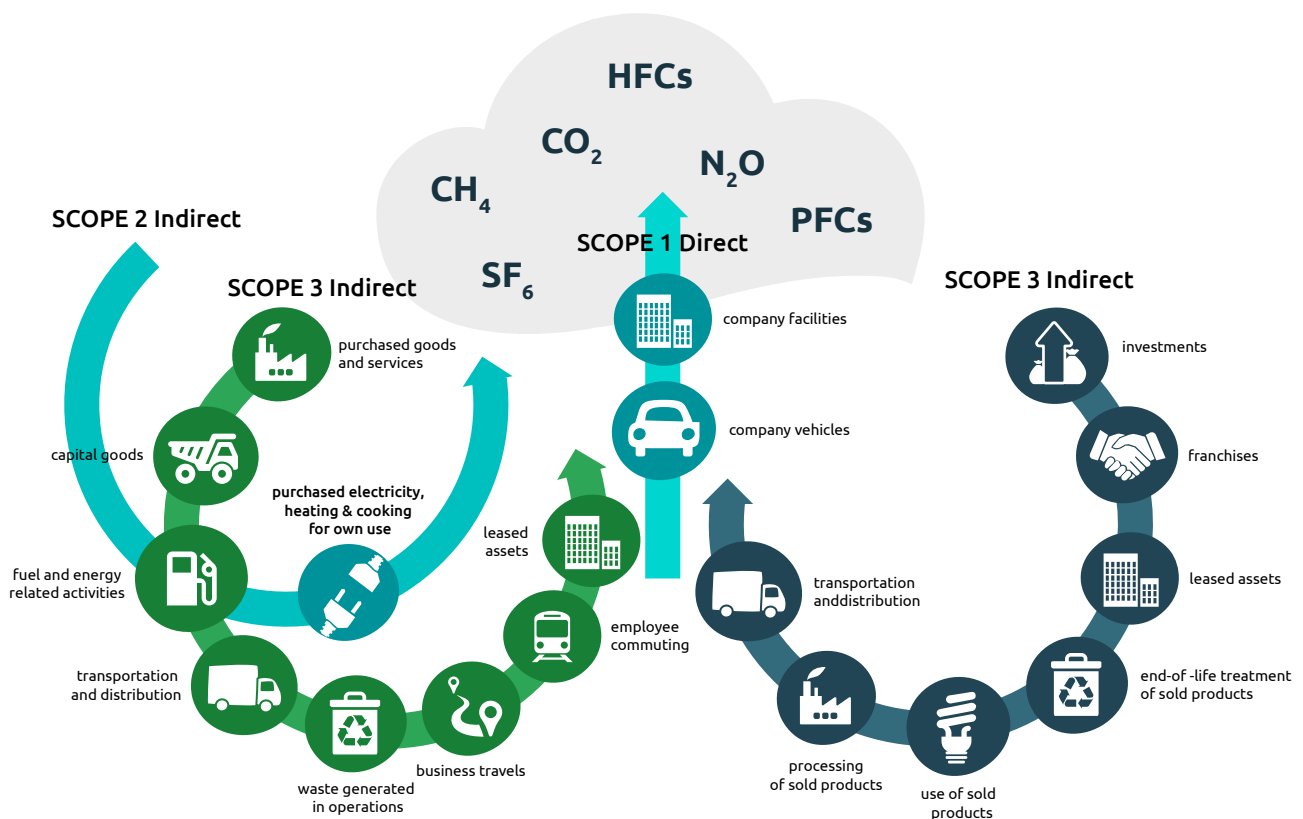
Long gone are the days when an organization's sustainability ranking was only judged by the impact of its own actions. Organizations which cannot provide relevant Scope 3 data in public reporting face the likelihood of stakeholders criticizing them for providing an incomplete picture of their total environmental impact. A company's Scope 3 emissions account for 65 to 95 percent of the total CO<sub>2</sub> footprint, but the findings from Capgemini

Research Institute's latest [Data for Net Zero](#) research show that only 22 percent of companies are measuring Scope 3 data today. This means that a majority of companies overlook most of their carbon footprints and simultaneously ignore the business value potential from emissions data.

## The complexity of Scope 3

A company's carbon footprint consists of Scope 1, 2, and 3 greenhouse gas emissions. Scope 3 emissions result from activities that are not directly owned or controlled by the company, including those coming from suppliers, distributors, partners, and customers. They are divided into 15 categories.

### GHG Protocol scopes and emissions across the value chain



Measuring and reducing emissions over an extended period to focus on shifts, but some valid Scope 3 measures are:

- Avoid unnecessary business travel and inefficient modes of transport
- Switch to lower-emission fuels and vehicles
- Manufacture more energy-efficient products
- Design durable, recyclable products.

Although sharing Scope 3 emission information has been optional for most businesses so far, both US and EU regulators are now pushing for increased transparency, and companies will increasingly face new regulatory requirements. Furthermore, companies are also realizing the business potential that sustainable value chain, operations, and products can provide. Findings from the Capgemini Research Institute show that 85 percent of organizations recognize the business value of emissions data, but it still remains inadequately used: 45 percent of the companies use the data only for reporting.

*Without accurate data and the skills to use it, you don't only struggle to report the right numbers, but it also becomes impossible to make predictions for the future and steer your business towards net zero.*





## The Scope 3 dilemma is all about solving a big data challenge

Scope 3 emissions come from external parties, so collecting accurate and reliable data can be particularly challenging. Without accurate data and the skills to use it, organizations not only struggle to report the right numbers but also to make predictions for the future and steer the business towards net zero-targets. So, Scope 3 is a big data challenge: reliable emissions data is needed for both asking the right questions and providing the right answers. But how to get started? Here are three data-foundation strategies that get things moving in the Scope 3 space.

### Emissions data collection: start with identifying hotspots

When a company has defined net-zero targets, it usually has already created an understanding of the most carbon-intensive parts of the value chain. For example, to a manufacturing company, such a hotspot might be logistics. A data-collection strategy for Scope 3 is a plan aligned with the sustainability strategy. It describes what data is needed, from where to collect it, and what to measure. With Scope 3, organizations should always aim at getting the source data if available. In practice, this means reaching out to suppliers and partners and asking for emissions data allocated to the products and services purchased. In some cases, when the actual data cannot be accessed, another way to estimate the activity data should be agreed. As with all data these days, a smart approach should be used. Hence, instead of collecting it all, focus on what data is really needed to understand where the organization



is, and make predictions for the future.

### Establish a shared single source of emissions data

A hub to ingest and store data in one place is next. The data will come in different formats and structures, and a common emissions data model will help make sense of it. Major cloud-platform providers such as Microsoft, Snowflake, and AWS have already developed accelerators in

their stacks to support Scope 3 emissions data collection, modelling, and analytics. One advantage of these cloud platforms is that they tend to have great data collection and sharing capabilities for data outside the organization. In the end, Scope 3 is all about sharing across the data ecosystem. Once the data is in one place, it is possible to use this single source of truth for multiple purposes, such as carbon accounting, reporting, or analytics.

## Let data lead the people

Calculating and reporting Scope 3 emissions can still be considered a quite straightforward part of the puzzle. When an organization starts building analytical models, what-if scenarios, or utilizing advanced AI – for example with digital twins – it gets tougher. The tricky part is how to make people trust the data and make decisions based on it. The data-powered sustainability game is, in the end about people, culture, and the right skills. As an example, in the manufacturing industry, R&D and

procurement teams are at the heart of change. These teams decide what kind of products to make, materials and processes to use, and from where to buy. When these teams have knowledge of the net-zero targets, understand their role in reaching them, and have access to data, tools, and insights that lead the way, change can happen. Emissions data literacy is a quality that involves people, tools, and processes. Similarly to financial data literacy, emissions data and related skills are essential tools for tomorrow's leaders.

It is evident that one of the toughest elements in the race to net-zero lies in Scope 3. Despite this big data challenge, here's the good news: by adopting a data-powered approach – starting with three foundational strategies – a business can take a leap towards a net-zero future, building data-management capabilities and data mastery along the way.

# Innovation takeaways

#SUSTAINABLEDATA  
#SMARTDATA  
#SUSTAINABILITYDATA  
#SCOPE3  
#SUSTAINABILITYANALYTICS

## BE SMART WITH DATA COLLECTION

For Scope 3, identify hotspots, collect what is really needed, and aim always for the critical data.

## ESTABLISH A SINGLE SOURCE OF TRUTH

Collect and store this data in a central place and manage it on top of a common sustainability data model.

## SUPPORT AND EDUCATE

Equip teams with the skills and tools to understand and use emissions data for business decisions, investing in a net-zero future.



# AI ROUNDTABLE ON SUSTAINABILITY

The answers in this article were completely authored by large AI language models. Only the questions were provided by humans. “Sabrina” is GPT-3 from OpenAI, “Jill” is Jurassic-1 from AI21, and “Kelly” is Cohere from Cohere (“Good morning, angels.”). None of the responses were edited. We prompted the three different AI models three times for each question and selected the best responses. The humans in the loop were Rajeswaran Viswanathan, Aishwarya Jagtap, and Karan Kajrolkar.



**SABRINA**

GPT-3,  
OpenAI



**JILL**

Jurassic-1,  
AI21



**KELLY**

Cohere

## How can we use data for a more sustainable world?

**SABRINA:** There are a few ways that data can be used to improve sustainability. One way is by helping policymakers and planners make more informed decisions about how to use resources and build infrastructure. Data can also be used to track and monitor environmental and economic indicators, which can help policymakers and businesses make informed decisions about how to manage resources. Finally, data can be used to develop new strategies for reducing environmental and economic impact.

**JILL:** Data-driven sustainability means collecting and using data to make decisions that guide measurable and responsible business practices. Whether it's lowering greenhouse-gas emissions, optimizing supply chains, or reducing waste, insights from sustainability data can power positive change while increasing profitability. Automated data collection and analysis empowers enterprises to make strategic, real-time decisions – the kind needed to achieve sustainability goals. In addition,

advanced technologies can uncover deep insights from data, opening a world of innovative ways to support sustainable practices across organizations.

**KELLY:** Data collection and analysis enables companies to make better decisions. AI can be used to analyze data to identify and eliminate inefficiencies and to create more sustainable business practices. For example, AI can be used to analyze data to identify and eliminate inefficiencies and to create more sustainable business practices. AI can also help create new data sources, such as the Internet of Things (IoT), which can collect and analyze data to provide insights that can help create more sustainable business practices.

## Can data and AI make the world more sustainable?

**SABRINA:** A lot of people think that data and AI can help make the world more sustainable, because they can help us better understand how our actions affect the environment and how to make better decisions. However, there are also some concerns that data and AI could actually make the world more

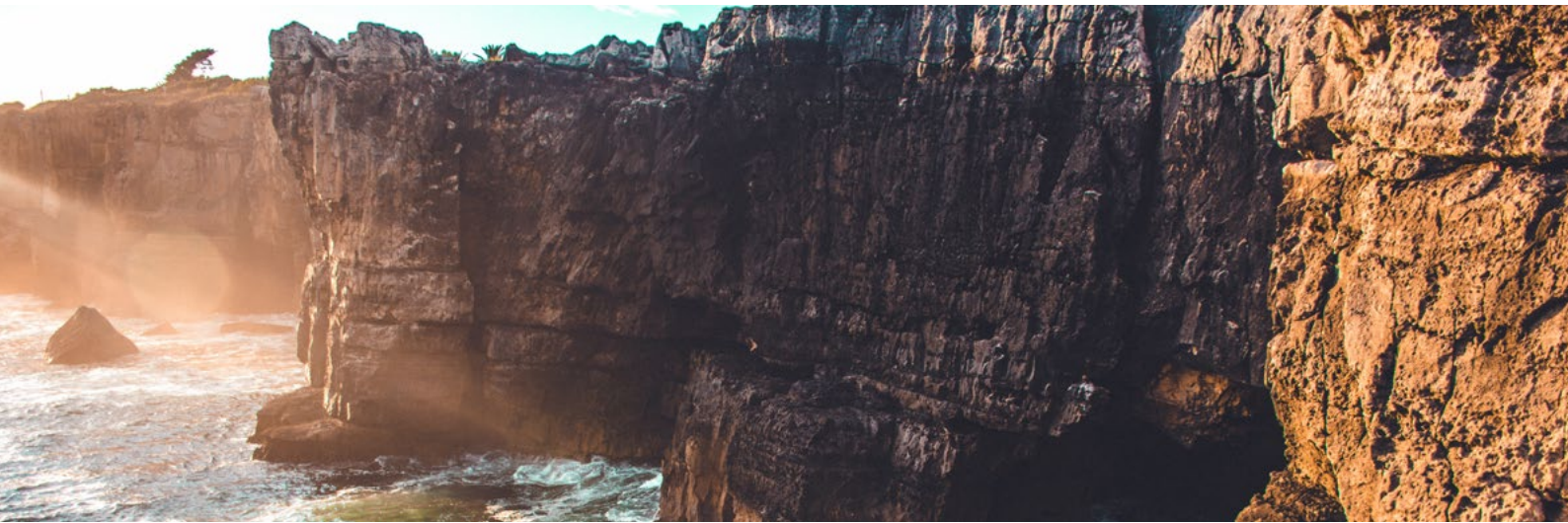
damaging, because they could lead to more wasteful and destructive behavior.

**JILL:** Yes, data and AI can make the world more sustainable. Data and AI can help address many sustainability challenges. From enabling smarter transportation to making buildings more energy efficient, from enhancing environmental monitoring to improving waste management, from providing personalized healthcare to improving food supply chains, AI and data can advance sustainability.

**KELLY:** AI is helping to change the world for the better by making decisions, improving efficiency, and minimizing risk, as well as inspiring innovation and supporting sustainability. For example, AI can help governments and businesses improve supply chain efficiency, monitor progress towards goals, predict threats, and avoid risk. AI can also be harnessed to enhance productivity and increase transparency. This could be done through the integration of AI into environmental sustainability platforms that track supply chain, social and environmental impact, or by sharing information in real-time about energy usage or pollution with consumers, regulators, and other stakeholders.







## What are the creative ways in which AI can be used to make the world more sustainable?

**SABRINA:** Artificial intelligence can be used to make the world more sustainable by helping to harness natural resources while also helping to reduce environmental costs. For example, AI could help to identify and manage plant growth in soils to optimize the use of resources, and could also help to predict when and where wildfires could happen.

**JILL:** In the agricultural sector, AI is enabling farmers to predict crop yield and disease outbreaks, helping them reduce losses, optimize inputs, and improve yields. AI is improving the efficiency of water and energy use in buildings, helping to reduce energy costs and greenhouse gas emissions. In transportation, AI is supporting efficient freight transport, optimized routes, and real-time traffic management. In the energy sector, AI is improving the performance of wind farms and solar panels, helping to reduce carbon emissions.

**KELLY:** AI can be used to make the world more sustainable. A number of companies are using AI to reduce their carbon footprint and save money. For example, AI-powered predictive analytics and intelligent grid systems can manage the supply and demand of renewable energy, cutting costs and unnecessary carbon pollution generation. AI can also be used to fight climate change. AI self-driving cars, for instance, may reduce emissions by 50 percent by 2050 by identifying the most efficient routes. AI can also help make the world more sustainable. For example, AI can be used to support the UN's Sustainable Development Goals (SDGs), and the UN Global Compact's Ten Principles, which include human rights, labor, environment, and anti-corruption.

## What should humans do to make the world more sustainable?

**SABRINA:** There is no single answer to this question, as the best way to make the world more sustainable depends on the individual and community context in which the act of reducing environmental impact is accomplished. However, some potential actions that could be taken

to make the world more sustainable include implementing sustainable tourism policies, supporting renewable energy sources, and reducing consumption patterns.

**JILL:** The answer to how we can make the world more sustainable lies in what we, as individuals, do. What we can do as individuals is reduce our carbon footprint, minimize waste, recycle, plant trees, plant more trees, and stop using plastic. We can also try to minimize our meat consumption, buy local, support local artisans, buy less and donate more, reduce our water consumption, drive less, buy less and donate more, and buy less and donate more.

**KELLY:** Our choices have a profound impact on the environment and climate. From the way we get around to the food we eat, every day we make choices that affect the environment, the climate, and other species. It is time for us to rethink the way we do things. All the AI is not going to help if we do not make better choices. Here are some of the best ways you can help make the world more sustainable: recycle, cut back on plastics, buy in bulk, switch to a reusable water bottle, and grow your own food. Be energy efficient, take shorter showers, replace your light bulbs with LEDs, and lower your heat in the winter and raise it in the summer, stop eating meat.



## How can humans and AI work together to create a sustainable world?

**SABRINA:** AI can help us to identify and quantify environmental problems, and provide solutions that are tailored to specific local conditions. For example, AI can help us to map land use, water resources, and carbon emissions, and to develop plans for mitigating and adapting to climate change. AI can also help us to better understand and protect biodiversity, and to develop sustainable agricultural and forestry practices. In addition, AI can help us to monitor and manage natural resources, and to find new sources of renewable energy. By

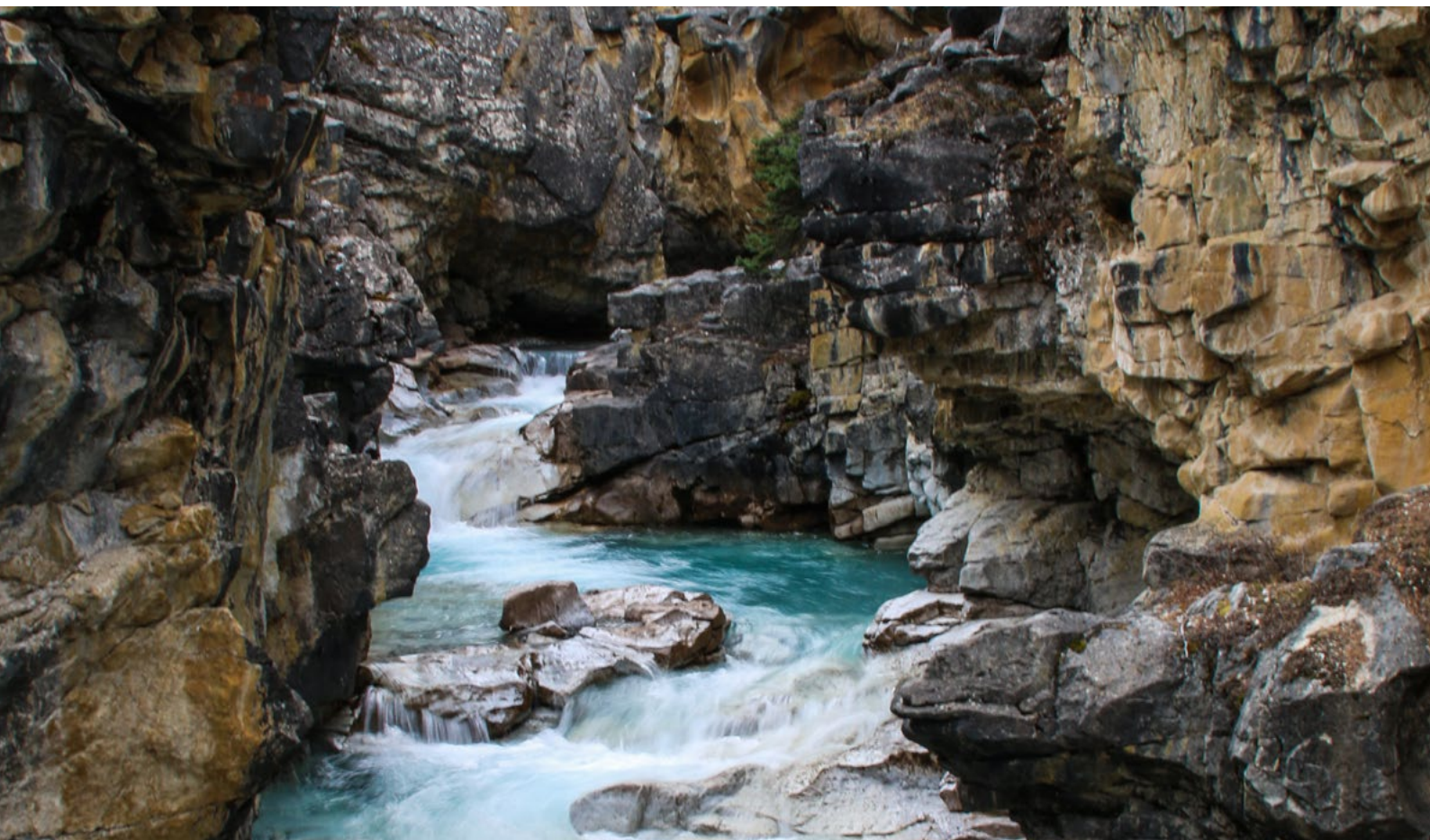
working together, humans and AI can create a sustainable world.

**JILL:** Humans and AI working together can create a sustainable world. The IPCC has concluded that the world needs to reduce emissions by 45 percent by 2030 to limit global warming to 1.5°C. With the right technology, human and machine can work together to help achieve this goal. The combined power of people and machines can power innovation, create new economic opportunities, and drive climate action.

**KELLY:** The confluence of human and machine intelligence is enabling radical new approaches to solving the world's biggest problems. As part of the Fourth Industrial Revolution, artificial intelligence is aiding everything from clean energy to new lifesaving treatments, and from conservation to policy creation. While AI has the potential to deliver many benefits to humanity, it also

has the potential to wreak havoc if it's not deployed responsibly. When it comes to building a sustainable future, what does it mean to be responsible? At this point, AI will be working side-by-side with humans for the foreseeable future. To maximize the benefits of AI for the future, it is important to involve humans at every stage of the development process, including planning and design.

#DATAPOWERED  
 #AI4GOOD  
 #DATAMASTERS #GPT3  
 #COHERE #AI21  
 #LANGUAGEMODELS  
 #DATAPOWERED  
 #AI4GOOD  
 #DATAMASTERS #GPT3  
 #COHERE #AI21  
 #LANGUAGEMODELS





# THE PARADIGM SHIFT OF ENTERPRISE SUSTAINABILITY

Growing concerns about environmental sustainability challenges experienced across industries and the dire need for conservation of natural resources have brought sustainability into the mainstream focus. Sustainability is about answering to the climate emergency and also about transforming organization to gain a new competitive advantage. Organizations can no longer manage sustainability just by defining and managing KPIs, however. Instead, a real paradigm shift is needed in business organizations and entire value chains. When core business models are being disrupted by external and internal factors, there is a definite opportunity to seed sustainability into these models as they are reinvented for the future.



**UMAMAHESWARI  
KATHIRVEL**

Senior Enterprise Architect,  
Cappgemini

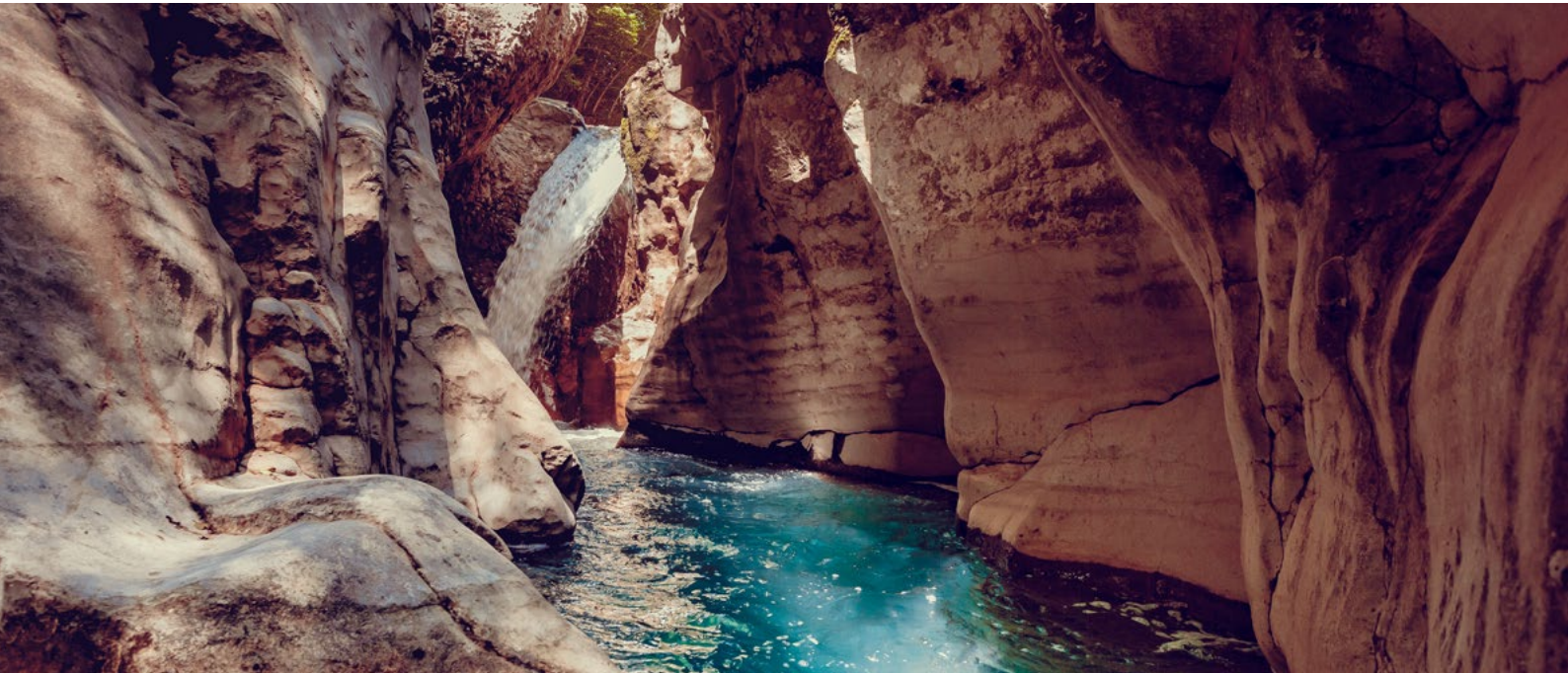


**YASHOWARDHAN  
SOWALE**

Architecture Head, India Domain  
Leader for AI, Insights & Data,  
Cappgemini







Earth is the only life-sustaining planet available to us, so it is important to meet our own needs without depleting natural resources for future generations. The pandemic has brought in a mindset change in consumer behavior, in which there is an increasingly critical view of organizations not doing enough for carbon neutrality. Organizations still struggle to grasp, though, how fundamentally consumer preferences have shifted in this context – in terms of trust, loyalty, and price expectations.

A sustainable business has three bottom lines: people, planet, and profit. Enterprises must move from awareness and understanding to strategy, action, and culture. They need to mobilize both their consumers and employees through awareness, education, and the clear choice to deeply embed sustainability in all activities. The [Sustainability Revolution](#) is a major change from the principles of current economic development (with its damaging social and environmental consequences), hence we see the need for nothing less than a true paradigm shift.

## What makes a paradigm shift?

Enterprise sustainability paradigm shifts occur when consumers acquire new insights and enablers that significantly alter their thoughts and affect their actions. We see enterprises position next-generation technology at the core of their sustainability initiatives and building an aligned, robust sustainability governance. Also, we see increasing [collaboration](#) between enterprises within the broader ecosystem for more impact. Capgemini's CEO Aiman Ezzat says it clearly: "We firmly believe that a sustainable future is achievable only with deep industry-wide collaboration with our clients, suppliers, and other stakeholders."

The [Sustainability economy](#) is a critical area touching the planet's population, notably Gen Z and Millennials. From a cleaner and safer environment to higher living and ethical standards, it offers benefits that go far beyond environmental issues commonly associated with sustainability. For example, Ikea has established a strategic partnership with the Ellen MacArthur

Foundation through which it is aiming to become a fully circular company by year 2030; it has started heavily utilizing non-conventional power and selling surplus energy. L'Oréal, to meet its ambitious 2030 sustainability targets, has established the L'Oréal for the Future program and is deeply investing in activities focused on regenerating damaged ecosystems, developing projects linked to the circular economy.







## It's all about new ideas

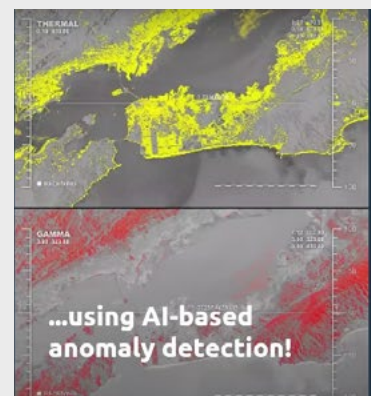
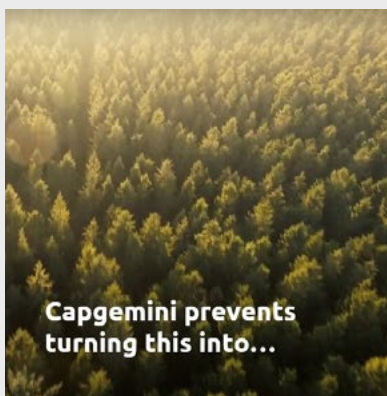
Let's see a real customer story of advanced AI enabling enterprise sustainability not only for organizations but also for regional economies. Capgemini helped one of the largest forest owners in northern Europe, which wanted to track the spread of European spruce bark beetles more effectively across expansive wooded areas; these were attacking very high value timber and

forests. Gaining sufficient accuracy in bark beetle tracking was very complex. This insect spread represents a clear and present danger to forests across significant parts of the country and the diverse environments within them.

We utilized the Geo Satellite Intelligence system, which uses artificial intelligence to review satellite imaging to identify beetle attacks across 200,000 hectares of forest. Using a deep-learning model to automatically recognize infestations, the solution can

identify attacks within a group of four to five trees using images. This is a good example of deep learning helping AI drive sustainability through advanced predictive analytics. The system also has the potential to track other subjects such as tree species, forest growth, and other types of damage to vegetation. This has wide-ranging implications for the preservation of forests and beyond, as governments and private organizations need to remain updated on many factors at any given time.

*Capgemini has large scale anomaly detection experience in the real world, across industries*



## Executing on the paradigm shift: How Capgemini helped a global auto OEM, from sustainability analytics to enabling decarbonization initiatives

Capgemini was selected to create a scalable data and analytics platform for CO2 and logistics data covering E2E supply chain and logistics from inbound to outbound systems and parts supply processes. This customer adopted an aggressive target for 2025 that would see the total CO2 emissions reduced by 40 percent over a life cycle of manufacturing. It also aimed to be a climate-neutral company by 2040. As our customer said, "Sustainability is as important to us as safety – and we target to have the same distinguished reputation for our sustainability achievements as we do

for safety." Capgemini closely worked with the customer in a variety of ways for decarbonization of supply chain, which included reconfiguration of supply chain framework and agile operational supply chain planning, tracking of recyclable products, reducing/optimizing total miles driven, optimized product mix with green products to baked-in BoM component-level emission reporting, and strategic supply planning.

# Innovation takeaways

#NETZERO #ZEROEMISSION  
#ZEROWASTE  
#ZEROINEQUALITY  
#RESPONSIBLESUPPLYCHAIN  
#MANAGINGCLIMATERISK

## TECHNOLOGY AND COLLABORATION MAKE A DIFFERENCE

Next-generation data-powered technology and collaboration are enablers to achieving enterprise sustainability objectives.

## METRICS AND KPIS ARE NOT ENOUGH, HOWEVER

A true paradigm shift is needed to fully embrace these enablers and actually transform.

## IT'S A BUSINESS ISSUE

Seeing environmental challenges as key business issues, and treating them exactly like that, is the way forward to a successful paradigm shift



# FEEDING THE WORLD BETTER WITH PROJECT ENHANCE

Capgemini is working in close collaboration with the World Food Programme, Johns Hopkins University, and the Zero Hunger Lab to use AI and big data to answer the crucial question of how to feed the world better. Welcome to project ENHANCE: Environment, Nutrition, and Health Analytics for National Consumer and Emergency diets.



**MAARTJE DE LAAT**

Senior Innovation Consultant,  
Insights & Data, Capgemini



**MARIJN MARKUS**

Managing Data Scientist,  
Insights & Data, Capgemini



Together, we can feed the world better.



World hunger and malnutrition are huge challenges.

The World Food Programme strives to tackle both.

And at Capgemini, we want to help.

Close to 10 percent of people in the world live in hunger.

But almost 40% can't access healthy diets either. Both issues have dire consequences for the health, economy, and society of a country

ENHANCE

# NUTRITION

Is complicated

THREE INCREASING LEVELS OF DIET QUALITY



	PEOPLE WHO CANNOT AFFORD (%)	PEOPLE WHO CANNOT AFFORD (millions)
<b>HEALTHY DIET</b> includes Foods from several food groups and has greater diversity within food groups	38,3	3,021
<b>NUTRIENT ADEQUATE DIET</b> meets required levels of all essential nutrient	23,3	1,513
<b>ENERGY SUFFICIENT DIET</b> meets needs for short-term subsistence	4,6	186

## The World Food Programme's mission

The UN's World Food Programme addresses these huge issues through data analysis, to run models and advise public institutions worldwide on how to best feed their people, as cheaply, nutritiously, and in the most environmentally friendly way.

How? By gathering data on nutrition and food prices worldwide and to evaluate all kinds of diets on affordability, nutritional content, health criteria, and sustainability, with the goal to address, analyze, and help solve these nutrient gaps worldwide.

For example, what if grain prices suddenly rise, and a country loses access to this staple?

This is a frighteningly relevant question in 2022.

Should its government switch to importing other sources of fiber?

Introduce rationing? Invest in fortified foods? Subsidize local farming?

There are dozens of options to help bridge the nutrient gaps that affect millions of people.

This is why the World Food Programme runs analyses and simulations to determine the optimal course of action. But building, running, and maintaining these models takes time.

This is where project ENHANCE comes in.

*ENHANCE allows users to balance factors like affordability, nutritional content, healthy diet criteria, and sustainability.*



## Project ENHANCE

By leveraging modern data-science techniques, Capgemini is playing its part to help the World Food Programme. In a collaboration with the WFP, the Zero Hunger Lab of Tilburg University, and the Center for a Livable Future of Johns Hopkins University, we have been building an enhanced set of tools and models to help address nutrient gaps at scale.

Using state-of-the-art models and insights from the scientific world, ENHANCE allows users to balance factors like affordability, nutritional content, healthy diet criteria, and sustainability. These directives challenge our world to address everything from family budgets to nutrient deficits and world hunger.

Through a set of control panels, algorithm hosted in the cloud, and interactive dashboards, users can use ENHANCE to ask nutrition and diet questions more quickly and accurately than before. Questions like: What if the tomato harvest in country X fails? What is the effect of cash handouts as a policy intervention? Are young girls more at risk of malnutrition than boys? What about families with Y children? Or vegan diets?

This platform will help government and individuals around the world make better choices and find optimal interventions. This will make diets and food system more future proof, fill the nutrition gap, and create a better world food ecosystem.

A public and openly accessible version of ENHANCE is in the works,

too. This will help create better, faster, and more actionable insights for policy makers worldwide.

Last summer, we delivered a first MVP, which is now being tested and iterated upon. The first results are promising, but there's always room for improvement.

Sustainability metrics and CO2 emissions of diets are a recent addition, for example. And we're eager to improve on hosting, accessibility, and speed of our models.

Last October, ENHANCE was presented at the World Summit AI, where we engaged with data experts from all over the world, many of whom tackle similar ethical and environmental challenges. The results from ENHANCE were positively welcomed.



## The future

We couldn't be prouder of our international team of young, enthusiastic engineers, scientists, and analysts who make all the magic happen. Getting to work with both academics and policy makers at the same time is a thrill. Learning so much about nutrition is very educational.

And to get to work on models that can help feed millions is humbling.

Of course, world hunger is a tremendously complex topic.

And our work is just a small piece of the puzzle.

A piece that shows we can feed the world better.



# Innovation takeaways

#FEEDTHEWORLD  
#DATA4GOOD #AI4GOOD  
#TECH4POSITIVEFUTURES  
#WORLDFOODPROGRAMME  
#PROJECTENHANCE

## A BIG TOPIC NEEDS BETTER DATA

Hunger and malnutrition are worldwide issues with major ramifications for society; data and AI can power solutions that address the challenge.

## A BIG TOPIC NEEDS BETTER ANSWERS

With data underneath, a set of control panels, algorithms hosted in the cloud, and interactive dashboards, nutrition and diet questions can be answered better.

## A BIG TOPIC NEEDS ENHANCE

Project ENHANCE (Environment, Nutrition, and Health Analytics for National Consumer and Emergency diets) aims to provide the power of data for feeding the world.



# SUST-AI-UN- ABILITY: AI MEETS UN SUSTAINABLE DEVELOPMENT GOALS

Humans have achieved incredible success through the use of technology, but we are struggling to attain the one thing which is critical for our survival: sustainability. Artificial intelligence has the potential to transform traditional sectors and systems to address climate change, protect biodiversity, and enhance human well-being. AI can be a game-changer in achieving Sustainable Development Goals (SDGs) as it augments human intelligence rather than replacing it. Any steps taken for achieving SDGs can be augmented and adopted at a larger scale through AI.



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United Nation's 17 Sustainable Development Goals



- |  |  |  |
|--|--|--|
| <p><b>01</b> AI-powered maps and satellite imagery can help to predict income levels and develop plans of action to tackle poverty</p> <p><b>02</b> AI can help in the automation of harvesting practices, water-resource management and prediction of extreme weather</p> <p><b>03</b> ML tools can predict disorders like heart diseases, cancers, etc, and have been effective in the process of automating drug discovery</p> <p><b>04</b> AI-led remote teaching can assist in educating more students in undeveloped countries</p> <p><b>05</b> Joonko, an HR start-up, uses AI to remove latent biases in the hiring process</p> <p><b>06</b> Bayesian geostatistical models along with ML tools can produce high-resolution maps with indicators such as access to sanitation, drought, etc.</p> | <p><b>07</b> Isreal is testing an AI-based floating solar panel system for producing electricity by tracking the sun</p> <p><b>08</b> Technologies like exoskeletons, digital twins etc. are helping to reduce injuries, maximizing productivity</p> <p><b>09</b> Siemens is using AI to lower energy consumption in data centres in the Baltics</p> <p><b>10</b> Loughborough University, UK, and Leicester-shire Partnership NHS Trust collaborated to use AI to improve the well-being of people with learning disabilities</p> <p><b>11</b> Canada has chosen a start-up Ectopia AI to build three-dimensional vector maps of the country's top 100 cities to support the goal to reach net-zero emissions by 2050</p> <p><b>12</b> AI-facilitated operational efficiency can be used to target goals such as reducing waste throughout the life cycle</p> | <p><b>13</b> As per BCG survey, 87% of leaders believe that AI is a useful tool in the fight against climate change</p> <p><b>14</b> The Integrated Coral Observing Network, the US-based organization, uses real-time integration of satellites and radar data sources for ecological forecasting</p> <p><b>15</b> AI helps in mapping ecosystem elements. Microsoft's Project SEEKER uses AI to detect illegally trafficked wildlife</p> <p><b>16</b> In the US, governments are using AI-based risk models for developing community-oriented decision support tools</p> <p><b>17</b> Partnerships as Open AI, AINow, and Responsible AI Institute focus on exploring the potential of AI to solve real-world problems</p> |
|--|--|--|

The United Nations member states adopted the 2030 Agenda for Sustainable Development in 2015, which provides a blueprint for peace and prosperity for people and the planet. These 17 goals offer a roadmap for sustainable

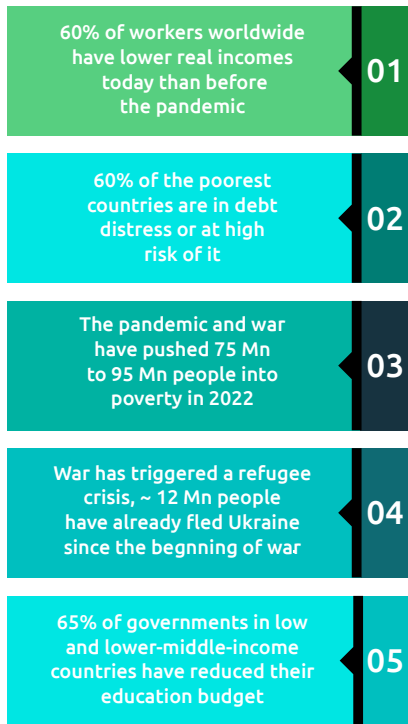
development. The progress made so far on these goals has been crippled by the pandemic and geopolitical conflict that resulted in an increase in food and energy prices and a worsening financial crisis – all adding to the misery of millions of people

already affected by the pandemic. The world is already witnessing the repercussions of climate change on life, livelihood, and quality of life.

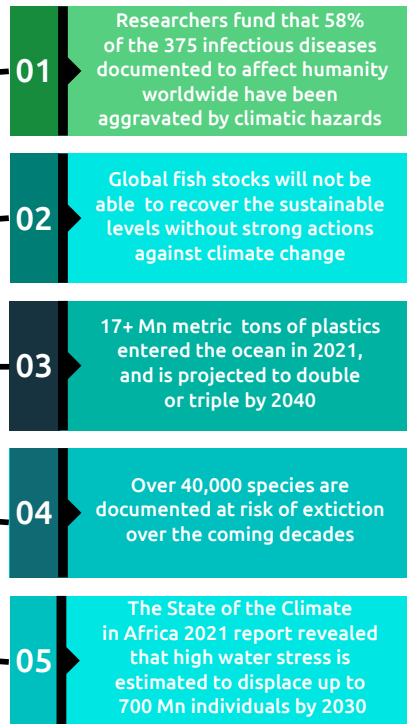


Goals cont.

IMPACT OF WAR AND PANDEMIC ON SDGS



IMPACT OF CLIMATE CHANGE ON SDGS



However, artificial intelligence (AI) has evolved as a decisive tool for policymakers to assess complex real-time information to both pursue

and monitor SDG progress. Here, we give examples – along the lines of the people, planet, prosperity, peace, and partnership – of how AI

can help to achieve every one of the UN’s 17 Sustainable Development Goals.



## People



### AI4Food and hunger and well-being:

People are suffering due to high inflation across the globe. The world is also witnessing a shortage of farm labor. Researchers and tech enthusiasts are employing machine learning and AI-driven technologies – such as drones, computer vision, and satellites – to solve global food insecurity and poverty problems.

- [The Food and Agriculture Organization](#) implemented two programs in which AI increases food security and improves agriculture sustainability: the WaPOR portal and the Agriculture Stress Index System. Both systems monitor water usage in agriculture.
- Similarly, [UC Berkeley-based research](#) launched a tool called



Multi-Task Observation using Satellite Imagery & Kitchen Sinks, which can analyze hundreds of variables drawn from satellite data from soil and water conditions to housing, health, and poverty at a global scale.

### AI4Education and equality:

AI makes the educational experience more engaging for students and teachers. It further detects educational anomalies and augments education-related administration processes. It also plays a pivotal role in promoting inclusiveness and equality.

- Capgemini Netherlands developed a predictive model that utilizes ML techniques to enable early identification of students who might drop out and helps teachers



to pay more attention to such students.

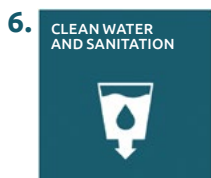


### AI4Health and well-being:

AI and ML solutions have great potential to transform healthcare and medicine globally, provided ethics and human rights are considered during their implementation. AI and automation can help in bridging the significant workforce gap faced by many countries.

In the US, hospitals and health systems like Boston Medical Center, M Health Fairview, Mercy, and Saint Luke's Health System partnered with Qventus, an AI-powered operations software start-up, to automate aspects of care operations like access and patient flow and decreasing length of stay.

## Planet



### AI4Environment:

Climate change leading to heat stress is expected to reduce total working hours, putting more pressure on the already existing labor crisis – resulting in a decline in GDP. According to [S&P Global](#), climate change could see a four



percent annual loss of global economic output by 2050. Big tech companies have embraced technology to help the environment.

- Google Cloud partnered with the Saudi Arabia government to launch the "Earth Observation & Science Program" to curb climate



change's impact on the environment, water, and agriculture.

- Grenada, a Caribbean Island, used its countrywide LiDAR and high-resolution imagery to create a digital twin of the country for achieving sustainability plans.





## Prosperity

7. AFFORDABLE AND CLEAN ENERGY



### AI4 Sustainable development and economic growth:

AI facilitates overall sustainable development by providing various tools to measure and optimize carbon emissions. It also increases the safety of the workers by automating difficult tasks. AI

8. DECENT WORK AND ECONOMIC GROWTH



promotes inclusiveness by providing data to uplift marginalized populations. Countries are adopting AI and other emerging technologies to design smart cities, foster a more inclusive economy, and make the energy system more efficient.

- Capgemini provides a dashboard through its [890 Platform](#) which

9. INDUSTRY, INNOVATION AND INFRASTRUCTURE



10. REDUCED INEQUALITIES



enables sharing of carbon data to allow downstream companies to compute and reduce carbon footprint.

- In the US, the AI project “Data for Black Lives” is collecting and analyzing data to back racial-justice initiatives.

11. SUSTAINABLE CITIES AND COMMUNITIES



## Peace

16.



AI can help in peacekeeping efforts by analyzing the available information from potential conflict zones and assisting policymakers to make insightful decisions. The UN is already using AI in search of peace in war zones.

- The UN collaborated with the AI start-up Remesh on an algorithm that helped negotiate peace agreements across Yemen and Libya. The tool helped to collect the responses and derive a consensus in near real-time. The

software assisted the UN to understand major concerns of groups in conflict zones during live discussions.

## Partnership



To achieve SDG, collaboration among governments, businesses, and civil society is more important than ever. One initiative taken by the G7 countries, the Global Partnership on Artificial Intelligence (GPAI), is a multi-stakeholder project that aims to bridge the gap between theory and practice on AI by supporting cutting-edge research and applied activities on AI-related priorities. Today, GPAI has 25 members.

Presently, the strategies designed to achieve sustainable development through AI by 2030 will have long-term benefits that could surpass the SDGs within this century.

These strategies must be tailored according to the specific needs of each society. The inclusion of all nations is necessary to achieve overall goals, as it otherwise may result in an unequal and an

unsustainable AI-fueled future. Also, while AI as a technology shows great promise, it could also have an adverse impact on the SDGs, due to challenges such as AI's energy footprint, biased AI, and the potential to worsen income inequality. Therefore, it is important for policy makers to adopt AI responsibly.

# Innovation takeaways

#AI4GOOD;  
#AIFORSDGs;  
#AI4SUSTAINABILITY

## AI FOR ACHIEVING SDGS

The failure of the linear economy in addressing environmental and health issues has given rise to the need for an alternative model which is fundamentally circular, just like our Earth's natural cycles, and mitigates the harms caused by industrial waste.

## EXPAND THE REACH OF TECHNOLOGY

Currently, the understanding of circular-economy principles among businesses is limited to recycling. It is important to encourage awareness around design and circular infrastructure.

## DESIGN ETHICAL MODELS

An AI-enabled futuristic circular approach is the key in accomplishing the majority of the UN's Sustainable Development Goals and generate goodwill among consumers for taking responsibility towards the environment.



# INNOVATION MOVERS AND SHAKERS



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