AI for Social, Economic, and Environmental Good

Tackling the World's Most Challenging Problems

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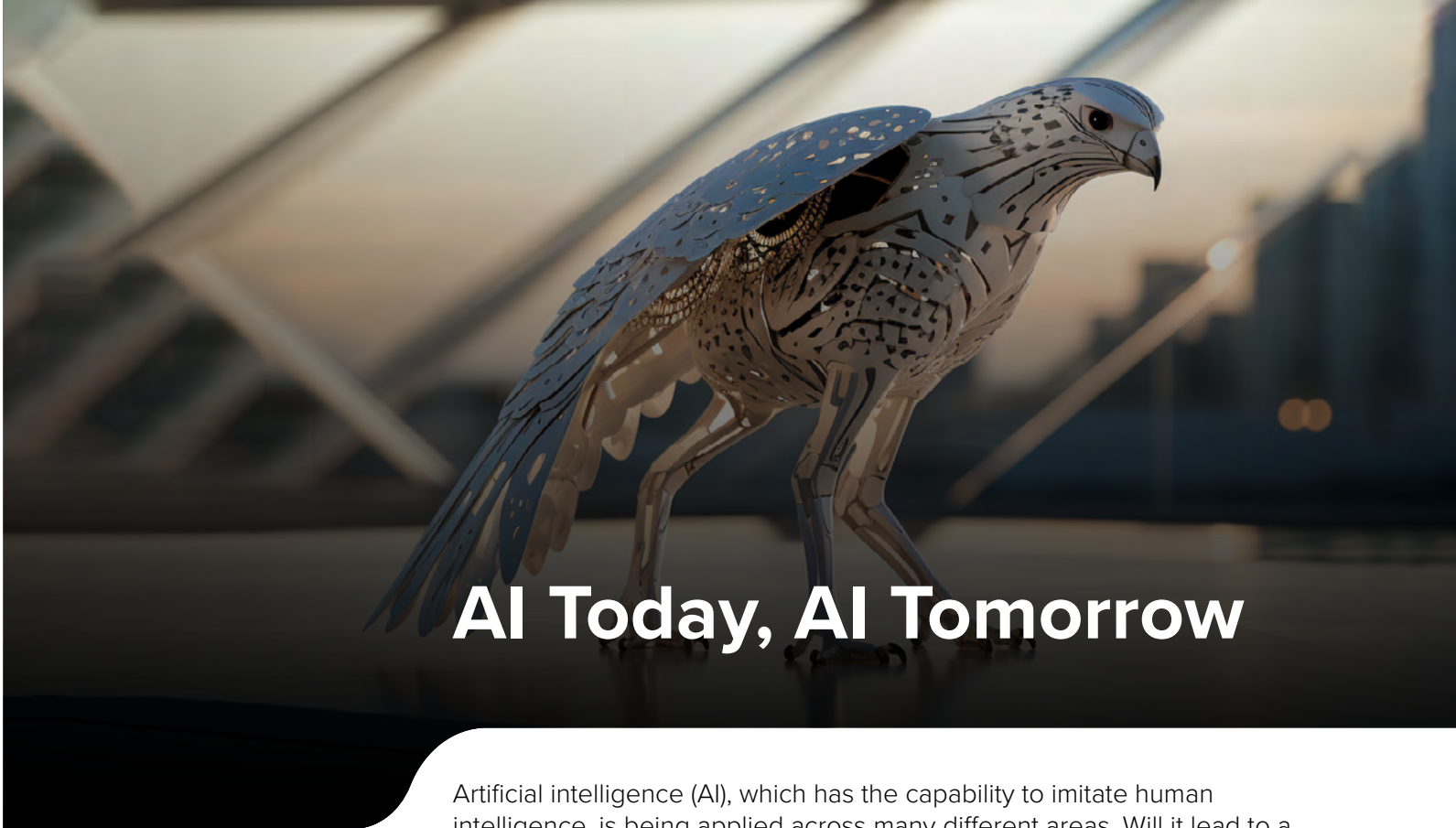
AI Today, AI Tomorrow

Artificial intelligence (AI), which has the capability to imitate human intelligence, is being applied across many different areas. Will it lead to a utopian or dystopian future? The answer is straightforward: Humans have the responsibility to use AI for good — to forge a new world order that will lead to a more prosperous social, political, and economic future. Is it going to be easy? No. Like other major breakthroughs in human history, the transformation will not be a simple journey.

> **AI is a double-edged sword that presents unique opportunities and risks which must be carefully addressed through the involvement of key stakeholders and comprehensive governance strategies.**
>
> Omar Sultan Al Olama
> Minister of State for AI, Digital Economy,
> and Remote Work Applications, UAE

The Industrial Revolution of the 18th and 19th centuries demonstrates how technology can remake societies. Thanks to the introduction of steam engines, light bulbs, modern assembly lines, and many other technological advancements, new factories opened near cities, production efficiency drastically improved, new employment opportunities emerged, and wages notably increased (in comparison to farming incomes).

Rapid industrialization also created problems. Prior to the Industrial Revolution, most people made their living as farmers. With the advent of factories, many people moved to urban areas, creating new housing and sanitation issues. Poor industrial waste management in cities negatively impacted the environment and human health. Such challenges were partially addressed by more effective plans, laws, and regulations, but the overall economic transformation was often difficult. Thanks to the lessons learned, humanity is better prepared to embrace any new technological revolution — such as AI — in a more organized and responsible manner.

A Global Race to Forge AI-Driven Digital Economies

> " As I shared today with CEOs of companies at the forefront of American AI innovation, the private sector has an ethical, moral, and legal responsibility to ensure the safety and security of its products. And every company must comply with existing laws to protect the American people. "

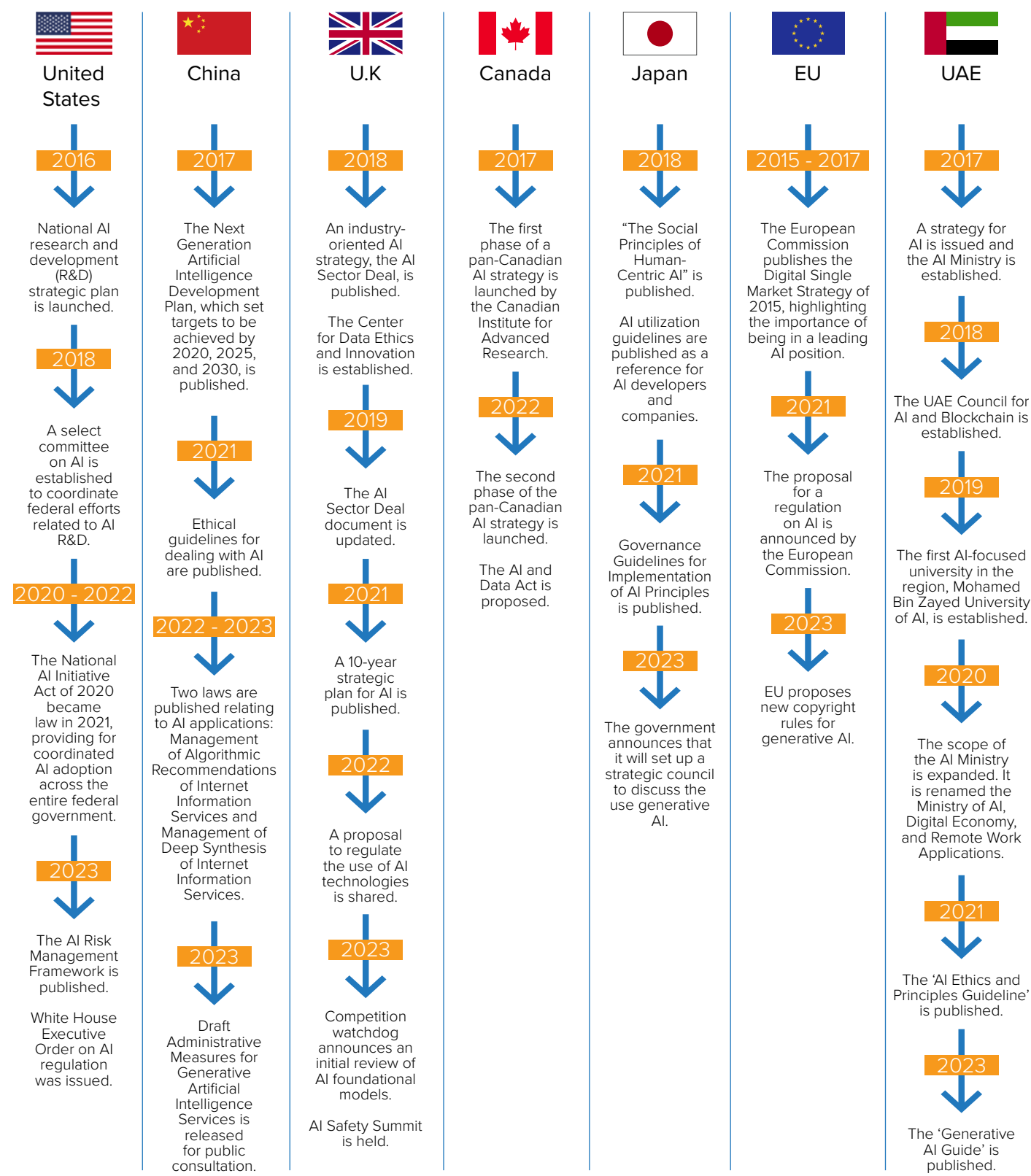**Kamala Harris**
Vice President, United States

Governments are well aware of AI's potential benefits. Indeed, governments of countries with mature AI practices are encouraging safe, AI-driven innovation. Some countries/regions are working on laws and regulations specifically designed for AI (e.g., the EU, Canada, and China). Other countries are relying on data privacy laws or cloud-related regulations and introducing non-binding AI frameworks in conjunction with end users and technology suppliers (e.g., the U.S., Switzerland, and Japan).

Table 1 provides a snapshot of key AI-related initiatives across select countries/regions. The EU is among the most proactive regions in terms of AI regulation development. The EU is also able to provide frameworks to other countries that are considering the introduction of AI regulations. The landmark 2023 EU AI Act, approved by a large majority in the European Parliament, signals the beginning of the final phase of the European legislative process — the "trialogue." This phase, characterized by high-level negotiations between the EU Parliament, Council, and Commission, is expected to last until the end of 2023. If negotiations are successful, the EU AI Act will come into effect in June 2024, with a two-year transition period to allow AI developers and providers to adjust to the new mandates.

Canada, the U.K., and China intend to implement laws and regulations aimed at ensuring the controlled, responsible adoption of AI. Each country has different cultural, social, political, and/or economic motivations for launching these regulations.

When it comes to the UAE, the UAE government has been acting as the key enabler of the country's progressive and fast-paced digital transformation. In 2017, the government issued its strategy for Artificial Intelligence and established the Artificial Intelligence Ministry - a world first. In 2020, the scope of the ministry was expanded, and it was renamed the Ministry of Artificial Intelligence, Digital Economy, and Remote Work Applications. There has been number of AI centric initiatives across both public and private sectors and the government's goal is to foster an innovation led AI ecosystem and create an environment where safe and responsible adoption of AI technologies is made possible. Until now, the UAE government has not introduced any laws or regulations with respect to AI and has been observing the market.

Table 1: Major Country-Specific Highlights Related to AI

United States

- **2016** National AI research and development (R&D) strategic plan is launched.
- **2018** A select committee on AI is established to coordinate federal efforts related to AI R&D.
- **2020 - 2022** The National AI Initiative Act of 2020 became law in 2021, providing for coordinated AI adoption across the entire federal government.
- **2023** The AI Risk Management Framework is published. White House Executive Order on AI regulation was issued.

China

- **2017** The Next Generation Artificial Intelligence Development Plan, which set targets to be achieved by 2020, 2025, and 2030, is published.
- **2021** Ethical guidelines for dealing with AI are published.
- **2022 - 2023** Two laws are published relating to AI applications: Management of Algorithmic Recommendations of Internet Information Services and Management of Deep Synthesis of Internet Information Services.
- **2023** Draft Administrative Measures for Generative Artificial Intelligence Services is released for public consultation.

U.K

- **2018** An industry-oriented AI strategy, the AI Sector Deal, is published. The Center for Data Ethics and Innovation is established.
- **2019** The AI Sector Deal document is updated.
- **2021** A 10-year strategic plan for AI is published.
- **2022** A proposal to regulate the use of AI technologies is shared.
- **2023** Competition watchdog announces an initial review of AI foundational models. AI Safety Summit is held.

Canada

- **2017** The first phase of a pan-Canadian AI strategy is launched by the Canadian Institute for Advanced Research.
- **2022** The second phase of the pan-Canadian AI strategy is launched. The AI and Data Act is proposed.

Japan

- **2018** "The Social Principles of Human-Centric AI" is published. AI utilization guidelines are published as a reference for AI developers and companies.
- **2021** Governance Guidelines for Implementation of AI Principles is published.
- **2023** The government announces that it will set up a strategic council to discuss the use generative AI.

EU

- **2015 - 2017** The European Commission publishes the Digital Single Market Strategy of 2015, highlighting the importance of being in a leading AI position.
- **2021** The proposal for a regulation on AI is announced by the European Commission.
- **2023** EU proposes new copyright rules for generative AI.

UAE

- **2017** A strategy for AI is issued and the AI Ministry is established.
- **2018** The UAE Council for AI and Blockchain is established.
- **2019** The first AI-focused university in the region, Mohamed Bin Zayed University of AI, is established.
- **2020** The scope of the AI Ministry is expanded. It is renamed the Ministry of AI, Digital Economy, and Remote Work Applications.
- **2021** The 'AI Ethics and Principles Guideline' is published.
- **2023** The 'Generative AI Guide' is published.

The United States, Japan, and the United Arab Emirates (UAE) have been developing guidelines and frameworks to ensure safe AI adoption and accelerate innovation. The governments of these countries stay in close touch with end users and technology solution providers to ensure the responsible and safe use of AI technologies. Having said that, the White House recently issued an executive order on AI regulation to establish new standards for AI safety and security in the US. Israel is an interesting outlier. Israel has been slow in executing its national AI plan and allocating budgets for AI initiatives, having gone through five elections between 2019 and 2022. However, Israel's strong innovation culture, and the agility of its private sector and academia, have helped it maintain a strong position in the global AI technology market.

> **"** Amid conservative wishes for more surveillance and leftist fantasies of over-regulation, parliament found a solid compromise that would regulate AI proportionately, protect citizens' rights, as well as foster innovation and boost the economy. **"**

Svenja Hahn
European Parliament Deputy

The rapid evolution of AI requires dynamic changes in the ways laws and regulations are developed and adopted. For example, facial recognition has been used by law enforcement officers in certain countries for almost two decades, and the accuracy of such technology has improved significantly over the years. However, concerns about privacy and false positives, which may lead to wrongful arrests, have slowed adoption of facial recognition technology. Authorities in some countries have long grappled with how to oversee the use of this tool. In Europe, the EU AI Act prohibits the use of real-time facial recognition in law enforcement (unless for important public security reasons).

In China, South Korea, Taiwan, and Singapore, there is heavy use of facial recognition and biometrics solutions in the public sphere. These countries view such technologies as strategic opportunities and are doubling down on efforts to create AI competencies that position them well in the global market. IDC projects that China will become the single biggest player in the global facial recognition market, with several major Chinese vendors (e.g., Alibaba and Tencent) spearheading development.

Generative AI (GenAI) is a groundbreaking innovation — and the rise of GenAI-based solutions has drawn the attention of authorities. The EU has already proposed a new copyright rule as an extension of the proposed AI Act. To comply with this rule, companies that deploy GenAI tools will have to disclose any copyrighted material used in their systems. Similarly, the countries covered in Table 1 are paying close attention to GenAI and considering regulatory frameworks/guidelines for the public and private sectors.

Table 2 provides a comprehensive look at the AI market readiness of the same countries highlighted in Table1, with the addition of Israel and Germany (the EU was not analyzed in aggregate in the Network Readiness Index). All countries in this table emphasize AI research.

Table 2: A Comparative View of AI Market Readiness (Positions Among 130 Countries), 2022

Country	Government Promotion of Investment in Emerging Tech	Investment in Emerging Technologies	AI Scientific Publications	AI Talent Concentration	Quality of Life
U.S	8	1	1	19	55
China	1	33	2	8	50
U.K	22	8	3	27	32
Canada	13	20	4	13	15
Japan	16	9	6	4	31
Germany	14	7	n/a	5	30
Israel	6	2	16	1	22
UAE	4	10	32	n/a	13

Source: networkreadinessindex.org

The UAE is among the leaders in the promotion and adoption of emerging technologies. The UAE also leads the benchmarked countries in terms of quality of life (i.e., in parameters such as happiness, freedom to make life choices, income equality, and life expectancy at birth). In terms of AI scientific publications, the UAE's position improved remarkably in 2022, rising from 49th place in the 2021 version of the same study. The UAE aims to use technology to ensure future generations live happier lifestyles and has made solid progress in international benchmarks via a structured set of initiatives.

Major Global AI Updates: A Forward - Looking View

According to IDC, worldwide AI spending will rise at a compound annual growth rate (CAGR) of 26.5% between 2022 and 2026 to reach $300 billion. Over the next 12 months, organizations will invest in AI to future proof their operations.

> " **As a percentage of overall technology spend, businesses plan to spend 18% on AI projects in 2023 — up from 11% in the past 12 months.** "
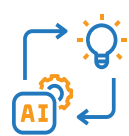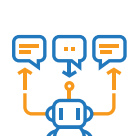>
> Source: IDC Industry AI Path, October 2022

The AI spending momentum is significant and resonates with IDC's discussions with end users and recent market surveys. According to IDC's AI Industry AI Path Survey conducted in late 2022, businesses are expected to spend an average of 18% of their overall technology spend on AI in 2023, up from the 11% they spent in the previous year. According to the same survey, 81% of organizations consider AI a priority. However, only 27% of the surveyed organizations have an enterprise AI strategy aligned with business goals that can yield recurring business value.

> " **For businesses to scale, compete, and be relevant in the current macroeconomic climate, an organization-wide AI strategy is critical. Organizations with a strategic, business-centric approach to AI are likely to outperform their competitors through operational excellence and superior customer value delivery.** "
>
> Ritu Jyoti
> Group Vice President, IDC Worldwide AI and Automation Research

Below, IDC outlines the global AI adoption trends expected in the short and medium terms.
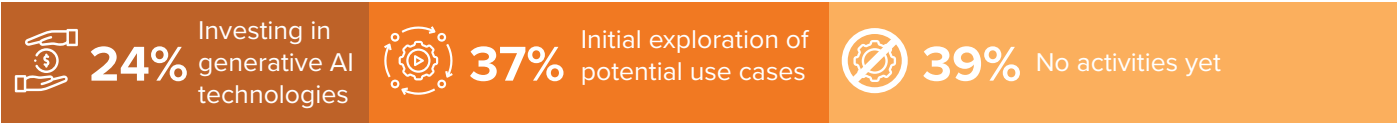
Financial Impact: Organizations will increasingly prioritize use cases in which AI can add the most business value, with ROI maximization being a key performance indicator (KPI).

Procurement Approaches: Two-thirds of organizations surveyed by IDC prefer to buy off-the-shelf solutions with embedded AI capabilities or customize an existing off-the-shelf solution using their internal AI capabilities (or those of services partners). Going forward, outsourcing is going to gain more traction as it helps companies quickly gain access to a large pool of technology experts and reduce dependency on internal or in-country AI talent.

Multi-Model AI: In 2026, IDC predicts that 40% of AI models will incorporate multiple modalities of data (combinations of text and images) to improve learning effectiveness and address the knowledge shortcomings of single modality AI solutions. AI-based solutions will become more complex and sophisticated to address continuously evolving business needs.

Codeless Development: IDC expects organizations to leverage codeless development for at least 30% of AI and automation initiatives by the end of 2023. Codeless development will help organizations scale digital transformation (DX) initiatives in a more agile and democratized manner.

Foundational Models: Over the next three years, the use of massive foundational models for language processing and image generation will become an industry norm. The AI market will become dominated by large global vendors and a few capable regional players with in-depth understandings of local requirements and strong R&D teams.

Accelerated Development of AI-Centric Industry Applications: With the increasing focus on large language models, many specialized technology companies will tune and tailor existing AI applications to address specific industry challenges and needs.

Horizontal AI Use Cases: In 2024, 60% of Global 2000 firms will have expanded the use of AI across horizontal business functions. GenAI capabilities embedded in business applications (e.g., productivity and customer relationship management tools) will accelerate this use across large and small organizations. According to IDC's AI Industry Path Survey, 52% of organizations plan to use AI for marketing, R&D, and maintenance of physical assets in the next 12 months.

Turbocharging Automation: To speed up automation development and augment business value, organizations will adopt intelligent business execution strategies and infuse AI into the automation life cycles across different horizontal functions.

Sustainability at the Core: In 2027, 50% of Global 2000 firms will invest in neural networks to identify, assess, and adapt to climate hazards. Given the increasing frequency of natural disasters and government mandates to reduce carbon footprints and better prepare for different types of catastrophes, sustainability investments across the public and private sectors will accelerate.

Market developments around GenAI require greater examination because of the potential impact of these technologies. Despite being at an early stage, the uptake of GenAI is already significant across the world. According to a recent global IDC survey, a significant portion of organizations (39%) are experimenting with GenAI-based technologies, while 24% are using them for various horizontal use cases. Close to 40% of the surveyed organizations have not yet started any GenAI-based initiatives.
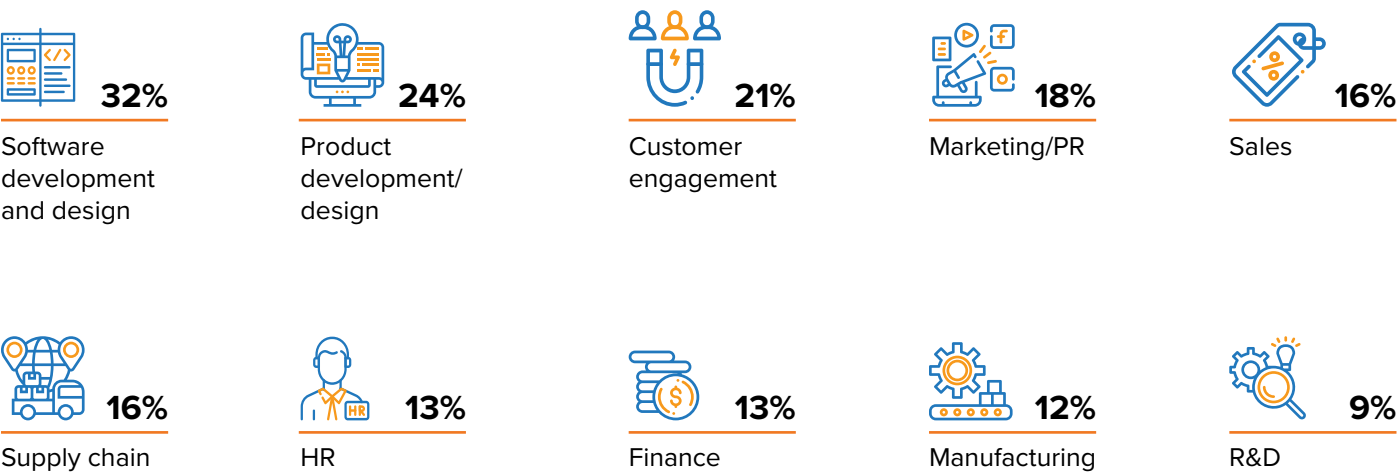
However, many are expected to soon start trials and proofs of concepts for various use cases. Line-of-business users will be important players in this journey.

Figure 1: Generative AI Use Cases and Investments Worldwide

Current Approaches to Generative AI

| 24% Investing in generative AI technologies | 37% Initial exploration of potential use cases | 39% No activities yet |

Current Approaches to Generative AI

Software development and design	Product development/ design	Customer engagement	Marketing/PR	Sales
32%	24%	21%	18%	16%

Supply chain	HR	Finance	Manufacturing	R&D
16%	13%	13%	12%	9%

Source: IDC's Future Enterprise Resiliency and Spending Survey, March 2023, base: 952

Use cases in the GenAI world are quite diverse, as employees across different business units have started using such solutions daily to improve their productivity. However, the degree of diversity is defined by an organization's ability to innovate and transform. In other words, technology companies can present use cases and best practices to customer organizations — but it is the senior managers of those organizations who can empower internal business units to explore potential AI use cases.

According to IDC's Future Enterprise Resilience and Spending Survey (March 2023), the key business areas in which GenAI-based solutions will be used to drive internal productivity and enhance value include software development and design, product development and design, and customer engagement. Organizations will leverage large language models to help users curate internal knowledge and make it accessible to everyone via a predefined set of prompts. Code development is another important area where GenAI has drastically improved developer productivity. Use of GenAI for marketing content generation and customer interaction are the other areas that will draw significant attention over the next 12–18 months.

The UAE has been making great strides in its Generative AI journey driven by the local innovation initiatives. In partnership with Mohamed Bin Zayed University and Cerebras Systems, G42 recently announced the launch of a new Arabic Large Learning Language Model named Jais. Jais is a homegrown Large Language Model with 13-billion parameters trained on 395-billion token Arabic and English dataset. The model was trained on Condor Galaxy, the recently announced multi-exaFLOP AI supercomputer built by G42 and Cerebras. Jais will also start to be utilized by several organizations including the UAE Ministry of Foreign Affairs, UAE Ministry of Industry and Advanced Technology, The Department of Health – Abu Dhabi, Abu Dhabi National Oil Company (ADNOC), Etihad Airways, First Abu Dhabi Bank (FAB), and e&. Core42, another G42 company, has recently announced strategic partnerships in the media sector with Publicis Groupe and TBWA\RAAD to leverage Jais and drive innovation in the field of marketing where such as large AI models can deliver significant benefits in driving creativity and maximizing efficiency and agility. The enthusiasm in the local market to drive multiplied innovation by leveraging such homegrown solutions is there. In the near term, as a result of this initiative, we will see many local use cases across egovernment services, banking services, and many other areas. In the near term, as a result of this initiative, we will see many local use cases across egovernment services, banking services, media, and many other areas.

Artificial Narrow Intelligence to Artificial General Intelligence

There is no generally accepted definition of artificial general intelligence (AGI). However, it is fair to define AGI as a system that has a broad set of cognitive capabilities, rather than one with intelligence limited to a specific domain. An AGI system can learn, reason, plan, and execute actions based on its extensive cognitive capabilities. Until now, AI research has focused on gauging how well a technological system performs a narrow set of activities (such as playing Go or chess). A system is "successful" if it can perform a specific task at or better than the human level. However, this narrow focus means that executing multiple tasks that require expertise in multiple domains is an ongoing challenge.

According to many AI researchers, AGI is not imminent, and there is an ongoing debate about when true AGI will be achieved. Many researchers claim that AGI will be achieved in the next 10–20 years; a few believe it will take much longer.

Rodney Allen Brooks, the Panasonic Professor of Robotics at MIT, believes it will take more than a century to achieve true AGI systems with human-level cognitive skills. He believes existing AI models should evolve in ways that have better connections with the real world (i.e., they should slowly gain an ability to understand real-world problems in an intuitive manner).

" **By 2028, 30% of Global 2000 companies will experiment with AGI (Currently Speculative) systems that will have a transformative effect on society and create significant opportunities and threats.**

Source: IDC FutureScape: Worldwide Artificial Intelligence and Automation 2024 Predictions

Microsoft researchers recently published a paper claiming that GPT-4 is showing "sparks" of AGI. However, the researchers also acknowledged that GPT-4 is far from reaching true AGI. Their underlying argument is that GPT-4 can source data from different sources, use multiple modalities, and plug into application programming interfaces (APIs). Its intelligence capabilities include the ability to reason, plan, and learn from experience at levels equal to or above humans in many instances. The paper substantiates its argument by outlining use cases from different domains (e.g., abstraction, comprehension, vision, coding, mathematics, medicine, and law).

It will take time for proper AGI systems to emerge. Nonetheless, the evolution of AI should be closely followed due to the rapidly growing capabilities of existing tools and models. AI will have a significant impact on business and society. It is up to humanity to use it for social, economic, and environmental good.

Impact of AI on Society, Environment, and Economy

Readers of this paper are probably familiar with the UN's Sustainable Development Goals, which are supposed to be achieved by all UN member states by 2030. The goals represent a call to action for all countries to promote prosperity and protect the planet. The 17 goals are grouped into three pillars — society, environment, and economy.

Figure 2: United Nations Sustainable Development Goals

Society

1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
11 SUSTAINABLE CITIES AND COMMUNITIES
16 PEACE, JUSTICE AND STRONG INSTITUTIONS

Economy

8 DECENT WORK AND ECONOMIC GROWTH
10 REDUCED INEQUALITIES
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
17 PARTNERSHIPS FOR THE GOALS

Environment

13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND

Source: https://www.un.org/sustainabledevelopment/news/communications-material/

AI will certainly play an important role in achievement of these goals. However, individuals and governments should be cognizant of the potential challenges that may emerge. According to a recent article by a group of researchers entitled "The Role of AI in achieving Sustainable Development Goals," AI can potentially enable 134 of the 169 targets outlined under the goals. Conversely, 59 targets can potentially be inhibited by AI (AI can simultaneously act as a catalyst and inhibitor for some goals).

AI will have a net positive impact on these goals, but it is important to understand what the inhibitors are and how they can be eliminated.

Some examples of AI use in each of the three pillars of the UN's Sustainable Development Goals are described below:

Society

AI can be expected to have a positive impact toward the achievement most goals under the society pillar — and its benefits will significantly outweigh any challenges. AI is already quite instrumental in transforming health and education and in creating sustainable Smart Cities. But most AI-augmented applications require massive computational power. According to a briefing on ICT energy consumption published on the U.K. Parliament website in 2022, the ICT industry accounted for 4-6% of global electricity use in 2020 — and this share of global energy consumption will dramatically increase going forward. Therefore, leveraging green energy resources to meet global energy demand and gradually shifting toward green energy resources for various ICT applications will be highly important. Poor enforcement of the ethical, unbiased, transparent, and fair use of AI is an important aspect that may drive inequalities if not tackled up front.

Economy

The implications of AI on economic indicators (in the context of the UN's Sustainable Development Goals) will be mostly positive, driven by incremental productivity gains and steady economic output. However, several important factors must be considered. Increasing AI use will eliminate some jobs. It will be necessary for organizations to upskill and reskill their workers and keep them relevant for the job market. Daron Acemoglu, Institute Professor in the Department of Economics at MIT, explained that the increasing use of automation should be counterbalanced by the creation of new sectors and opportunities that demand labor with new skills.

> **The reason why, in the '50s and the '60s and early '70s, we had this shared prosperity is because we did have quite a bit of automation.**
>
> **And for every sector that had a significant decline in labor share because they were automating a lot, there were some new sectors that were coming up and demanding more labor and paying more for labor. It was this counterbalancing nature of different types of technologies that created balanced progress**
>
> Daron Acemoglu
> Institute Professor in the Department of Economics at MIT

Governments and the private sector should thus act much faster and be more proactive in transforming the local workforce with new capabilities, as the disruptive effects of AI adoption will be visible in a much shorter time span.

Environment

It is clear that AI will increasingly be leveraged to better understand the environment and the dynamics of climate change. AI will be instrumental in augmenting the capabilities of decision support systems and providing predictive climate models for governments and the private sector. However, as mentioned previously, AI use will also drive energy consumption, leading to higher carbon emissions.

> **By 2027, 50% of Global 2000 organizations will invest in neural network–powered climate hazard assessment, adaptation, and identification of opportunities, driving 25% profit growth**
>
> IDC FutureScape: Worldwide Artificial Intelligence and Automation 2022 Predictions

Like any other disruptive technology, AI presents opportunities and challenges. The challenges should be acknowledged and accepted rather than ignored. All market participants should act as an ecosystem (a term discussed later) to capitalize on opportunities and tackle the challenges ahead.

Capitalizing on the AI Opportunity: Industry Perspective

AI will certainly have a major impact on all vertical markets. According to IDC's Worldwide Artificial Intelligence Spending Guide of February 2023, banking and retail are the two industries that will drive the largest AI investments going forward. But significant spending growth will be seen across all vertical markets.

This section focuses on a select set of verticals in which AI will have a transformative impact in driving operational excellence and boosting customer/citizen experience.

Government

Governments worldwide have a strong focus on driving adoption of emerging technologies. In the Middle East, there has been tremendous effort to utilize these technologies across various government services. The Internet of Things (IoT), Big Data, AI, and 5G are at the epicenter of many government initiatives. Macroeconomic and geopolitical challenges have made achieving digital sovereignty a high priority strategic initiative for government entities across the world.

IDC defines digital sovereignty as the capacity for digital self-determination by nations, companies, or individuals. In the context of the government sector, a strong, self-sufficient ICT ecosystem that can deliver digitally sovereign solutions is particularly important. A robust ecosystem can help governments transform their internal operations and public services and develop sophisticated, AI-augmented, and digitally sovereign use cases.

> " Due to recent economic and geopolitical events, by 2024, 45% of national governments will consider digital sovereignty as critical to the protection of key national infrastructures. "
>
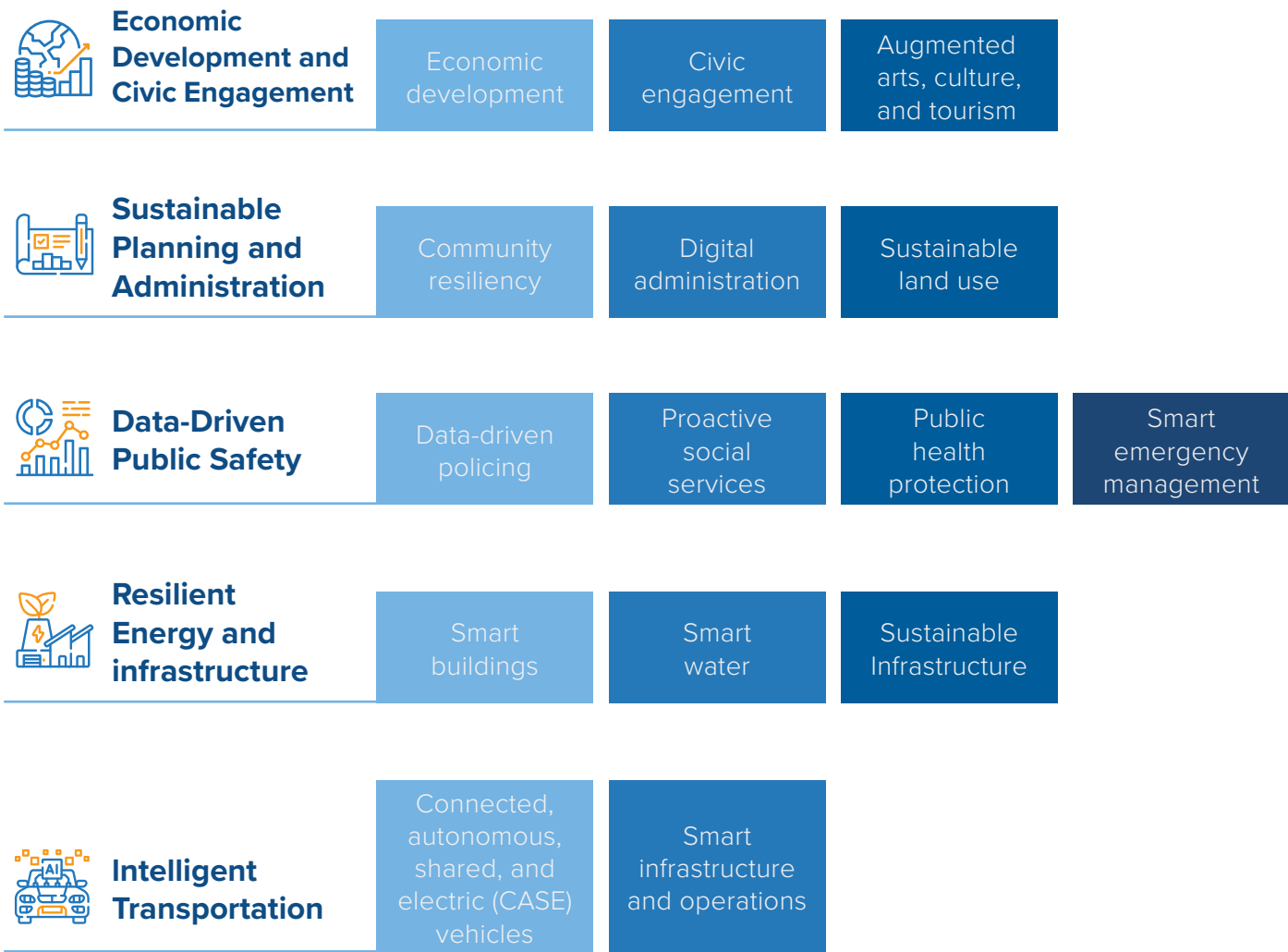> IDC FutureScape: Worldwide National Government 2023 Predictions

> " By 2027, 75% of cities will make critical changes to data governance, culture, and management to improve data-informed outcomes and support the exponential growth of analytics and AI. "
>
> IDC FutureScape: Worldwide National Government 2022 Predictions

To succeed on their DX journeys and capitalize on AI opportunities, governments should take a proactive approach to managing data life cycles, ensuring data quality, privacy, and security, and enabling safe and secure data sharing across different public entities. This approach is a foundation of success in the buildout of AI-driven use cases. A key IDC prediction is that governments will make critical changes to data governance and culture over the next several years. Governments will also increasingly collaborate to deliver integrated use cases and citizen journeys by sharing data and leveraging process automation technologies augmented by natural language processing (NLP)/natural language understanding, computer vision, and other AI techniques.

Figure 3 below provides a snapshot of the key areas where emerging technologies can/should be leveraged to digitalize government operations and deliver superior citizen experiences. Having already made steady progress with technology implementation, public entities around the world are now shifting their focus from executing DX initiatives to running fully fledged digital organizations.

Figure 3: Digital Transformation Segments for Smart Cities and Communities

Economic Development and Civic Engagement	Economic development	Civic engagement	Augmented arts, culture, and tourism	
Sustainable Planning and Administration	Community resiliency	Digital administration	Sustainable land use	
Data-Driven Public Safety	Data-driven policing	Proactive social services	Public health protection	Smart emergency management
Resilient Energy and infrastructure	Smart buildings	Smart water	Sustainable Infrastructure	
Intelligent Transportation	Connected, autonomous, shared, and electric (CASE) vehicles	Smart infrastructure and operations		

Source: IDC, 2022

Figure 3 only provides a high-level view of DX areas in government. In terms of AI, hundreds of use cases — both large and small scale — can be embedded into each one of the above areas. Below are the top AI-driven digital use cases with the greatest impact on mission outcomes in government:

- Public health promotion and disease prevention and management (including contact tracing)

- Shared digital workspace, productivity, and collaboration tools

- Employee self-service tools

- IT infrastructure security monitoring

- Loans and grants management

- Environmental monitoring (air quality, water quality, and weather monitoring)

- Digital content, document, and workflow management

- Constituent hotline phone numbers) and constituent self-service

- Facilities and building management

- Public safety, security, and surveillance

> " Much of the value of AI is going to be derived from small iterations and small models. You can deploy a model that affects 10 people, but you're helping that office quadruple the workload it can handle. That's not a groundbreaking newspaper story, but do a bunch of those and you'll have a big effect on the bottom line of the agency that you're working at. "
>
> Jesse Rowlands
> AI Strategic Officer at the US Defense Logistics Agency of Department of Defense

The U.S. Department of Defense established the Joint Artificial Intelligence Center to work closely with federal, state, and local agencies to develop AI systems that improve the safety and efficacy of disaster response operations (and thus save lives and reduce property and environmental damage). The center's first AI project was to predict where wildfires may spread and identify fire lines that would enable firefighters to contain such blazes.

The Defense Logistics Agency of the U.S. Department of Defense is similarly making use of AI. The agency handles more than $37 billion in goods and services annually, employs 26,000 civilians and military personnel, and operates in most U.S. states and in 28 countries. Underscoring the importance of a strong governance model, the AI officer of the organization tracks multiple AI projects and ensures everything is documented in a transparent and repeatable manner. With AI, it is possible for a specialist to reverse engineer the work of a former employee who wrote code but did not leave documentation (not the case with traditional IT).

Environmental sustainability is an important priority for government organizations, and there are many initiatives that leverage AI for this purpose. For example, the Sino-Singapore Tianjin Eco-City — a Smart City in Binhai constructed jointly by the governments of China and Singapore — is guided by 30 quantitative and six qualitative KPIs aligned with international standards. The KPIs cover the city's ecological, economic, and social development, including ambient air quality, the quality of water bodies within the city, the ecological shoreline retention rate, the native vegetation index, access to parks and green spaces, residents' life satisfaction level, residents' health literacy rate, carbon emission per unit of gross domestic product, and usage of renewable energy.

To achieve these KPIs, the city uses smart infrastructure and other digital equipment. The eco-city monitors environmental data pertaining to air, surface water, temperature, noise, drinking water quality, and renewable energy generation and consumption in real time. The growing varieties of intelligent infrastructure in the city are bolstered by smart back-end platforms (e.g., urban and public service open data platforms) outfitted with the most recent data aggregation and analytics technologies. Policies are in place to encourage organizations to share data. Examples of smart infrastructure include the Smart City operation center, smart transportation monitoring system, smart bus stops, and smart street lamps. The city has teamed up with technology companies to leverage AI, IoT, 5G, and Big Data. Residents experience the impact of AI in their daily activities (e.g., riding on autonomous buses).

GenAI presents governments with an opportunity to use new techiques across digital public services. Numerous GenAI use cases can be applied to government entities to enhance value. Notably, large language models can be utilized to provide more contextualized and personalized experiences to citizens during their engagements through digital government channels. Numerous proofs of concepts can be expected in this space in 2024. Due to digital sovereignty requirements, public or private cloud instances hosted on sovereign clouds will be the preferred deployment models for public entities going forward.

Transportation and Logistics

In their quest to become more resilient to future disruptions, organizations in the transportation and logistics sector continue to improve visibility and agility across their supply chains. Complex global supply chains are nothing new, and achieving on-time deliveries of goods to the right places can be quite challenging, especially during periods of uncertainty. The COVID-19 pandemic, the winter storms in Texas, and the blockage of the Suez Canal by the Evergreen cargo ship were all stark reminders of the need for resilient supply chains powered by AI and automation technologies that mitigate internal and external risks. Today, supply chain disruptions continue due to geopolitical and macroeconomic challenges, and the cost of transporting goods constantly rises.

Figure 4: Transportation Challenges Faced by Organizations Worldwide in 2022

44% Higher rates; difficulty in renegotiating uncompetitive contracted rates

41% Shortages of labor/workers at warehouses/distribution centers

34% Logistics service providers underperformance to SLAs

34% Unreliable/highly variable transit times

25% Shortages of vehicle/asset capacity

24% Lack of shipping equipment availability

23% Lack of visibility/traceability

20% Port congestion/bottlenecks

20% Shortage of drivers

13% Lack of aircraft capacity

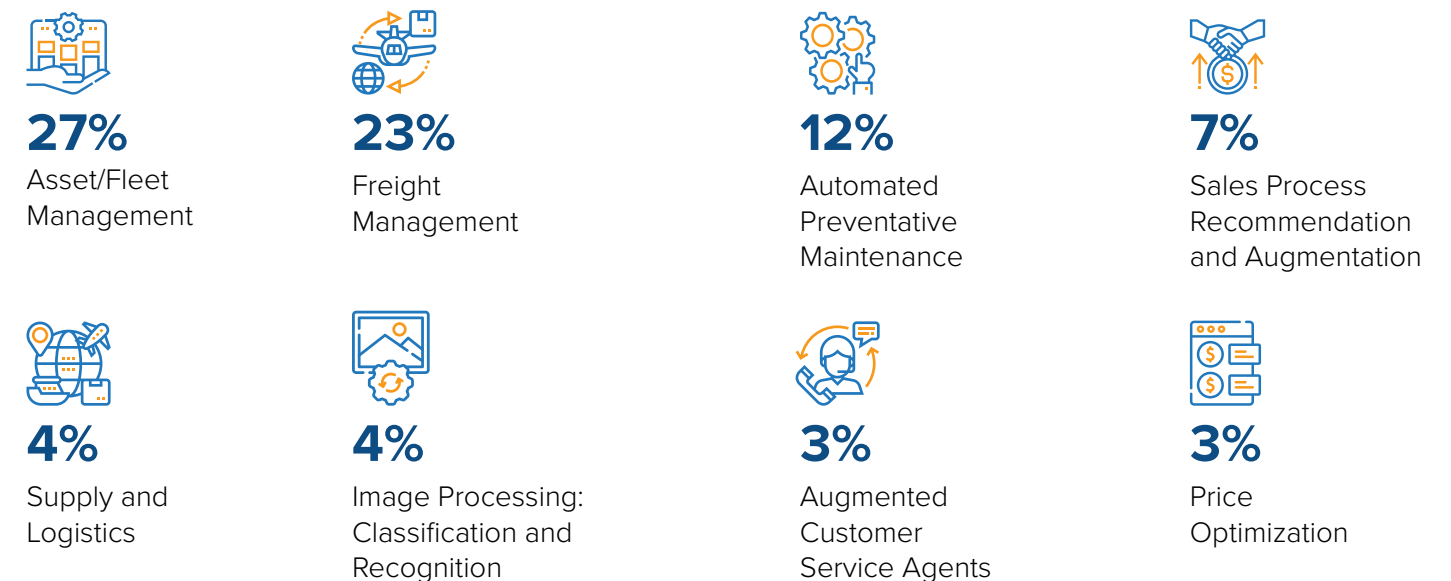**10%** Did not face any challenges

Source: IDC Global Supply Chain Survey, IDC, March 2023

Figure 4 shows key challenges affecting the transportation and logistics industry. Adjusting logistical contracts to better reflect market conditions is a leading challenge, alongside the supply chain execution problems that persist across global transportation networks. As a result, DX initiatives underpinned by data, AI, and automation technologies are being prioritized across the transportation and logistics industry to improve service levels, tackle existing challenges more effectively, and better prepare for future disruptions.

Figure 5: Top AI Use Cases for Transportation and Logistics

Share of AI spending for each use case within the worldwide transportation and logistics industry

27% Asset/Fleet Management

23% Freight Management

12% Automated Preventative Maintenance

7% Sales Process Recommendation and Augmentation

4% Supply and Logistics

4% Image Processing: Classification and Recognition

3% Augmented Customer Service Agents

3% Price Optimization

Source: IDC's Worldwide Artificial Intelligence Spending Guide (March 2023)

AI enables transport organizations to address the challenges associated with disrupted logistics networks and increased costs. Making data-driven and evidence-based decisions at a faster speed improves operational agility and drives employee productivity, thus minimizing the impact of labor shortages. According to IDC's March 2023 Worldwide Artificial Intelligence Spending Guide, asset/fleet management and freight management stand out as the use cases with the biggest share of overall AI spending in the transportation sector. But autonomous driving is perceived as one the most disruptive technologies in the transportation sector.

> **Auto OEMs have changed their autonomous vehicle research strategies by reprioritizing investments and shifting focus toward the introduction of new vehicles with partial and semi-autonomous driving technologies — such as SAE Level 2+ vehicles — that can enable hands-free highway driving.**
>
> Sandeep Mukunda
> Research Manager, Worldwide Digital Automotive and Transportation Strategies at IDC

Asset/fleet management solutions use AI to increase visibility into assets and control systems; they also leverage real-time operational intelligence to enable the remote management of assets. Route optimization and automated responses to vehicle conditions (via remote diagnostics) and driver behavior (via tracking of idle or stopped time) are some of the key capabilities of such solutions.

Freight management solutions intelligently monitor the entire supply chain process and provide end-to-end visibility across freight operations. These solutions help in operational areas such as truck load optimization, container management, spare parts planning, dock availability monitoring, and customer experience management. Many other areas in the transportation and logistics industry can benefit from GenAI as well, including route optimization, supply chain management, warehouse/stock management, and pricing. For example, GenAI can combine data about customers, current inventory levels, transportation costs, and competition to create optimal pricing models. GenAI also can optimize delivery routes by leveraging data about delivery points, times, and frequencies.

Supply chain optimization is an important part of sustainability initiatives in transportation and logistics. Many organizations are aiming to report on and reduce their Scope 1 and Scope 2 emmissions stemming from supply chain activities. This goal will expand partnership opportunities and have a positive impact on the environment. However, reporting of Scope 3 emissions remains a significant challenge faced by 90% of transport organizations worldwide.

Employee health and safety is also a priority for organizations in the transportation and logistics sector. Like many industrial companies, transportation and logistics organizations are leveraging computer vision to monitor freight facilities, vehicle fleets, and employee compliance with corporate health and safety guidelines. Given this background, AIQ, an ADNOC and G42 joint venture, developed an AI-enabled health and safety monitoring solution. AIQ has deployed this solution on 90 ships belonging to one of its clients. The solution leverages edge computing to automatically detect health and safety violations. It gauges whether crew members are complying with personal protective equipment mandates and delivers instant alerts for incidents such as persons overboad, slip-and-fall accidents, or missing helments. The solution can rapidly be deployed and customized for any industrial environment.

Autonomous Vehicles

The use of autonomous vehicles in Smart City initiatives or the operations of logistics companies is an important consideration in the transportation sector. Supply chain disruptions, chip shortages, and lower demand for new vehicles previously disrupted the automotive industry. However, the global automotive market is now normalizing and demand for new vehicles is growing. Automakers have correspondingly shifted their strategies toward the development of semi-autonomous vehicles. The North American market is at the forefront of R&D, production, and shipment of vehicles with such capabilities.
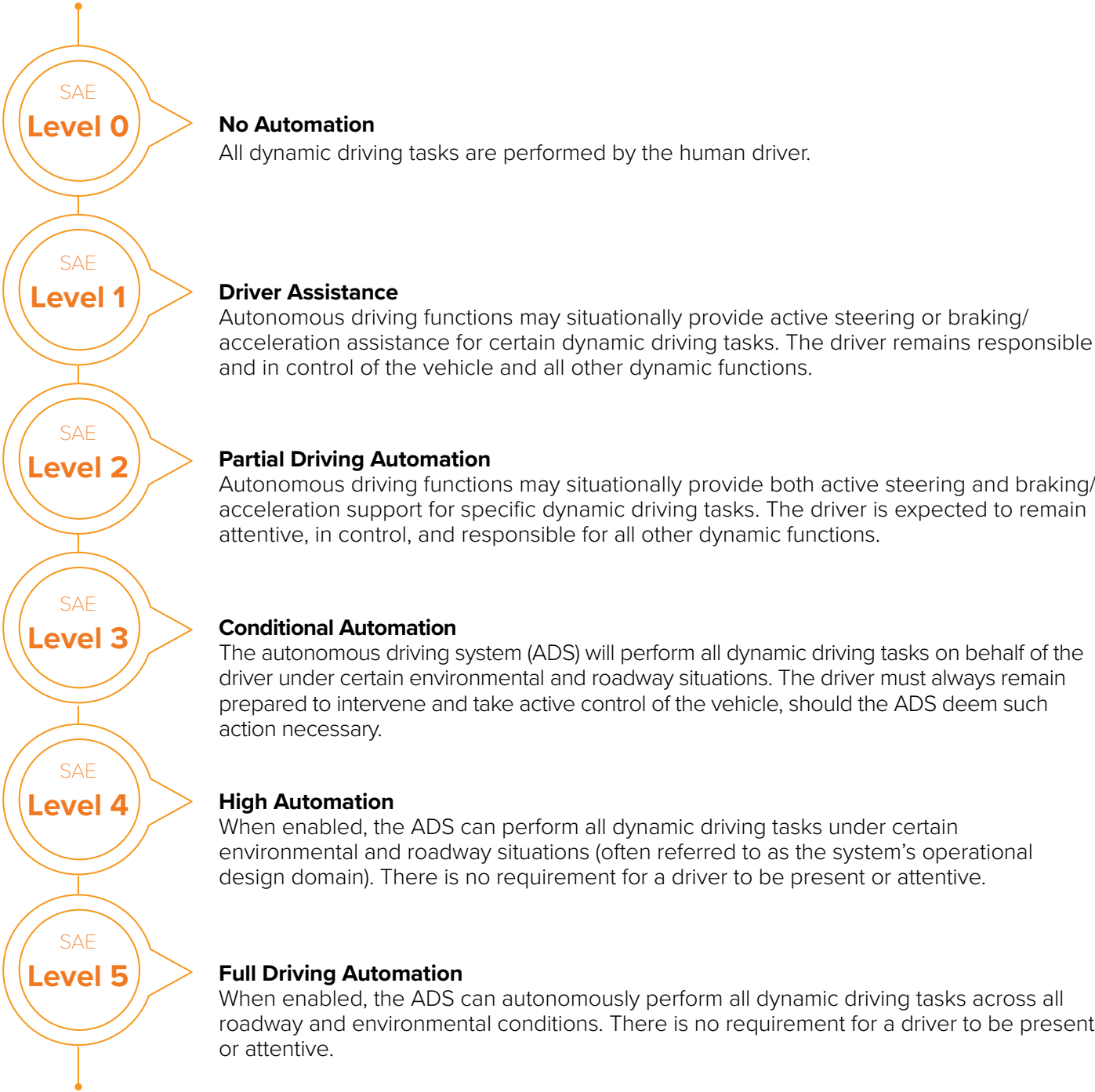
Fully autonomous vehicles (e.g., buses, taxis) have already started being part of daily life in different ways. In some countries, they are used for daily commutes in metropolitan areas. For example, Sino-Singapore Tianjin Eco-City has introduced autonomous self-driving bus services. It has further implemented a system for enhanced smart traffic coordination and control to improve convenience and increase the effectiveness of different transportation systems.

In 2022, Kodiak Robotics, a developer of self-driving trucks, and U.S. Xpress, one of America's largest freight carriers, partnered to roll out self-driving trucks between Dallas and Atlanta. Their goal is to come up with new driverless trucks over the next couple of years. However, legal and regulatory gaps must be filled if driverless trucks are to be adopted at scale and a market is to be developed. Early adopters are partnering with states, provinces, and municipalities to ensure vehicle safety and tackle regulatory challenges.

The UAE is among the global pioneers in the adoption of self-driving cars. Residents and tourists are already enjoying self-driving taxis and buses; eight robotaxis and four minibuses are operational in Yas Island. IDC provides more information regarding this use case in the "Role of Industry Ecosystem Partnerships" section.

Edge computing and AI technologies, especially computer vision technologies, are key enablers of autonomous/driverless vehicles across city roads and highways. Countries with better transport infrastructure (roads, traffic management systems) are better positioned to introduce autonomous vehicles. However, such vehicles may be limited to highways that have more predictable driving conditions in comparison to congested city roads that have too many different types of objects that need detection.

Table 3: Society of Automotive Engineers (SAE) "Levels of Driving Automation" Standards

SAE Level 0

No Automation
All dynamic driving tasks are performed by the human driver.

SAE Level 1

Driver Assistance
Autonomous driving functions may situationally provide active steering or braking/acceleration assistance for certain dynamic driving tasks. The driver remains responsible and in control of the vehicle and all other dynamic functions.

SAE Level 2

Partial Driving Automation
Autonomous driving functions may situationally provide both active steering and braking/acceleration support for specific dynamic driving tasks. The driver is expected to remain attentive, in control, and responsible for all other dynamic functions.

SAE Level 3

Conditional Automation
The autonomous driving system (ADS) will perform all dynamic driving tasks on behalf of the driver under certain environmental and roadway situations. The driver must always remain prepared to intervene and take active control of the vehicle, should the ADS deem such action necessary.

SAE Level 4

High Automation
When enabled, the ADS can perform all dynamic driving tasks under certain environmental and roadway situations (often referred to as the system's operational design domain). There is no requirement for a driver to be present or attentive.

SAE Level 5

Full Driving Automation
When enabled, the ADS can autonomously perform all dynamic driving tasks across all roadway and environmental conditions. There is no requirement for a driver to be present or attentive.

Source: IDC's Worldwide Autonomous Vehicle Forecast, 2022–2026

According to IDC's Worldwide Autonomous Vehicle Forecast, 81% of total vehicle shipments in 2023 will be SAE Level 1 vehicles; 18% will be Level 2. In 2026, SAE Level 1 and Level 2 vehicles will represent 62% and 31% of total shipments. respectively. Level 4 and Level 5 vehicles will represent approximately 7% of total shipments. The shift toward autonomous vehicles heralds a new chapter in the transportation industry.

The shift to vehicles with more autonomous capabilities, coupled with the aims to increase electrical vehicle production capacity by global car manufacturers, will deliver more sustainable and safer transportation experiences, reduce carbon footprints, and mitigate traffic jams. Many developed countries have clearly defined goals to drive the gradual adoption of such vehicles.

Healthcare

The healthcare industry is under pressure to contain the challenges of the post-pandemic era (e.g., inflation, employee shortages, and supply chain constraints). At the same time, healthcare institutions are working hard to become digital-first and customer-centric organizations.

In the short term, macroeconomic challenges (e.g., inflation) will drive technology investments that improve revenue management, address labor shortages via automation, and accelerate innovation through analytics and AI. Digital-first strategies in areas such as mental health, telehealth, clinical trials, digital therapeutics, "care anywhere," and patient engagement will benefit from such investments going forward.

> By 2027, 70% of healthcare organizations will rely on digital-first strategies, interoperable workflows, and consumer data platforms to empower patients, elevate experiences, and champion trust.

Source: IDC FutureScape: Worldwide Healthcare Industry 2023 Predictions

Healthcare organizations will also invest in centralized data platforms that elevate patient experiences and enable more informed decision making. These platforms will enable hospitals to make quicker and smarter clinical and operational decisions. According to IDC, by the end of 2027 one of every five large hospitals worldwide will have established AI-driven command centers to improve patient care, enhance operational efficiency, and enable "care anywhere" initiatives. The command centers will support advanced and predictive analytics as well as advanced data monitoring. Dashboards and visualizations will be integrated with various IT systems (e.g., electronic health record tools and medical imaging tools). The AI-enabled data platforms of healthcare institutions will ingest data from external sources such as wearables, remote patient monitoring devices, and insurers.

> By the end of 2027, one out of five large hospitals will have established AI-driven command centers to improve care coordination, reduce costs, optimize operations, and enable care anywhere initiatives.

Source: IDC FutureScape: Worldwide Healthcare Industry 2023 Predictions

Key AI-Driven Technology Use Cases and Trends to Follow in Healthcare

Digital Patient Experience: AI can be leveraged for diagnostic purposes. AI-based algorithms can gather and process health-related information and provide the right outputs. These capabilities reduce the time needed to diagnose illnesses, minimize errors, and cut down the 'diagnosis-treatment-recovery' cycle.

Treatment Efficacy: AI can be leveraged to study the efficacy of treatments and compare outcomes across the different health systems of countries. AI can also deliver much value to the entire healthcare ecosystem, including hospitals, insurers, pharmaceutical companies, regulators, and patients. However, AI integration into healthcare is not a seamless process.

Pharmaceutical companies usually evaluate the efficacy of new drugs introduced in the marketplace. However, this is only possible with examination of real-life data sets. In addition, most drug trials are conducted on the Caucasian population; as such, their results may not be applicable or suitable to members of other ethnicities or races.

For a drug trial to be a success, the target sample must be diverse, spanning demographic factors like race, ethnicity, gender, age, pregnancy or lactation status, or presence of additional comorbidities.

The use of diverse real-world data sets and AI enables insights to be mined from a reasonably sized cohort of test subjects that may match the outcomes of actual patients. Doctors would have a powerful precision medicine tool to prescribe drugs at the optimum dosage based on the demographic characteristics of patients. Moreover, real-world data coupled with AI can be used to study the health characteristics of well-represented groups (e.g., Caucasians). For example, their genome profiles could be studied for more targeted treatments and precision medications. Healthcare organizations, however, should keep in mind that data about individuals' genome profiles may be subject to complex regulations. These organizations should ensure that clinical trials augmented by AI are thorough and well documented.

Pharmacogenomics is an important area that is an extension of precision medicine. Pharmacogenomics is a research method that focuses on patients' genome profiles. For several years, research in this area has mainly focused on exploring the relationships between various pharmacogenes (i.e., genes of pharmacological importance) and variable drug responses. For example, the relationship between drug molecules and cardiology and neurology pharmacogenes can be understood more effectively via pharmacogenomics. By looking at the mutations in an individual's pharmacogene family of genes, better medical dosages can be prescribed for that specific patient.

> **An estimated 48% of clinical trials do not meet their patient enrollment targets, and 80% of trials are commonly delayed due to low patient recruitment and increasing time and costs. In addition, trial quality is a concern as an estimated 30% of patients drop out of trials after sign-on... making the creation of positive patient experiences key to the success of a clinical trial.**
>
> Source: AWS Blog post, Improving Patient Engagement in clinical trials using voice and chat with AWS

Clinical Trials: According to Deloitte, pharmaceutical companies spend $2.3 billion on average and take five to eight years to develop and take a drug to market. The research-to-market process is quite costly and time consuming. Therefore, pharmaceutical companies cannot afford to spend money on studying all molecules with potential health benefits. At the same time, clinical trials must enroll a certain number of subjects to achieve statistically significant results. Tens of thousands of subjects should make up a phase three trial, and the progress of every participant should be followed closely.

Typically, clinical trials consist of a control group and an experimental group. The control group receives an existing drug, whereas the experimental group receives an untested medication. Unfortunately, real-life data pertaining to the existing drug have not been leveraged in such trials (e.g., due to regulations and differences in reporting mechanisms of various healthcare institutions). In the United States, such real-life datasets are now accepted as a part of regulatory submissions. With AI algorithms, the hidden insights from real-life datasets can be captured, thereby reducing the time needed to conduct clinical trials as well as the cost.

Conversational AI can be used to guide patients throughout the trial process (e.g., such AI can be used to administer proactive reminders or capture near real-time responses to daily questionnaires). Companies also develop algorithms that analyze the 3D shapes of drug molecules and clinical subjects to streamline trial efforts. Although the analysis of drug molecules and clinical subjects may produce approximate results, it is still a viable way of expediting trials and drug discovery processes.

Preventing Adverse Drug Events: In most cases, adverse drug events go unnoticed and are thus underreported. According to "Deep Dive: Artificial Intelligence for Payer Use Cases" (IDC #US49995322, January 2023), it is estimated that adverse drug events cause 100,000+ deaths per year and impact more than 7 million patients nationwide. With clinical evidence and adequate information about patients that suffered adverse effects after taking a certain drug, AI models can draw conclusions that can help doctors treat patients that match certain profiles.

Chronic Disease Management: Electronic health records can be turned into predictive tools that help doctors become more effective in their diagnoses and medical decisions. Via NLP and machine learning, any patient's entire medical history can be analyzed in real time. This history can then be linked to the symptoms, chronic infections, or illnesses affecting other members of the family. Predictive analytics tools can also recommend prescriptive actions before a disease becomes life threatening.

Preventive Care for Population Health: Healthcare today is primarily reactive: People get sick and get treated. However, the future of healthcare is proactive. Proactive postures will improve quality of life and reduce the financial burden on healthcare institutions and individuals.

According to the Global Obesity Observatory, 28.4% of males and 44.5% females in the UAE are obese. Over time, these individuals can potentially develop cardiovascular disease, diabetes, hypertension, and other metabolic maladies (e.g., thyroid hormone disfunction). In such cases, AI can be used to classify individuals as low, medium, and high risk and thereafter develop public health intervention programs that increase awareness about risk exposure. Notably, the 20/80 rule — where 20% of people account for 80% of spending — applies to the healthcare industry. As such, it is possible to deliver a more economic and balanced healthcare service by adopting a more proactive approach.

Patient and Doctor Experience: Doctors typically need to look at computer screens and take notes for record keeping, insurance, or billing purposes during their interactions with patients, largely due to their heavy administrative workloads. Eric Topol, cardiologist and author of Deep Medicine: How Artificial Intelligence Can Make Healthcare Human Again, argues that doctors spend too little face-to-face time with patients. Patients often feel neglected, while doctors are overwhelmed with recordkeeping tasks. This situation increases the burden on the healthcare system, as patients may visit other doctors. In this context, AI presents an opportunity to reinforce the human side of medicine and improve patient-doctor interactions. Conversational AI solutions that listen to doctor–patient conversations, transcribe discussions, and suggest a right course of action for doctors and insurers are already available on the market.

Hospital Process Efficiency: Many people may show up at a clinic on certain days of the week for various reasons. AI can be leveraged to mine hidden insights, optimize supply management processes, develop better staff planning strategies, and improve patient service quality. AI can also be used to monitor the number of patients who do not show up for scheduled visits. An AI model that optimizes bookings by predicting potential no-shows may be quite useful, as healthcare institutions can take certain actions (e.g., an automated courtesy call to remind a patient of an appointment or allocate a slot to someone else). Such a model would not only improve downstream operational efficiency but also drive revenue growth.

GenAI can also be leveraged across multiple use cases in the healthcare industry. According to the World Economic Forum, clinical decision making, risk prediction of a pandemic, personalized medication and care, and drug discovery and development are potential use cases in which GenAI can be leveraged. For example, GenAI can be used to analyze a patient's medical records, lab results, previous treatments, and other tests (e.g., magnetic resonance imaging scans) to identify health problems and provide guidance.

Addressing Data Challenges

The healthcare industry is highly regulated because data privacy is a major issue. Existing healthcare data needs to be leveraged without violating regulations to deliver value to the entire ecosystem. However, data can be isolated across different IT systems or third-party solution providers (e.g., the electronic health recording systems of business process outsourcing [BPO] providers). Data may also lack uniformity due to different reporting standards, and languages that vary from hospital to hospital and country to country. Therefore, data must be collected based on regulatory guidelines; it must also be cleansed, normalized, and standardized before use. This effort requires healthcare institutions to become data-driven entities. Healthcare institutions must also create a single source of truth and collaborate with regulators and third-party BPO providers. By doing so, they can create synergies that support groundbreaking research and improve patient care.

Oil and Gas

The climate change crisis has brought the oil and gas industry to a critical juncture. Numerous organizations in this industry are aiming to transition into diversified, net zero energy companies. Energy companies around the world are investing in renewables and decarbonization technologies. For example, ADNOC is aiming to become net zero by 2050 by reducing the Scope 1 emissions generated by its operations and lowering the Scope 2 emissions arising from the energy it purchases. BP has also pledged to achieve net zero emissions by 2050 through several initiatives. For example, the company aims to decrease methane intensity across its operations and develop roughly 50GW of net renewable generating capacity by 2030. Other oil and gas majors have similarly announced net zero targets, including Shell, Total, Repsol, and Equinor.

> " **We will lead by example, bringing together energy, technology, and finance leaders to create a realistic and practical pathway to net zero by 2050.** "

Source: https://www.adnoc.ae/en/ourstrategy/net-zero-by-2050

Based on these goals, initiatives to measure and report emissions are poised to be at the forefront of the oil and gas industry. For a long time, oil and gas companies have taken direct measurements of emissions from venting, flaring, and various other processes. In most cases, these measurements are required by regulatory authorities. However, organizations that are pursuing net zero initiatives must measure both direct and indirect emissions. According to IDC, 40% of oil and gas companies will be utilizing simulation technologies to estimate and reduce emissions in 2026 (half of all emissions could be eliminated with simulation and predictive AI).

> " **By 2026, 40% of oil and gas operators and processing companies will utilize simulation technologies to estimate and reduce emissions at the enterprise level.** "

Source: IDC FutureScape: Worldwide Oil and Gas 2023 Predictions

Per IDC's recent Energy Transition Survey, AI-augmented analytics, visualization, and simulation technologies are viewed as key investment areas. Many oil and gas companies are developing and implementing more value-added AI use cases across upstream, midstream, and downstream operations. A good example comes from AIQ, an ADNOC and G42 joint venture. AIQ has been developing an AI emissions platform to collect data from different sources across the oil and gas value chain. The platform will provide a holistic view of thousands of data points and deliver predictive analytics capabilities to enable users to generate insights about future CO_2 emissions and support decision-making processes across the value chain.

> " **AIQ's innovative AI technology is at the forefront of driving the transition to a more sustainable future. With a focus on reducing the energy sector's carbon emissions and environmental impact, we are making significant progress toward achieving the UAE's commitment to net zero carbon by 2050.** "

Omar Al Marzooqi
CEO, AIQ

Key Digital Business Trends to Follow in the Oil and Gas Sector

Oil and gas companies will make business-oriented technology investments in five key areas: data-driven operations, IT/operational technology (OT) convergence, energy transition, digital asset management, and digital infrastructure. AI will have a very high impact on the value delivered through each of these investments. However, IDC's 2022 AI Path Oil and Gas Survey revealed that only 13% of surveyed oil and gas organizations have a company-wide AI strategy in place. Enterprise-wide data and AI strategies are still not commonplace; projects are driven by business units or operations in almost 50% of surveyed organizations. But 92% of organizations believe AI can deliver greater value. These organizations will have a strong tendency to transform their operations via the use of AI in the coming years.

Figure 6 shows the key use cases that oil and gas organizations worldwide are planning to invest in. Some of these may leverage GenAI technology. For example, oil and gas companies can use GenAI to identify potential inefficiencies in their supply chain and optimize their transportation and distribution networks. GenAI can also be leveraged in downstream operations to analyze geological and geophysical data and identify patterns that may indicate the presence of oil and gas deposits.

Figure 6: Key AI Use Cases in the Oil and Gas Sector
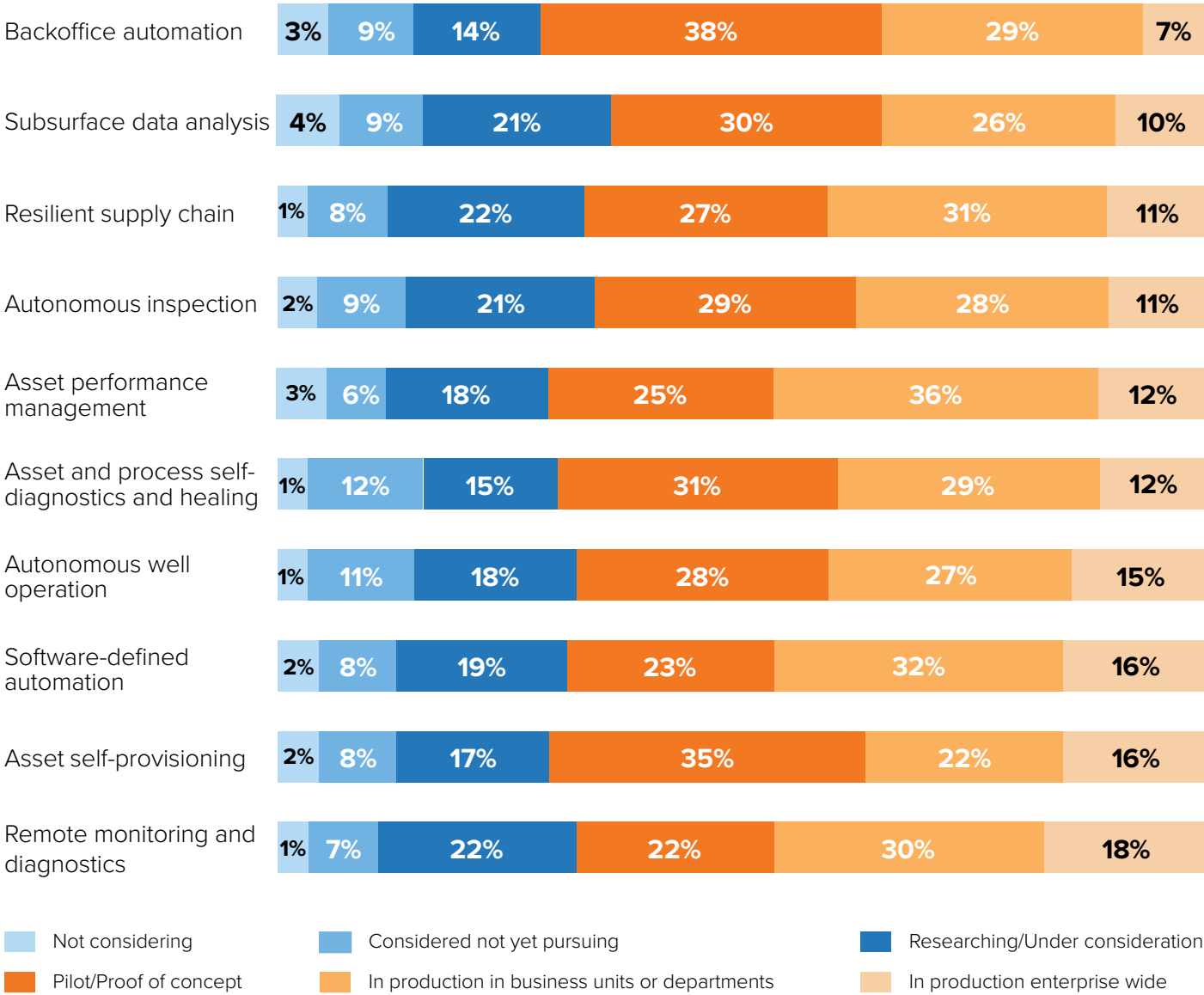
Source: IDC Industry AI Path, Oil and Gas, 2022

For organizations to get the most value out of AI-driven digital initiatives, they must have a centralized and coordinated approach to technology implementation that is tied to business goals and enables cross-collaboration between business and technology teams. In the next sections, we focus on the five business-oriented technology investment areas and discuss how AI is being leveraged.

Data-Driven Business Operations

Users of exploration and production data need a scalable, flexible, and cost-effective data architecture that provides fast and simplified information about important subsurface geoscience assets. However, many national and international oil and gas companies do not leverage open data platforms or utilize the reference data architectures of software vendors. These information gaps create silos across teams and applications. An open data platform on which multiple ISVs can deploy applications and create centralized data pools is one solution.

One such platform is the Open Subsurface Data Universe, developed by the Delphi data ecosystem. This is an open source community that includes oil and gas companies, hyperscalers, software vendors, and many other ecosystem players. Via this community, oil and gas companies can break up data silos; their data science teams can build customized workflows and use cases that leverage advanced AI models that deliver business value.

Infusing AI into the data management life cycle and making use of AI-based automation and data interpretation tools will improve end user efficiency and shorten the time needed to analyze subsurface data. IDC predicts that half of oil and gas companies will invest in AI to democratize and operationalize data-driven decision making across their midstream and downstream operations. There are many use cases that can be implemented, but oil and gas companies will prioritize those that drive efficiency across operations. They will work with suppliers that help them identify use cases with the highest value and facilitate mutual co-innovation and co-development.

> **By 2024, 50% of midstream and downstream players will have deployed AI/ML technologies to automate the data analytics life cycle, freeing up data resources and operationalizing data-driven decision making.**

Source: IDC FutureScape: Worldwide Oil and Gas 2023 Predictions

IT/OT Integration

Integration is a challenging area for many oil and gas companies, chiefly because most of their OT systems operate in silos. Silos create operational inefficiencies and hold back organizations from investing in value-added DX use cases. Therefore, the building of converged IT security frameworks, data governance models, and resource optimization tools and processes will be highly important. Organizations can only start working on more sophisticated data science projects and capitalizing on AI technologies with such frameworks and models in place. For example, ADNOC introduced its Panorama Command Center to gain a consolidated and integrated view of its entire operations (including subsidiaries). This command center oversees all IT/OT operations, including those pertaining to wells and refined/finished products. Via this center, teams can carry out predictive maintenance and run predictive analytics that enable them to make better, and granular, decisions. It also acts as a centralized crisis management center by leveraging CCTV cameras across all assets. ADNOC's Senior Vice President Abdul Nasser Al Mughairbi has spoken about how organizations with robust, unified data governance models can deliver greater value through data.

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Digital Asset Management

The oil and gas industry is extremely asset-intensive. Companies operating in this industry heavily invest in solutions to digitalize asset operations, minimize unplanned shutdowns, reduce asset maintenance costs, and improve asset availability. Asset shutdowns may result in productivity loss, wastage of onboard manpower, standby charges for contractors and subcontractors, and major financial damage. As shown in Figure 6, asset monitoring and diagnostics and asset self-provisioning are the top AI-based use cases that oil and gas companies have implemented or are planning to implement in the coming years.

> **According to IDC's Future of Operations survey, 45% of oil and gas companies stated that worldwide oil and gas exploration and production operations will be remotely monitored in three years**
>
> Source: IDC's Worldwide Future of Operations Survey, 2022

Oil and gas organizations have been striving to gain operational insights from upstream, midstream, and downstream asset data. These organizations will leverage digital twin technologies to design, operate, and manage renewable assets as part of their energy transition goal. However, cybersecurity threats stemming from digitally connected assets, failed proof of concept attempts based on IoT, digital twin, and AI use cases, and lack of internal digital skills have been roadblocks in digital asset management initiatives.

> **A digital operations twin will create a safer workplace and lower costs and emissions, in addition to increasing production via data-driven insight and decisions. It will streamline our processes and take field operations to a level we've never seen before. Our ambition is to create value and have an impact on both existing and future fields**
>
> Ine Dolve
> SVP operations and asset development, Aker BP

Digital Infrastructure

The future of digital infrastructure is ubiquitous, autonomous, and cloud-based. Oil and gas organizations have been quite conservative about using multiple cloud deployment models as a part of their digital infrastructure strategies, but other entities use combinations of public, private, and edge cloud deployment models to drive efficiency and enable scalability across operations. The preferred deployment model varies by use case. For example, command centers and predictive models require highly scalable cloud-based digital infrastructure. Data sharing and data privacy concerns still exist in the oil and gas industry, especially in the exploration domain, but a rising number of organizations are using public cloud environments.

> **By 2025, 85% of upstream companies, driven by cost pressures, will be compelled to streamline back-office operations using intelligent automation and outsourcing. They will also adopt public cloud to increase profitability**
>
> Source: IDC FutureScape: Worldwide Oil and Gas 2023 Predictions

Energy Transition

According to IDC's 2022 Energy Transition Survey, 83% of oil and gas organizations globally have linked sustainability KPIs to their business objectives. The Russia-Ukraine War and supply/macroeconomic challenges have impacted energy transition plans, but many oil and gas companies have stuck to their strategies. IDC research has found that energy management, waste management, carbon emission management, and hazardous material management are key investment focus areas under the environmental sustainability umbrella. In particular, energy management, carbon emission monitoring, and supply chain management will be areas in which AI will be heavily leveraged. According to IDC's AI Path Survey, 31% of oil and gas companies have AI-enabled supply chain solutions in production, and another 27% are piloting such solutions. IDC's Future of Operations Survey found that about 35% of worldwide exploration and production organizations have improved their environmental metrics by implementing digital technologies. More investments in energy management can be expected.

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Sports

The spectacle of high-level sports has an outsized influence on society. The sports industry also directly or indirectly delivers social, environmental, and economic value. Hundreds of millions of people, for example, can become aware of an environmental, social, and governance initiative adopted by the sports industry. Given its goal of ensuring that different sports activities are available to audiences in real time or on demand, the question facing the industry is how to improve viewership via Big Data and AI. Analytics and AI can be leveraged to deliver better streaming services, monitor subscriber experiences, and alter how sports content in captured and delivered. This section focuses on how better-performing sports teams can be created via the use of Big Data and AI.

In the Hollywood movie Moneyball, Billy Beane, general manager of the Oakland Athletics, leveraged data mining to find undervalued players in the late 1990s and early 2000s. He created a team that could compete against clubs with spending budgets 2–3 times larger than the Athletics. Beane's approach fundamentally changed the way baseball teams are built and operated.

Big Data and AI are foundational for building better performing sports teams. Data must be captured on a real-time or near-real time basis to gain meaningful in-game insights and conduct post-game tactical and strategic analyses. A solid data platform is highly important for success in this regard. Such a platform enables data from different sources and endpoints to be ingested, processed, and visualized for meaningful analysis and decision making.

> **The math works. Over the course of a season, there's some predictability to baseball. When you play 162 games, you eliminate a lot of random outcomes. There's so much data that you can predict individual players' performances and also the odds that certain strategies will pay off.**
>
> Billy Beane
> General Manager, Oakland Athletics

Computer vision for video and image processing is a crucial AI capability needed for advanced sports use cases. AI technologies such as language models, pattern recognition, and predictive analytics are also important. Key AI use cases in sports include:

Advanced Analytics

Whether for a basketball game or car race, a robust data analytics platform is highly important. Sensors and cameras deployed in a field, court, or Formula One track can collect, ingest, process, and consolidate data in real time with the support of such a platform. Each wheel on a Formula One vehicle has three sensors, while on-board thermal cameras in the driver cabin monitor tire temperatures in real time. More than 300 sensors are installed across the vehicle. Data from all these sensors and cameras is used to maximize the car's performance.

Player Tracking

In football, video cameras can be leveraged to capture player movement, speed, acceleration, deceleration, and distance covered in real time. They can also be used to ascertain ball rotation during games and practice sessions. Coupled with the data visualization capabilities of an analytics platform, the captured video data provides valuable insights about a player's performance and enhances the study of game tactics and strategies. AI-based pattern recognition enables the most and least effective game plans to be presented according to selected parameters. Natural language capabilities can be leveraged to query ball movements that fit certain patterns.

Performance Analysis and Enhancements

With wearables and other edge devices, vast amounts of data related to a player's performance can be captured and analyzed during games or practice sessions. Training and diet programs for individual players can be optimized; more personalized player development strategies can be implemented.

Scouting and Recruitment

Player performance data can be leveraged to explore recruitment opportunities. Advanced analytics can be leveraged to understand a team's strengths and weaknesses and identify players that can fill gaps in a team.

Refereeing

AI-based cameras that are leveraged to track players and ball movement can be used to support the decision-making processes of referees. Hawk-Eye is a camera-based solution used in cricket and tennis to track the trajectory of a ball and determine if it is fair or foul. The National Football League is similarly using a next-gen stats system to track player movement and improve referee decision making.

Injury Detection and Prevention

Computer vision and data science are being leveraged to determine the risk of injuries. Because knee injuries are the most common type of sport-related injuries in the United States, researchers have been leveraging multi-angle cameras to identify the factors that cause such injuries and determine how they can be prevented.

Crowd monitoring and security, advertising, ticketing, and journalism are other areas where AI can be leveraged in sports.

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Role of Industry Ecosystem Partnerships

Advances in technology are reshaping competitor and partner landscapes and creating value in every industry. Relationships between customer organizations and partners are no longer transactional in nature, partly due to the complexity of customer needs and radical changes to operating models. Today, partner ecosystems that expedite the flow of money, goods, people, and services are being built in every industry. Multiple parties with different focus areas and capabilities are joining forces to deliver relevant, state-of-the-art solutions.

Industry ecosystems are going beyond traditional peer-to-peer partnerships as more companies and organizations share data, applications, operations, and expertise. The shared economy model will deliver incremental value to all stakeholders in various ways — financial, operational, and societal.

> " **By the end of 2023, organizations that share data, applications, or operations with their ecosystem partners through joint ventures will increase their profitability by five percentage points.** "
>
> Source: IDC FutureScape: Worldwide Future of Industry Ecosystems 2023 Predictions

Drivers and Enablers of Industry Ecosystems

Industry value chains are being disrupted by changing customer preferences, the widespread drive to build digitally resilient enterprises, talent shortages, operational efficiency requirements, the pace of innovation, and sustainability aspirations. Regulations play an important role in the way industry ecosystems are built and operated, especially given the rising concerns about digital sovereignty. Governments want to increase in-country value, overcome supply chain constraints, preserve intellectual properties developed by ecosystems, and reduce data and privacy risks.

New industry ecosystems that go beyond peer-to-peer transactional partnership models are based on the sharing economy. The sharing of data, applications, operations, and expertise is key to the success of these industry ecosystems.

Shared Data and Insights

In industry ecosystems, the sharing of information, trending data, and knowledge benefits all stakeholders. For example, organizations in the fast-evolving automotive industry ecosystems are partnering with firms in other industries to boost innovation in the connected and autonomous vehicle space. Examples of firms that are sharing data insights include:

- **Otonomo** A provider of fleet management, diagnostics, mapping, and traffic and safety management services, Otonomo's data aggregation platform tracks 50+ million connected vehicles for performance and safety. BMW, Mercedes, and Avis are part of its ecosystem.

- **Goldman Sachs Financial Cloud for Data** Goldman Sachs and AWS have created a data management and analytics platform for financial services organizations. Via the platform, Goldman Sachs' market data and software tools can be shared with hedge funds and asset managers for data cleansing, trading, and investment.

Shared Applications

There are also industry ecosystem partnerships in which organizations work together to develop applications that lower the cost of operations and customer engagement. Some organizations with few resources may rely on their industry ecosystem partners to develop such shared applications. Examples include:

- **SAP Oil and Gas Cloud** SAP, together with Accenture, rolled out a preconfigured, cloud-based application platform for upstream oil and gas activities. The platform was developed with the collaboration of BP, Chevron, ConocoPhillips, and Shell.

- **DeveloperDAO** The organization focuses on the education of Web3 builders. Like any decentralized autonomous organization, DeveloperDAO is a self-governed community that open sources Web3 development.

Shared Operations

The shared operations model is leveraged to scale capacity, overcome supply chain constraints, jointly innovate, improve access operational expertise, and drive higher throughput rates. Examples include:

- **Openpediatrics:** Developed by IBM and Boston Children's hospital in collaboration with Harvard and MIT, this platform enables clinics to share best practices and knowledge on pediatric care worldwide.

- **Ethereum Blockchain:** This community-run, decentralized blockchain platform establishes a peer-to-peer network for enabling token-based transactions and decentralized applications. Any organization can use the platform to build applications or interact with third parties.

Role of Industry Ecosystems in Driving AI-Based Use Cases

Industry ecosystems are complex and require many resources to create and manage. There are numerous examples of such ecosystems around the world, particularly in the United States, China, and European countries. However, the UAE provides the best example of a world-class industry ecosystem. The UAE has a strong vision to stay ahead of the emerging technology adoption curve. The government, together with citizens and organizations in the public and private sectors, has been quite open to experimenting with and adopting AI-based solutions that deliver economic, social, and environmental value.

Mobility Best Practice: TXAI

The UAE government has launched several autonomous transportation services that include taxis and minibuses. TXAI, a robotaxi initiative recently launched on the Yas Island of Abu Dhabi, was piloted in December 2021 and phase one trials were completed in early 2022. In the testing phase, more than 2,000 passengers safely commuted across the island, and taxis traversed over 16,000 kilometers. The taxi service is provided to visitors and residents of Yas Island free of charge, but there are plans to turn it into a paid service. Eight taxis and four minibuses are presently operational.

A competent and capable orchestrator with a clear vision and goal is a critical element of any industry ecosystem. In TXAI's case, Bayanat (an ADX listed company in which G42 is the majority shareholder) is the enabler and orchestrator of the autonomous vehicle ecosystem. Bayanat aims to unlock the true potential of technology for human progress and build a better future for younger generations by developing environmentally, economically, and socially sustainable solutions backed by data-driven intelligence. According to Bayanat, robotaxi technology will reduce road accidents 30–40% and reduce costs per trip by at least 25%.

IDC's Future of Industry Ecosystems Survey of June 2022 found that the top 3 considerations for designing successful ecosystems include:

Creating the right business value and revenue model for a financially sustainable ecosystem

Ensuring consistent environmental, social, and governance practices and/or policies

Establishing KPIs for success measurement

Bayanat factored these considerations into its plan and will continue to do so in the coming years. The company aims to replicate its model across other countries and geographies. Moreover, the company is using electric vehicles to ensure to meet the UAE's environmental sustainability goals, align with local regulatory requirements, and ensure safe trips. In terms of regulation, a safety officer is required to sit in the driver's seat, and all data captured and processed by Bayanat must be hosted in a sovereign cloud datacenter.

The industry ecosystem enabled by Bayanat (see Table 4) is crowded with multiple stakeholders. Robotaxis are generally not regulated and are still quite new. The use of such vehicles remains in the distant future for many countries due to problems with infrastructure readiness, technology readiness, and coordination and alignment of ecosystem partners. However, TXAI has a coherent strategy that built around the UAE national vision and strongly aligned with the objectives of ecosystem partners.

Table 4: TXAI Robotaxi Industry Ecosystem Stakeholders

Role	Stakeholders
Enabler/Orchestrator	Bayanat
Digital Transportation Infrastructure and Policies	Abu Dhabi Department of Municipalities and Transport, Integrated Transport Center, Abu Dhabi Distribution Company, Parson Corporation
Entertainment and Experience	Miral
Investor Community	Mubadala
Economic Development and Ecosystem Expansion	Abu Dhabi Department of Economic Development
ICT Solutions Providers	Etisalat by e&, Core42, UISEE, Baidu/Apollo, WeRide, and various other software, hardware and IT services companies
Law Enforcement and Security	Abu Dhabi Police and private contractors
Digital Business Services	AXA, Daypop, and digital payment partbers
Talent Capacity	Mohammed Bin Zayed University of AI and other universities and research institutions
Automative Value Chain	Lincoln, Nissan, Toyota, distributors/car dealers, and maintenance partners

Source: IDC, Bayanat

The role of each stakeholder is outlined below:

Enabler: Bayanat is the enabler of the entire ecosystem. Bayanat not only bring togethers different parties but also provides the core software platform that captures and processes data. Some real-time decisions are made by the processing units in vehicles (in other words, at the edge), whereas data from various other sources (e.g., videos and images) is processed and stored at the core G42 datacenter. Bayanat also drives co-innovation and co-development initiatives together with its partners. For example, Bayanat works with third-party technology companies (e.g., UISEE, Baidu/Apollo, WeRide) to develop autonomous driving kits for cars and create the right solutions for specific business cases. The organization also has a governance mechanism in place, and all processes are documented and aligned based on the requirements of regulators and other government authorities.

Digital Transportation Infrastructure and Policies: Bayanat partnered with a number of authorities to align the autonomous service with the guidelines and regulations of the Integrated Transport Center (ITC), which is part of the Abu Dhabi Department of Municipalities and Transport. The ITC is a key partner in setting application strategies, running pilot projects, developing policies and regulations, supervising and licensing, and spearheading testing and certifications as well as infrastructure development. Given that the vehicles used for the robotaxi service are electric, Bayanat also partnered with Abu Dhabi Distribution to implement the right charging infrastructure. Parson Corporation is another key stakeholder that provides project management and consultancy services, especially in civil engineering.

Law Enforcement and Security: Bayanat is working with the Abu Dhabi Police to ensure passenger safety and security. A private contractor also provides the safety officer who sits in the driver seat of the car. This officer continuously monitors the car and the driving experience. Bayanat, together with its partners, conducts automatic driving safety training sessions for these safety officers.

Entertainment and Experience: To make commutes more attractive, especially to international visitors, the route of the robotaxis was planned in conjunction with Miral. Miral is a globally recognized asset management company that operates various leisure and entertainment destinations across Yas Island.

Investor Community: Investors such as Mubadala (the Abu Dhabi-based sovereign wealth fund) have an important role in nurturing the autonomous vehicle ecosystem. Mubadala makes investments in small- or large-scale initiatives (e.g., investments in early- or late-stage technology startups or large-scale industrial investments).

Economic Development and Ecosystem Expansion: The Abu Dhabi Department of Economic Development has played an important role in supporting the market entry and expansion of technology solution providers from different parts of the world. Its efforts will enrich the ecosystem and deliver greater value to all stakeholders and users of the service.

ICT Solutions Providers: As one of the sovereign cloud providers in the UAE, Core42 (the resulting of the merger of G42 Cloud, Injazat and Inception) delivers public cloud infrastructure-as-a-service offerings that support solution delivery. IT hardware (e.g., NVIDIA), software (provided by 3D mapping partners and autonomous driving software partners such as UISEE, Baidu / Apollo, and WeRide), and integration services are also important parts of the autonomous vehicle solution. As such, there are strong partnerships with multiple technology companies to support service delivery. Different software solutions integrate with Bayanat's autonomous car platform as well. Autonomous car start-ups based in Masdar City's incubation centers are also part of the ecosystem. Etisalat by e& is the telecommunications services provider for TXAI that ensures constant connectivity and continous data flows, which are critically important elements of the overall solution.
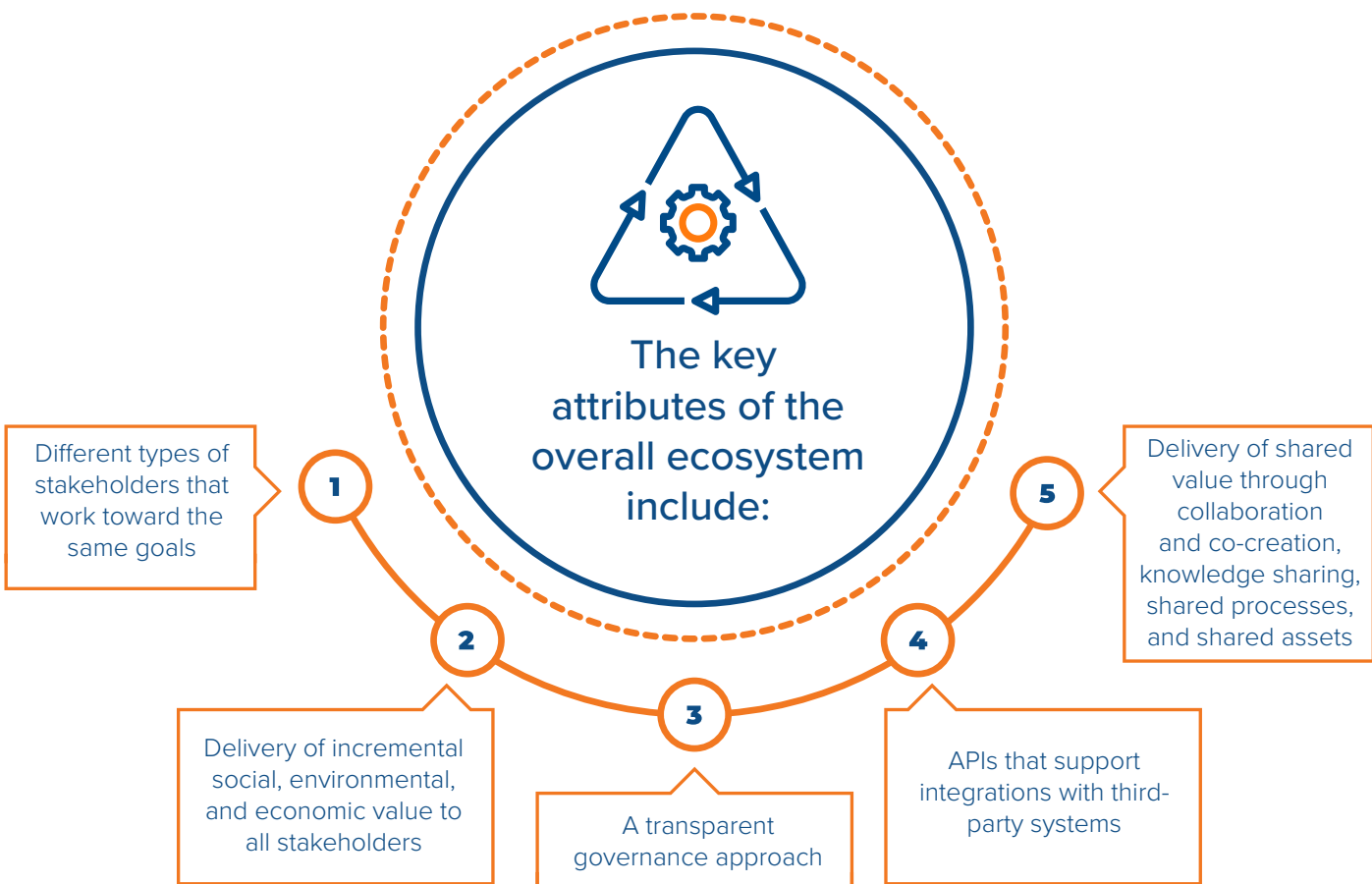
Digital Business Services: Bayanet has partnered with AXA for insurance services, as autonomous vehicles require insurance just like any other car. On the payment side, Bayanat is going to work with several partners, including DayPop. While the robotaxi service is presently free, a mobile payment solution will be integrated at some point in the near future.

Talent Capacity: Enabling an ecosystem for a commercial taxi service with SAE Level 4 autonomous driving capabilities is not easy. As the developer and owner of the autonomous driving platform, Bayanat needs to nurture local talent by partnering with research institutions and universities. Mohammed Bin Zayed University of AI is a key partner instrumental in boosting local talent capacity for the initiative.

Automotive Value Chain: Bayanat currently leverages the cars of global OEMs such as Lincoln, Nissan, and Toyota through its partners. The company also works with car dealers and distributors to procure and maintain vehicles. Other suppliers provide lidar systems and other sensor-based technologies mounted on the cars. Numerous co-development and co-innovation activities take place between these companies and Bayanat. Vehicle maintenance is outsourced to local garages.

Figure 7: The Key Attributes of the Ecosystem

The key attributes of the overall ecosystem include:

1. Different types of stakeholders that work toward the same goals
2. Delivery of incremental social, environmental, and economic value to all stakeholders
3. A transparent governance approach
4. APIs that support integrations with third-party systems
5. Delivery of shared value through collaboration and co-creation, knowledge sharing, shared processes, and shared assets

Source: G42, IDC

Industry ecosystems are important in accelerating innovation and developing sustainable, scalable, and resilient solutions built on emerging technologies. In the case of AI, creation of differentiated value may require an ecosystem with diverse players that have different capabilities and open mindsets. Without such an ecosystem, it may not be possible to enable such complex and sophisticated use cases.

Redefining Healthcare

Healthcare is another important area where AI can be deliver greater value to the entire ecosystem with the goal of ensuring healthy lives and promoting well-being for all at all ages. This is one of the important pillars of United Nation's Sustainable Development Goals And UAE has clearly outlined its goal of delivering progressive, healthcare services to its citizens to improve their life quality and become a world class medical hub. In line with that goal, G42 and Mubadala have built M42 in 2022, an integrated healthcare company that combines medical and data- and AI-centric technologies to deliver world-class care. There are many initiatives that the newly established organization is working on and one of the most important initiatives is the organization's focus on using large language models to enhance healthcare services and research, as demonstrated by the recent launch of Med42, a 70 billion parameter Clinical LLM.

Recently, advancements in AI-driven language models have paved the way for even more sophisticated conversational tools and this resides at the center of many initiatives driven by M42. For instance, Med42 has shown promise in assisting doctors with making information easier to find, in addition to assistance with administrative tasks. Such models will improve experience for doctors by enabling them to spend more time with their patients, help patients get better healthcare services and enable them to access their medical information in a more understandable form, and accelerate innovation in healthcare research.

In terms of use cases, the "making information easier to find" can play out in multiple ways. For example:

1. LLMs can be trained on huge datasets of medical records and notes. They can then generate concise summaries of a new patient's medical history, allowing the doctor to get up to speed quickly. This saves the doctor time from having to read through lengthy records manually.

2. The model can highlight the most relevant information from a patient's history, such as major diagnoses, procedures, allergies, medications and test results. This acts like an automatic pre-filtering of the lengthy records. Note that this extent of filtering would need to be catered to the visit. For example, if a cardiac patient shows up in ER (Emergency Room) with broken leg, the cardiac history may be of limited relevance, whereas the history involving orthopedic care may be more relevant.

3. Since medication records span multiple documents, the model can piece together the full medication history, dosages over time, and highlight any issues like drug-drug interactions or inconsistent prescriptions. This gives the doctor a consolidated view.

In its efforts, M42 has built an ecosystem driven value creation approach and has been interacting with different healthcare industry ecosystem stakeholders at different levels. Below you can see the key stakeholders of this ecosystem and the value proposition for each one of them.

Table 5: Healthcare Industry Ecosystem Stakeholders

Patients
Models can provide more personalized care plans based on the patient's unique medical history. They can also enable easier access to health information and recommendations, by making it simpler to understand complex medical information and personalizing recommendations.

Hospitals
Models can help hospital systems be more efficient through automated documentation, scheduling optimization, and improved resource allocation. For example, hospitals can provide chat-based interface to answer patient FAQs and appointments.

Doctors
Models can save doctors time on administrative tasks and provide data-driven clinical decision support, in addition to making it easier to surface insights through a simplified interface as opposed to current workflows which require several clicks and page changes.

Insurers
Models may help insurers analyze claims data, identify risk factors, and potentially detect fraud, in addition to checking policy documents for compliance with local policy, and providing chatbots that can respond to patient queries.

Regulators
Agencies like FDA, and Department of Health, Abu Dhabi, will need to develop frameworks for safely testing and validating these models before they can be used as a clinical decision support systems.

Pharma industry
Models can aid drug discovery and clinical trial design and recruitment, in addition to increasing engagement with clinical trial participants for reducing loss to follow up.

Public health officials
Models can synthesize population health data to forecast and monitor emerging health threats. Public health officials can also derive insights from trends derived from the questions raised asked by the users.

General public
General public could use the LLMs for use cases inprevention and wellness.

Pharmacists
Models can help flag potential drug-drug interactions and suggest optimal dosage based on genomics and other data.

Nurses
Nurses could use the model as a documentation assistant in preparing and submitting preauthorization requests, and assistance with reviewing policies and procedures applicable in a given scenario.

Lab technicians
Lab techs can use the model to review procedural details for any lab work. They can also use it to review safety and cleanup procedures following accidents in the lab, to ensure compliance with policies.
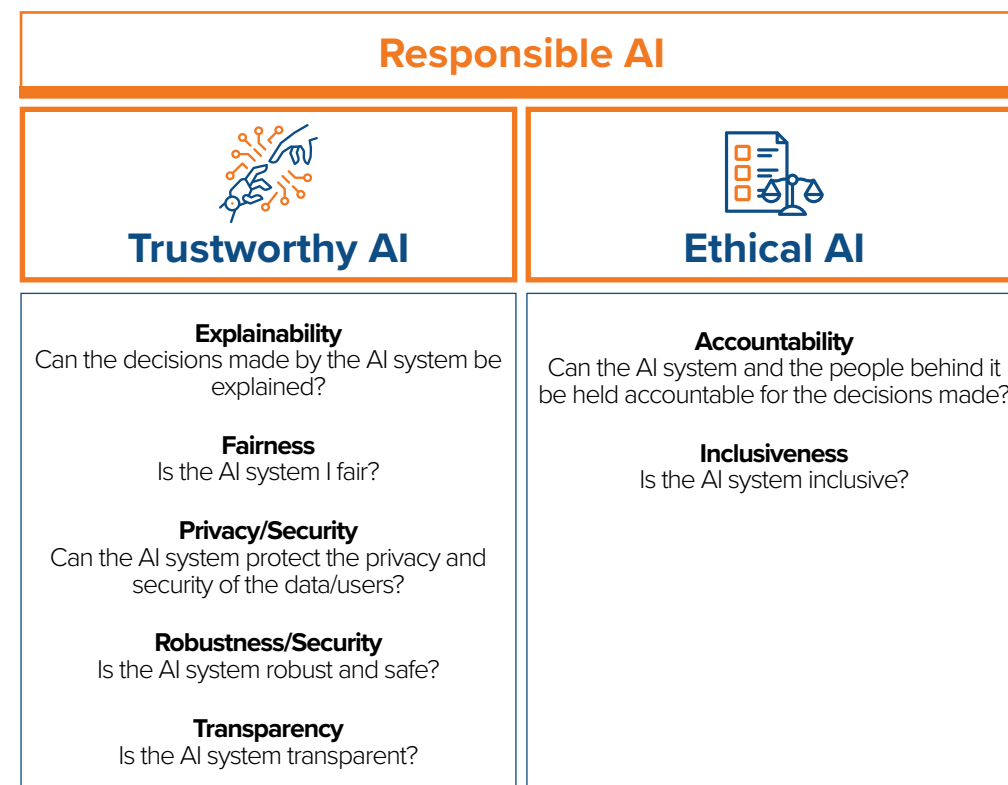
Source: IDC, M42

M42, as the orchestrator of this ecosystem, also partners with cloud infrastructure providers (e.g., Core42, AWS), the broader IT ecosystem players, and the healthcare industry-oriented technology companies to ensure that the state-of-the-art technology is being leveraged to drive incremental value across all the initiatives. For example, Core42's GPU enabled high performance computing infrastructure is designed to host LLM based AI models to meet the cost and performance expectations of M42 and ensure the delivery of the expected value-based outcome.

Navigating Through AI Disruption

AI technology deployments must be built on the principles of explainability, fairness, privacy, robustness, transparency, accountability, and inclusiveness. Figure 8 highlights IDC's framework for a responsible AI practice.

Figure 8: Pillars of Responsible AI

Responsible AI	
Trustworthy AI	**Ethical AI**
Explainability Can the decisions made by the AI system be explained? **Fairness** Is the AI system I fair? **Privacy/Security** Can the AI system protect the privacy and security of the data/users? **Robustness/Security** Is the AI system robust and safe? **Transparency** Is the AI system transparent?	**Accountability** Can the AI system and the people behind it be held accountable for the decisions made? **Inclusiveness** Is the AI system inclusive?

Source: IDC

Many organizations seeking to create a responsible AI practice do not know where or how to start. First and foremost, organizations must have a formalized AI governance framework and the mindset to responsibly design, develop, deploy, and manage AI systems.

Personas responsible for different AI processes within the organization are similarly important. These personas should also be accountable for the successful execution of this framework.

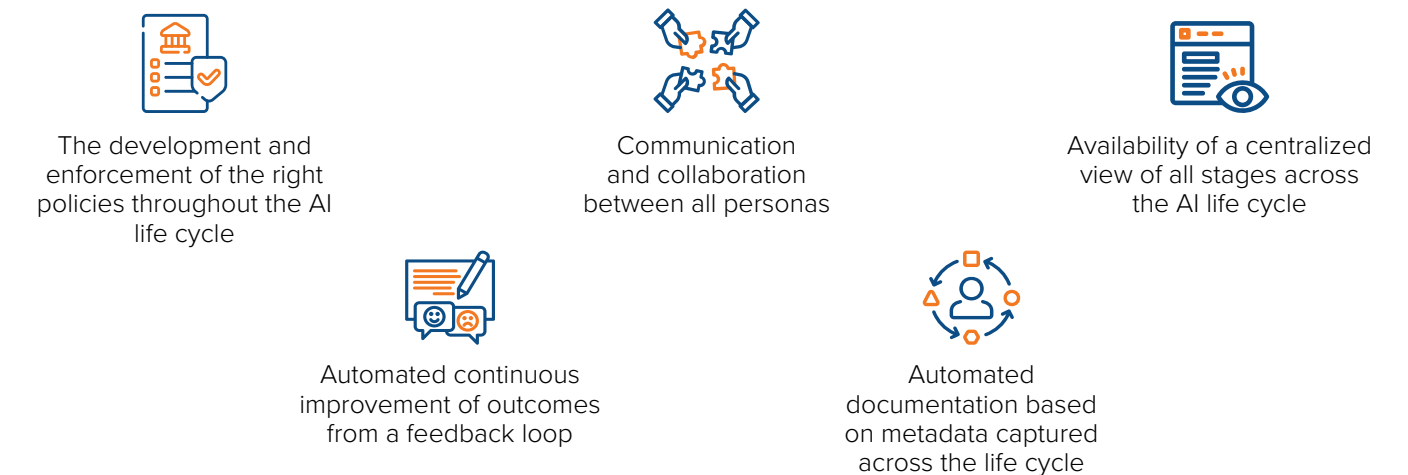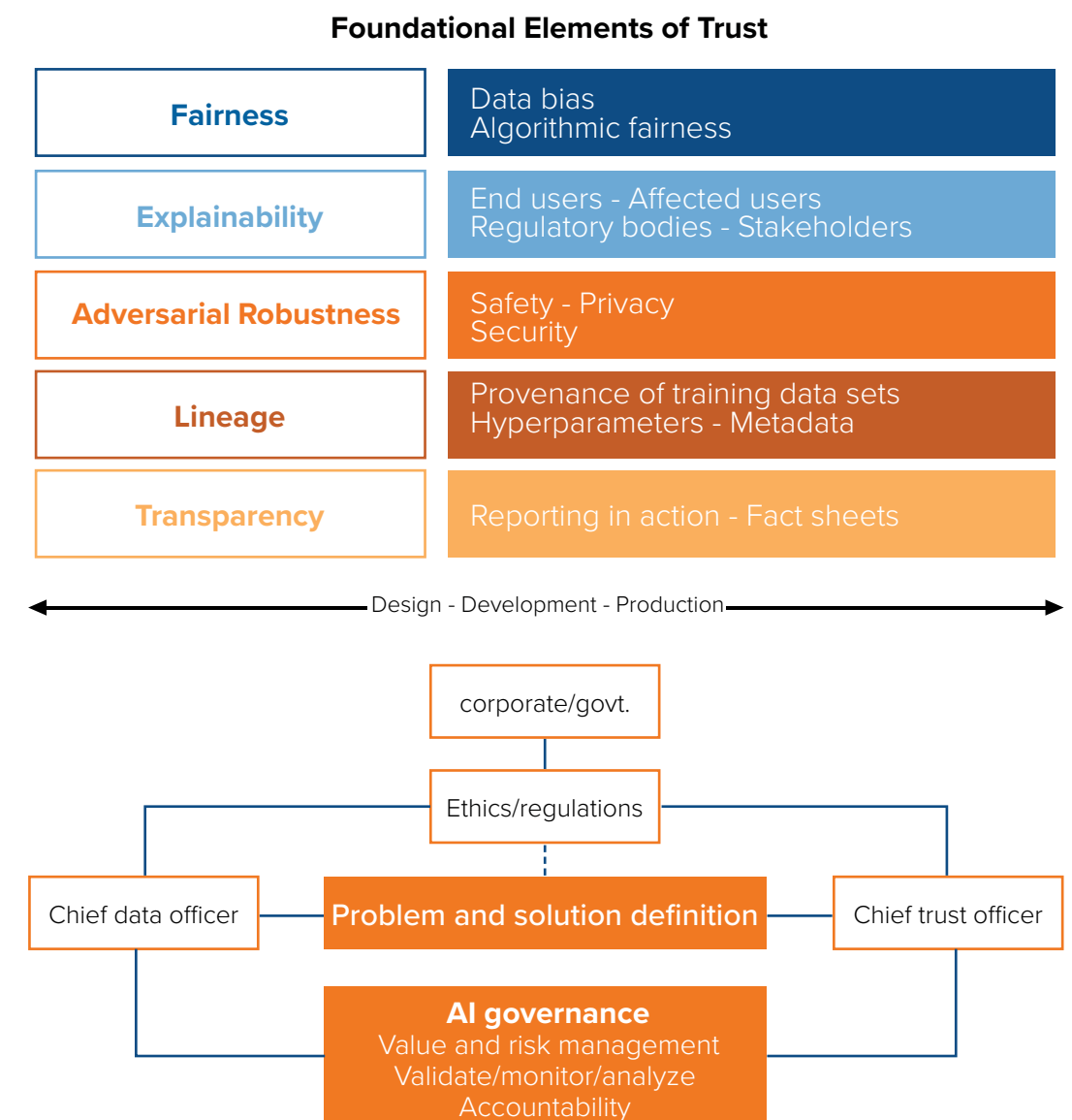**A well-governed AI implementation should ensure:**

- The development and enforcement of the right policies throughout the AI life cycle
- Communication and collaboration between all personas
- Availability of a centralized view of all stages across the AI life cycle
- Automated continuous improvement of outcomes from a feedback loop
- Automated documentation based on metadata captured across the life cycle

Figure 9: AI Implementation Governance Framework

Foundational Elements of Trust

Fairness	Data bias Algorithmic fairness
Explainability	End users - Affected users Regulatory bodies - Stakeholders
Adversarial Robustness	Safety - Privacy Security
Lineage	Provenance of training data sets Hyperparameters - Metadata
Transparency	Reporting in action - Fact sheets

◄——— Design - Development - Production ———►

corporate/govt.

Ethics/regulations

Chief data officer

Problem and solution definition

Chief trust officer

AI governance
Value and risk management
Validate/monitor/analyze
Accountability

Additional points that should be considered when developing responsible AI:

- Some geographies that organizations operate in may lack regulatory frameworks or guidelines. In such cases, organizations must be proactive in defining what responsible AI means for their operations. They should outline how they are going to govern AI processes.

- Responsible AI should encompass ethical considerations like fairness, bias mitigation, and privacy preservation. As an extension of their internal governance mechanisms, organizations that heavily use AI should consider forming AI ethics boards to introduce specific guardrails. With such boards, organizations can ensure that the outputs of AI models do not contradict with societal norms.

- AI integrity, transparency, and explainability largely depend on data inputs and the type of underlying base model. To ensure integrity, the base model should be rigorously tested. Its parameters should also be adjusted based on the application that is being built. These steps will ensure that the model does not provide misleading answers (known as confabulations or hallucinations). Misleading answers arise when data is not diverse enough for the AI model.

- The outputs of an AI model can be very difficult to explain. However, a stringent validation framework can be used to explain different outputs of an AI model. Incorporation of explainable and controllable rules into AI system will aid explainability efforts.

- Certain AI models work like a black box and are deterministic in nature. In such instances, it is difficult to ensure 100% explainability across use cases. Nonetheless, AI can still be leveraged to give guidance, and human supervision can be incorporated in the decision-making process.

- Machine learning operations (MLOps) can be leveraged to scale AI models and handle multiple use cases. MLOps will increase control over AI model life cycle.

- Organizations should ensure that the AI-augmented products and services they purchase make use of responsible AI.

- AI workloads are quite compute intensive and, as an extension of the responsible AI strategy, it is also important to factor in AI's impact on environmental sustainability. Organizations should design green and sustainable digital infrastructure architecture to minimize and / or eliminate the environmental impact of AI.

The Way Forward

To succeed in their AI journeys, governments and end user organizations should:

- **Implement an organization-wide AI strategy.** Organizations should ensure that different units and teams understand key business goals and define how AI will support the achievement of those goals. Top management should empower business units to take ownership of their data and be part of the AI use case identification and implementation process, as AI initiatives require strong alignments between IT and business for success. In line with their national visions, government should similarly ensure that organizations adopt AI in a responsible manner and meet defined goals within the required timeframes.

- **Closely monitor AI technology evolution.** Despite being at an early stage in its evolution, AI technology is advancing rapidly and has already started disrupting business processes and daily lives. Organizations and governments should stay abreast of developments in the AI space to maintain a competitive edge, drive operational efficiency, and deliver enhanced customer/citizen experience.

- **Become data-driven.** Before embarking on AI, organizations should have a structured approach toward storing and maintaining data. In other words, organizations should adopt a data-driven culture and manage the entire data life cycle in a systematic way. These efforts should be underpinned by a modern data architecture. If an organization has the ability to collect data from various internal and external sources and ingest, cleanse, label, categorize, and prepare that data, it can successfully unlock the true value of AI.

- **Prioritize AI-based use cases.** Organizations should enhance their data readiness and think about the business value they want to achieve by leveraging AI across different use cases. Since AI-based use cases can be costly, use cases that will not deliver the expected operational, financial, or customer value should be deprioritized.

- **Use AI for social, economic, and environmental good.** Organizations should think about how they can leverage AI technology in different use cases to deliver greater economic, social, and environmental value. These considerations will not only improve brand value but also boost the quality of life across society.

- **Drive IT/OT convergence.** Silos between IT and OT functions should be broken to achieve greater operational value. A converged IT security framework, data governance model, and resource optimization practice will be highly important in AI initiatives. As demontrated in the ADNOC example, an organization's ability to have a holistic view of its operations through advanced analytics and AI makes a lot of difference.

- **Implement a talent strategy.** The business goal of AI (and any other technology) is to grow and manage costs in an effective manner. Advancements in the AI space have already started redefining the job market. In fact, many jobs as we today might be carried out by AI in the future. Organizations should thus consider reskilling or upskilling their resources in ways that meet new business requirements. Similarly, governments should broadly evaluate how jobs are going to be impacted and identify the new job roles that will arise. By doing so, they can develop appropriate national talent strategies.

- **Build industry ecosystems to address complex business requirements.** Small AI use cases can deliver great value to organizations. Single organizations can internally develop and implement such use cases or work with a partner to roll out AI projects. Conversely, organizations from different industries and backgrounds need to work together to resolve more complex business problems. Building and governing industry ecosystems is difficult; nevertheless, any organization can achieve its business outcomes by shifting away from linear partnership models to industry ecosystem-driven partnerships.

- **Build a responsible AI practice.** Organizations should implement an internal governance mechanism with stakeholders from different business units to ensure responsible use of AI. AI initiatives should be built on the principles of explainability, fairness, privacy, robustness, transparency, accountability, and inclusiveness. A lack of regulatory frameworks or guidelines may be challenging, but organizations can still be proactive in developing internal governance mechanisms. Governments can also think about implementing regulations and frameworks that promote the responsible use of AI technologies. The right approach varies from country to country due to cultural and societal differences. There is no single version of truth.

About G42

G42 is a global leader in creating visionary artificial intelligence capabilities for a better tomorrow. Born in Abu Dhabi and operating worldwide, G42 champions AI as a powerful force for good.

Through its portfolio companies, G42 offers end-to-end services and products to its customers in the public and private sectors, enabling true commercial and societal impact across industries and markets.

Founded in 2018, G42 has over 23,000 employees from 85+ nationalities and is backed by two leading global investors, Mubadala and Silver Lake.

Our people are constantly reimagining what technology can do, applying advanced thinking and innovation to accelerate progress and tackle society's most pressing problems.

To learn more about G42, visit www.g42.ai

Below is a brief overview of G42's portfolio companies:

Portfolio Companies

AIQ – JV with ADNOC

Develops AI energy tools of the future to drive the oil and gas industry into the digital realm. AIQ efficiently collects, categorizes, and models data, allowing for smarter, safer, and more informed decision-making.

https://aiqintelligence.ae/

Bayanat

AI-powered, leading end-to-end provider of customized geospatial products and services in the region, enabling smarter processes and operations across a wide range of industries including, Real Estate, Oil & Gas, Defense, Transportation, Urban Development and Smart City, and more. Bayanat is a publicly listed company on the Abu Dhabi Securities Exchange (ADX).

www.bayanat.ai

Core42

Born from the merger of G42 Cloud, Injazat, and Inception in October 2023, Core42 is the UAE's national-scale enabler for cloud and generative AI, combining G42 Group's expertise across multiple technology disciplines into a single platform for public sector and large enterprise transformations. Building on our capabilities as sovereign cloud and HPC specialist, we bring generative AI, cybersecurity, professional and managed services expertise to enable national-scale program deployments across industries.

www.core42.ai

Khazna Data Centers – JV with e&

The leading commercial wholesale data center provider in the UAE and the largest data center infrastructure operator in the Middle East with over 100MW of active capacity and over 200MW under construction.

www.khazna.ae

M42 – JV between G42 Healthcare and Mubadala Health

Established in 2022, following the coming together of G42 Healthcare and Mubadala Health, M42 is a first-of-its-kind integrated healthcare company that combines unique medical and data-centric technologies with state-of-the-art facilities to deliver world-class care. By harnessing innovative solutions, unique medical and data-centric technologies, including genomics and AI, M42 is transforming the traditional healthcare ecosystem and delivering the highest level of precise, patient-centric, and preventative care. In May 2023, M42 acquired Diaverum, the world's 3rd largest dialysis provider with over 15,000 employees.

www.m42health.com

Presight

A publicly listed company on Abu Dhabi Securities Exchange (ADX), Presight is a leading AI and predictive intelligence company fusing Big Data, advanced Analytics, and Machine Learning to power the next generation of cities, businesses and industries by unlocking better decision-making processes and efficiencies.

www.presight.ai

About IDC

International Data Corporation (IDC) is the premier global provider of market intelligence, advisory services, and events for the information technology, telecommunications, and consumer technology markets. IDC helps IT professionals, business executives, and the investment community make fact-based decisions on technology purchases and business strategy. More than 1,300 IDC analysts provide global, regional, and local expertise on technology and industry opportunities and trends in over 110 countries worldwide. For 50 years, IDC has provided strategic insights to help our clients achieve their key business objectives. IDC is a subsidiary of IDG, the world's leading technology media, research, and events company.

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