UAE
Centre for the
Fourth Industrial
Revolution

مؤسسة دبي للمستقبل
DUBAI FUTURE FOUNDATION

Fourth Industrial Revolution in the UAE

100 USE CASES

October 2026

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Foreword

The Fourth Industrial Revolution (4IR) is reshaping the foundations of economic growth, industrial competitiveness, and public value. Around the world, governments and industries are moving from digital transformation as a narrow technology agenda to a broader question: how can advanced technologies be deployed responsibly, at scale, and in ways that strengthen resilience, productivity, and human progress?

The United Arab Emirates has positioned itself early in this transformation. Through long-term national strategies, investment in future technologies, agile regulation, and strong collaboration between the public and private sectors, the UAE has built an environment where innovation can move from concept to implementation. Artificial intelligence, advanced manufacturing, space technologies, digital finance, smart-city systems, clean-energy technologies, and precision agriculture are no longer distant possibilities. They are an integral part of the country's operating model for the future economy: the UAE is truly a capital of 4IR.

This report reflects that transition. It showcases 100 selected 4IR use cases across the UAE, demonstrating how 4IR technologies are being applied across sectors that matter to national competitiveness and societal well-being. The examples featured in this report show the breadth of the UAE's 4IR ecosystem: from factories and farms to hospitals, ports, financial platforms, creative industries, public services, and space-enabled applications.

The value of documenting these use cases is not only to recognise achievement. It is to support learning and further advancement. Real-world deployment reveals what policy, partnership, infrastructure, talent, and governance are required to turn technology into impact. It also allows lessons from one sector to inform progress in another.

As part of the wider 4IR network, the UAE has an opportunity to contribute practical knowledge to global conversations on responsible innovation as the first Centre with the World Economic Forum. The UAE Centre is a collaboration between Dubai Future Foundation and the World Economic Forum. It supports this effort by helping translate future-focused ideas and emerging possibilities into practical applications, partnerships and real-world experimentation. The use cases in this report show how a country can align ambition with execution, and how advanced technologies can be directed toward economic diversification, sustainability, resilience, and improved quality of life.

The 4IR will be defined not only by the technologies that emerge but also by the choices societies and industries make in applying them. The UAE's experience offers a powerful example of how vision, coordination, and implementation can come together to shape a future economy that is innovative, inclusive, and globally connected.

KHALFAN BELHOUL
Chief Executive Officer
Dubai Future Foundation

Executive Summary

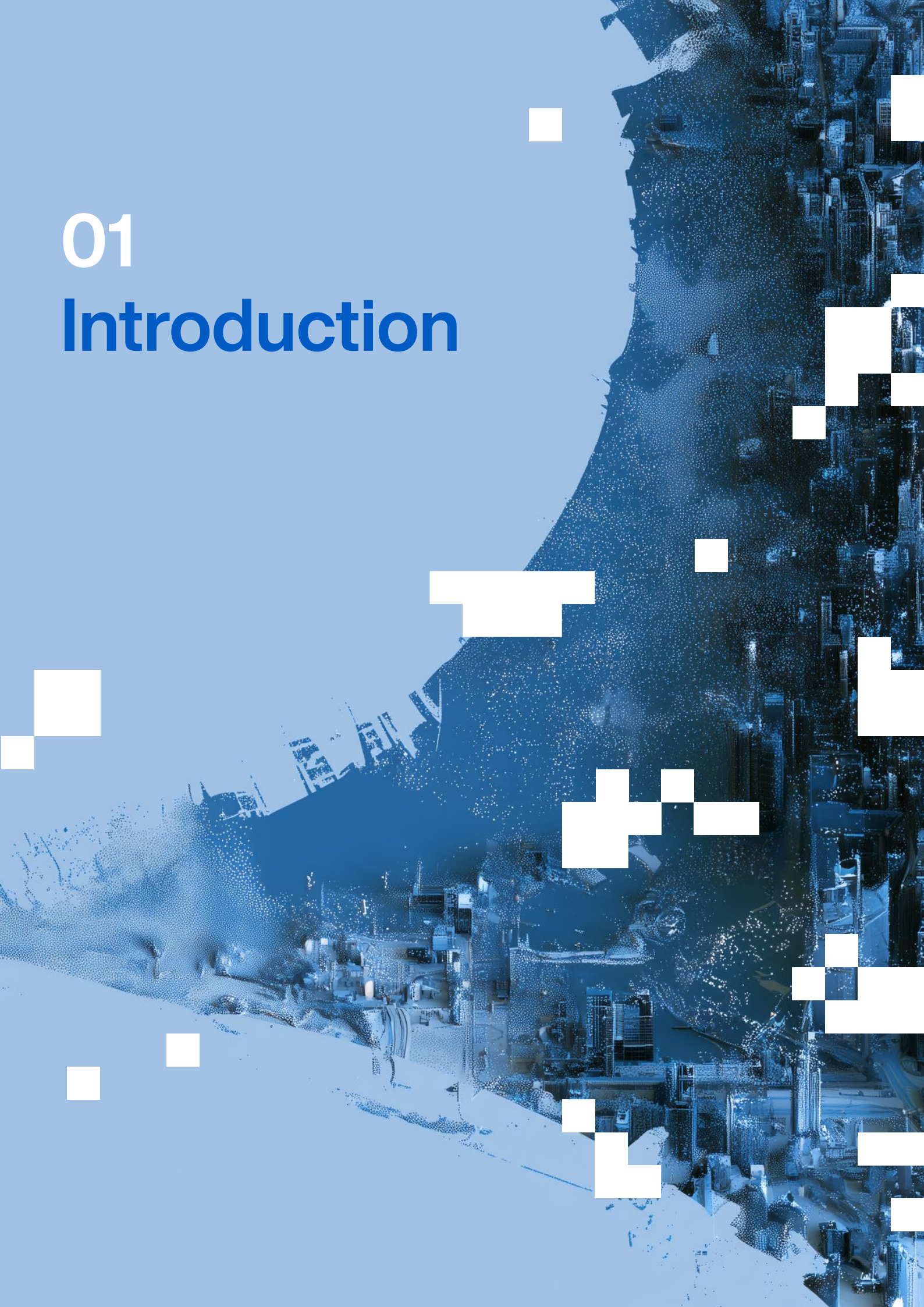
The UAE's Fourth Industrial Revolution (4IR) transformation is no longer a policy ambition. It is deployed capability. Across the country, robotic surgical platforms are operating in at least seven hospitals, two of which have together completed more than 4,000 procedures. At Dubai World Central, an indoor vertical farm has been built to grow more than one million kilograms of leafy greens a year in the desert. Near Dubai International Airport, the vertiport that its developer describes as the world's first commercial facility of its kind has reached technical completion. These are not announcements. They are operating systems.

This report documents 100 of these use cases across nine sectors: smart cities, manufacturing, energy, logistics, healthcare, agritech, fintech, space, and creative industries. Each was assessed through a structured scoring framework covering 4IR relevance, UAE significance, implementation maturity, measurable impact, replicability, and responsible deployment. The framework distinguishes between what has been announced and what has actually been built.

Three findings stand out. First, the strongest results come from technology convergence around a defined operational problem: sensors and connected assets generate data, cloud and edge systems process it, AI identifies patterns, and machines or people act on the result. Second, institutions determine whether innovation can scale. Government provides direction, regulation, infrastructure and demand; companies contribute technology, capital and operating expertise; universities and research institutes add specialist knowledge and talent; and workforce development supplies the skills and certification needed to operate new technology safely. Of the 100 cases, 61 are public-private or broader cross-sector collaborations. Third, the portfolio points to a shift from technology adoption towards domestic capability creation, from locally developed AI models and sovereign Earth-observation systems to applied robotics, precision agriculture and advanced manufacturing.

This report takes a sector-centric approach. Use cases were drawn from across the emirates and assessed on implementation maturity and strategic relevance. Some early-stage startups may not be represented, as the framework prioritises deployed and validated examples over concepts or announcements.

01
Introduction



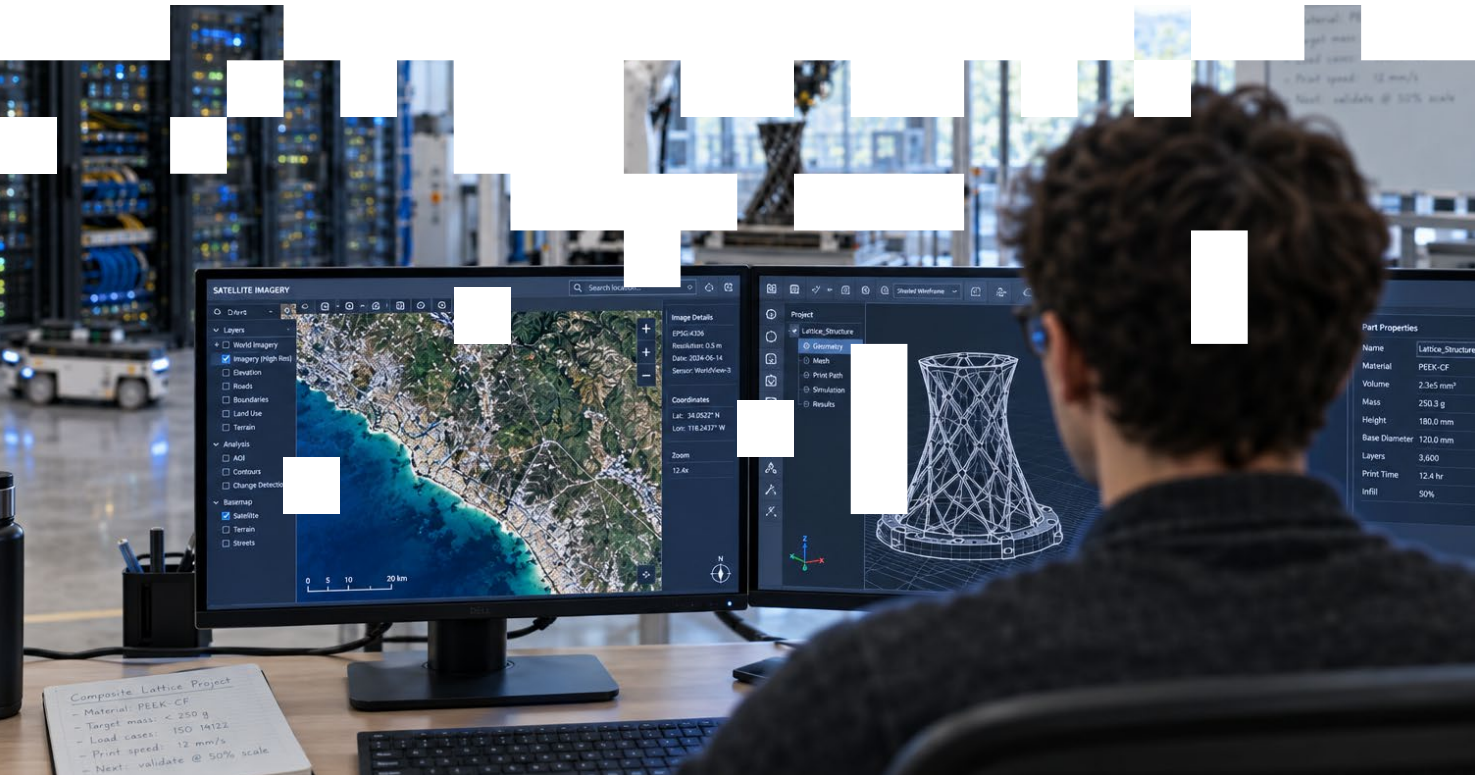
1.1 WHAT IS THE FOURTH INDUSTRIAL REVOLUTION?

The Fourth Industrial Revolution (4IR) describes a new phase of technological change in which digital, physical and biological systems are becoming increasingly interconnected.

The World Economic Forum has used the term over the past decade to describe this accelerating transformation. Although the Forum has since evolved its terminology to focus on emerging technologies, the concept remains relevant for understanding a transformation that is fundamentally different from earlier industrial revolutions because of its speed, scope and systemic impact: it is changing not only what economies produce but also how they produce it, as well as how societies live, work, govern, and relate to one another. Unlike the first industrial revolution, which was driven by mechanisation and steam power; the second, which was shaped by electricity and mass production; and the third, which centred on electronics, computing, and digital automation, the fourth is defined by convergence.[1]

This convergence matters. Artificial intelligence, robotics, cloud computing, advanced sensors, blockchain, genomics, autonomous systems, additive manufacturing, advanced materials, and satellite technologies are not developing in isolation. Their transformative potential comes from the way they combine with each other. AI can interpret data from connected machines; robotics can act on those insights in factories, warehouses, or hospitals; digital twins can simulate physical infrastructure; biotechnology can be accelerated by machine learning; and satellite data can inform climate, agriculture, logistics, and urban planning. The result is a new technological landscape in which boundaries between industries are becoming less fixed, producing multiplier effects.

This technological transformation is therefore not simply about adopting individual advanced technologies. It is about the reconfiguration of entire systems. Its defining features are speed, because technological diffusion occurs rapidly through digital networks; scale, because platforms and data systems operate across borders and sectors; and systemic impact, because technologies are reshaping institutions, labour markets, value chains, and public services at the same time.[2] For governments and industries, the central question is no longer whether these technologies will matter but how quickly and responsibly they can be deployed.



1.2 WHY 4IR MATTERS GLOBALLY AND FOR THE UAE

Around the world, governments are investing in 4IR because it has become a core driver of competitiveness, productivity, and resilience. Economies that can deploy 4IR technologies across industry, services, and government are better positioned to raise productivity, strengthen supply chains, create high-value jobs, and build new platforms of growth.[3] The applications span sectors: AI and robotics improving factory output and surgical precision, connected sensors optimising energy grids and water systems, genomics enabling earlier diagnosis, digital platforms making government services faster and more responsive, and data-driven agriculture producing more food with fewer resources.[4,5]

For the UAE, 4IR is strategic because it supports several national priorities simultaneously: economic diversification, industrial development, public-sector innovation, sustainability, food and water security, human-capital development, and global competitiveness.

***The UAE's** Fourth Industrial Revolution Strategy **aims to strengthen the country's position as a global hub for 4IR and increase the contribution of innovation and future technologies to the national economy.**[6]*

This ambition is reinforced by a wider policy architecture. The *National Artificial Intelligence Strategy 2031* positions AI as a driver of government performance and future economic value.[7] The *Digital Economy Strategy* aims to double the digital economy's contribution to GDP from 9.7% in 2022 to 19.4% by 2031.[8] *Operation 300bn* seeks to raise the industrial sector's contribution to GDP from AED 133 billion to AED 300 billion by 2031, with *UAE Industry 4.0* supporting industrial digital transformation, productivity, and high-skilled job creation.[9,10] The *UAE Net Zero 2050 Strategy*, *National Food Security Strategy 2051*, and *National Space Strategy 2030* extend this agenda into climate, food systems, and space-enabled economic development.[11,12,13]

The UAE is also home to the world's first Centre for the Fourth Industrial Revolution (C4IR UAE), established jointly by the Dubai Future Foundation and the World Economic Forum. The Centre serves as a public-private platform for developing technology governance frameworks across priority sectors, connecting UAE institutions to a global network of governments and industry working on shared 4IR challenges. This report is a product of that work.

The UAE approach is a combination of long-term ambition, institutional coordination, and practical deployment. The country has not treated 4IR as a single-sector initiative. Instead, it has embedded advanced technologies across industrial policy, digital government, climate strategy, food systems, finance, logistics, healthcare, space, and urban development. This creates a strong basis for system-level transformation: national strategies set the direction, institutions create enabling conditions, and real-world use cases show how technology can be translated into economic and social value.

1.3 WHY THIS REPORT MATTERS

The UAE has built a strong strategic foundation for 4IR. The next question is how that ambition is being translated into practice. This report focuses on implementation: where advanced technologies are already being deployed, which sectors are adopting them, and what these examples reveal about the UAE's emerging 4IR model.

Real-world use cases give the 4IR agenda its evidence base. A successful use case in one sector can offer lessons for others: AI-driven predictive maintenance developed in energy applies directly to manufacturing and logistics; precision agriculture techniques built for food security inform water management across sectors; digital-twin platforms piloted in smart cities provide frameworks adaptable to industrial and healthcare settings.

1.4 KEY TECHNOLOGIES ENABLING 4IR

This section does not aim to catalogue every technology shaping 4IR. Instead, it focuses on the role these technologies play, individually and in combination, in enabling 4IR transformation across sectors.

4IR is not powered by one technology. It happens when several technologies start working together. Sensors collect data. Cloud platforms process it. AI finds patterns. Robots and autonomous systems act on them. Digital twins test options before they are applied. Biotechnology, quantum tools, and space data open new possibilities in health, food, climate, and security. Together, these technologies are reshaping economies, governments, and societies from the ground up.

1.4.1 Digital Technologies

Digital technologies are the connective tissue of 4IR. They allow economies, industries, and governments to collect, connect, analyse, and secure data across complex systems. Their importance lies not only in the technologies themselves but also in how they work together: connected devices generate data, cloud platforms store and process it, AI converts it into insight, cybersecurity protects the system, and digital twins allow organisations to test decisions before applying them in the real world.[14,15,16]

- **Artificial intelligence** enables systems to identify patterns, generate predictions, and support decision-making at speed and scale. It is increasingly used to improve industrial productivity, optimise logistics, detect fraud, personalise healthcare, support public services, and automate complex workflows.[17]
- **Internet of Things** connects physical assets through sensors, devices, and networks. It allows machines, buildings, vehicles, farms, and infrastructure to generate real-time data, creating the basis for smart cities, smart factories, predictive maintenance, and intelligent resource management.[18]
- **Blockchain** creates shared digital records that can be verified by multiple parties without relying on a single central intermediary. Through cryptography and smart contracts, it can strengthen trust, traceability, and automation, especially when combined with IoT, AI, and digital identity in supply chains, financial services, government documentation, and asset registries.[19]
- **Cloud computing** provides the scalable computing power and storage required for advanced digital systems. It allows organisations to deploy AI, analytics, and digital platforms without building every layer of infrastructure internally, accelerating innovation and reducing barriers to adoption.[20]
- **Edge Computing** processes data closer to where it is generated – on devices, machines, or local servers – rather than sending everything to centralised cloud infrastructure. This reduces latency, improves real-time decision-making, and enables AI and IoT systems to operate in environments where connectivity is limited or speed is critical, such as factories, ports, autonomous vehicles, and remote infrastructure.
- **Cybersecurity** protects the trust and continuity of connected systems. As industries, infrastructure, and public services become more digital, cybersecurity becomes essential to economic resilience, privacy, operational reliability, and national security.[21]
- **Digital twins** create virtual models of physical assets, systems, or environments. They allow governments and companies to simulate scenarios, optimise performance, and reduce risk before making changes in the real world.[22]
- **Quantum technologies** are an emerging family that includes quantum computing, sensing, communications, and materials. They could improve complex simulation, optimisation, secure communications, and materials discovery, with applications in energy, health, climate, logistics, and cybersecurity. Even before the technology is fully mature, quantum creates strategic urgency: future systems may be capable of breaking today's encryption, making quantum-safe security and workforce readiness increasingly important.[23,24]

1.4.2 Physical Technologies

Physical technologies turn digital capability into real-world action. They are the machines, autonomous systems, production tools, and engineered materials that change how things are produced, moved, inspected, and maintained. Their impact is visible in factories, ports, farms, hospitals, construction sites, energy assets, and transport networks.[25,26]

- **Robotics** improves precision, consistency, and safety in industrial and service environments. Robots can perform repetitive, technical, or risky tasks in factories, warehouses, laboratories, hospitals, and hazardous sites. When combined with AI and sensors, they become more flexible and useful across different settings.[27]
- **Autonomous systems** operate with limited human control. These include self-driving vehicles, mobile robots, industrial machines, maritime systems, and service robots. They can reduce downtime, improve efficiency, and support operations in places that are remote, complex, or unsafe.[28]
- **Additive manufacturing**, often referred to as 3D printing, changes how products and parts are designed and made. It allows faster prototyping, more customised production, less material waste, and the creation of complex parts that may be hard or expensive to make using traditional methods.[29]
- **Drones** bring automation into the air. They can inspect infrastructure, map land, monitor crops, support emergency response, move small goods, and collect data from difficult-to-reach places. In sectors such as energy, construction, agriculture, and logistics, drones can reduce manual work and improve visibility.[30]
- **Advanced materials** improve the performance of products and infrastructure. Lighter, stronger, more durable, or more sustainable materials can support aerospace, clean energy, construction, healthcare, transport, and advanced manufacturing. Their value increases when combined with digital design and modern production methods.[31]
- **Biotechnology** uses advances in genomics, gene editing, synthetic biology, and biomanufacturing to create new treatments, crops, materials, and industrial processes. Combined with AI and advanced computing, it can speed up drug discovery, improve diagnostics, and analyse large biological datasets. In healthcare, agriculture, and biosecurity, it can support more personalised care, climate-resilient crops, disease surveillance, and more sustainable forms of production.[32]
- **Precision agriculture** uses sensors, AI, robotics, controlled environments, and data analytics to make food systems more efficient, resilient, and sustainable. Field, climate, equipment, and value-chain data support better decisions from farm to consumer. For countries facing water scarcity, arid climates, or food-import dependence, these technologies can improve how water, energy, nutrients, and land are managed.[33]
- **Space data and Earth observation** use satellites and remote sensing to monitor the planet. They support climate tracking, urban planning, disaster response, agriculture, maritime monitoring, infrastructure management, and environmental protection.[34,35]

1.5 PRIORITY SECTORS TRANSFORMING THROUGH 4IR IN THE UAE

1.5.1 Introduction to Sector Selection

The sectors identified in this report were selected because they are central to the UAE's economy and are already being reshaped by 4IR technologies. They are linked to national priorities such as diversification, resilience, sustainability, competitiveness, public-service innovation, and human-capital development, while also showing clear signs of technology-led change.

The selection reflects three criteria: why the sector matters for 4IR globally, why it matters for the UAE, and how UAE policies and strategies are shaping the way ahead. Together, these sectors show how 4IR is moving into practical areas of the UAE national transformation.

1.5.2 Smart Cities

Why the sector matters for 4IR. Smart cities are one of the clearest expressions of 4IR because they connect infrastructure, mobility, energy, public services, and citizen experience through data. Around the world, cities are using sensors, cloud platforms, digital identity, AI, digital twins, and integrated command systems to improve how urban systems are planned, monitored, and managed. The impact is practical: traffic can be managed in real time, public services can become more proactive, infrastructure can be maintained before failures occur, and urban planning can become more evidence-based.[36]

Why the sector matters for the UAE. The UAE is highly urbanised, digitally ambitious, and globally connected, making smart-city transformation central to national competitiveness and quality of life. Dubai and Abu Dhabi have both positioned digital government and smart infrastructure as foundations of future governance, with Sharjah, Ras Al Khaimah, and the northern emirates following with their own digital transformation agendas.[37,38]

UAE policies and the way ahead. The *UAE Digital Government Strategy 2025* aims to embed digital transformation across government and make services more inclusive, resilient, user-driven, data-driven, and proactive.[39] UAE smart-city initiatives also emphasise digital services, smart infrastructure, and sustainable urban management.[40] The next stage will see deeper integration across agencies, stronger data governance, cyber resilience, trusted AI, and the ability to scale digital services across the full public-sector ecosystem.

1.5.3 Manufacturing and Advanced Industry

Why the sector matters for 4IR. Manufacturing is one of the original anchors of *Industry 4.0* – the application of digital technologies such as robotics, AI, and connected systems to transform industrial production. Globally, connected machines, robotics, additive manufacturing, digital twins, AI-enabled quality control, and predictive maintenance have changed how products are designed, produced, and serviced. The shift is not only about automation. It is about more flexible, data-driven production systems that can reduce downtime, improve quality, lower waste, and support more customised production.[41]

Why the sector matters for the UAE. Manufacturing is central to the UAE's diversification agenda.[42] The country is building industrial capability in areas such as advanced manufacturing, food production, pharmaceuticals, clean-energy equipment, and technology-enabled industry.[43,44] 4IR technologies can help UAE manufacturers compete on productivity, quality, speed, and sustainability rather than cost alone. For a country seeking deeper local production, stronger supply chains, and higher-value exports, advanced manufacturing is one of the most direct pathways from technology adoption to economic value.

UAE policies and the way ahead. *Operation 300bn* aims to raise the industrial sector's contribution to GDP from AED 133 billion to AED 300 billion by 2031.[45] *UAE Industry 4.0* supports this goal through technology adoption, readiness assessments, financing, and incentives for industrial digital transformation.[46] The next step is scale: moving advanced manufacturing capabilities beyond national champions into SMEs, industrial zones, and supplier networks.

1.5.4 Energy and Clean Technologies

Why the sector matters for 4IR. Energy systems have become more digital, distributed, and data-intensive. AI, IoT, drones, robotics, digital twins, and advanced analytics are being used to optimise grids, manage demand, integrate renewable energy, inspect assets, and improve operational efficiency. This matters because the energy transition is not only about adding clean generation capacity. It also requires smarter systems that can balance reliability, affordability, decarbonisation, and resilience.[47,48]

Why the sector matters for the UAE. Energy is one of the UAE's most strategically important sectors, both economically and geopolitically. The country is investing heavily in renewables, grid modernisation, carbon management, and industrial efficiency.[49,50] 4IR technologies are relevant across this transition. They can improve existing energy operations while accelerating cleaner, more flexible, and more efficient energy systems. The UAE's energy sector also has the scale and investment capacity needed to deploy advanced AI, robotics, remote operations, and industrial data platforms.

UAE policies and the way ahead. The *UAE Energy Strategy 2050* aims to triple the contribution of renewable energy and invest AED 150 to AED 200 billion by 2030 to meet growing energy demand.[51] The *UAE Net Zero 2050 Strategy* sets the wider decarbonisation direction.[52] The opportunity ahead is to use 4IR not only to reduce emissions but also to build a more intelligent, efficient, and resilient energy system.

1.5.5 Logistics and Mobility

Why the sector matters for 4IR. Logistics has been transformed by data, automation, and connectivity. Ports, airports, warehouses, roads, and freight corridors increasingly depend on digital platforms, IoT tracking, electronic documentation, AI-enabled planning, and more interoperable data exchange between public and private actors. These capabilities can reduce delays, improve route planning, increase visibility, and strengthen supply-chain resilience. As supply chains are more exposed to disruption, logistics systems that can anticipate shocks, coordinate across networks, and move goods with speed, transparency, and reliability have an advantage.[53]

Why the sector matters for the UAE. The UAE's economic model is linked heavily to its role as a global trade, logistics, and aviation hub. Its ports, airports, free zones, and multimodal corridors support the country's connectivity with regional and international markets.[54] 4IR is especially relevant because logistics competitiveness increasingly depends on speed, visibility, automation, and trusted digital documentation. Smart logistics can reinforce further the UAE's position as a gateway economy, support non-oil trade, and create opportunities in e-commerce, cold-chain logistics, autonomous delivery, and regional supply-chain orchestration.[55]

UAE policies and the way ahead. The UAE is developing a *National Logistics Integration Strategy*, targeting growth in the sector's contribution from AED 136.7 billion in 2024 to over AED 200 billion by 2032. Dubai's *Commercial and Logistics Land Transport Strategy 2030* and the *Dubai Logistics Master Plan 2040* complement this at the emirate level. The recently inaugurated Etihad Rail, a 900-kilometre freight network linking all seven emirates, adds a critical multimodal dimension to the sector.

1.5.6 Healthcare and Life Sciences

Why the sector matters for 4IR. Healthcare is being reshaped by data, AI, genomics, connected devices, robotics, and digital platforms. These technologies can support earlier diagnosis, personalised medicine, remote monitoring, clinical decision support, public-health surveillance, and more efficient care delivery. The 4IR shift in healthcare is important because it links technology directly to human outcomes. Better use of data can help health systems move from reactive treatment toward more predictive, preventive, and personalised care.[56]

Why the sector matters for the UAE. Healthcare is central to the UAE's long-term competitiveness because it affects population well-being, national resilience, and the country's ability to attract talent, investment, and specialised expertise. 4IR technologies are increasingly relevant to this agenda: secure health-data exchange can improve continuity of care, AI can support faster and more accurate decision-making, genomics can enable more personalised medicine, and digital platforms can extend services beyond traditional clinical settings. The UAE's opportunity is to connect these capabilities into a more integrated, preventive, and data-enabled health system, while maintaining the trust, privacy, and clinical governance required in healthcare.[57,58]

UAE policies and the way ahead. The UAE's healthcare 4IR agenda is supported by the *National Artificial Intelligence Strategy 2031*, national health programmes such as the *National Genome Strategy* and *Emirati Genome Programme*, and digital health infrastructure including Riayati, Malaffi, and Nabidh.[59,60] The opportunity ahead is to use 4IR not only to digitise healthcare services but also to build a more integrated, predictive, and personalised health system supported by trusted data, responsible AI, and strong clinical governance.

1.5.7 Agritech and Food Security

Why the sector matters for 4IR. Food systems are under pressure from climate change, water scarcity, supply-chain disruption, and rising demand. 4IR technologies are increasingly being used to produce food more efficiently and resiliently. Precision agriculture, controlled-environment farming, sensors, AI, robotics, drones, biotechnology, and data platforms can help optimise water, energy, nutrients, and land use. The value of agritech is not only higher productivity; it is also the ability to make food production more predictable, resource-efficient, and adaptable in difficult environmental conditions.[61]

Why the sector matters for the UAE. Agritech is strategically important for the UAE because food security is shaped by arid conditions, limited freshwater resources, and reliance on imported food.[62] These constraints make conventional agriculture difficult, but they also create strong incentives for innovation. Controlled-environment agriculture, vertical farming, desert agriculture, alternative proteins, and AI-enabled resource management are especially relevant because they can reduce pressure on water and land while strengthening local production capacity.[63] For the UAE, agritech is both a resilience strategy and an economic opportunity, with potential to develop models that can be adapted by other arid and climate-stressed regions.

UAE policies and the way ahead. The *National Food Security Strategy 2051* aims to make the UAE a world-leading hub for innovation-driven food security and enhance local production through modern technologies.[64] The way ahead is linked to scaling commercially viable models, linking farms to data and logistics systems, supporting R&D, and ensuring that new production methods are energy- and water-efficient.

1.5.8 Fintech and Digital Finance

Why the sector matters for 4IR. Financial services are being transformed by digital payments, AI, blockchain, cloud infrastructure, open finance, digital identity, and real-time data. Fintech can improve speed, access, transparency, and efficiency across payments, lending, insurance, capital markets, and compliance. It can also support financial inclusion and lower transaction costs, while creating new risks around cybersecurity, data governance, market integrity, and consumer protection. The sector is therefore a major test of how countries balance innovation with trust.[65]

Why the sector matters for the UAE. The UAE has a strong financial sector and a growing fintech ecosystem supported by national digital-economy ambitions and financial-sector digital transformation.[66,67] Digital finance supports faster payments, more efficient financial infrastructure, and new models for financial access.[68] It also connects directly to other 4IR sectors: smart cities require seamless payments, logistics depends on trade finance and digital documentation, SMEs need access to finance, and digital identity underpins trusted transactions. For the UAE, fintech strengthens both economic competitiveness and the financial infrastructure needed for a more digital, connected economy.

UAE policies and the way ahead. The Central Bank of the UAE's FinTech Office aims to build a mature fintech ecosystem and position the UAE as a leading fintech hub regionally and globally.[69] The *Financial Infrastructure Transformation Programme* is designed to accelerate digital transformation in financial services and strengthen the UAE's competitiveness as a financial and digital payment hub.[70] Future opportunities include open finance, AI-enabled supervision, embedded finance, secure cloud infrastructure, and cross-border payment innovation.

1.5.9 Space

Why the sector matters for 4IR. Space is increasingly part of the 4IR economy because satellites generate data that supports decisions across many sectors. Earth observation, satellite communications, navigation, remote sensing, and space-enabled analytics are used in climate monitoring, disaster response, agriculture, maritime security, urban planning, infrastructure management, and environmental protection. Space data becomes more valuable when combined with AI, cloud computing, and digital platforms, turning satellite imagery and signals into operational intelligence.[71,72]

Why the sector matters for the UAE. Space is strategically important for the UAE because it supports economic diversification, scientific capability, national prestige, security, education, and advanced technology development.[73] The country has built one of the region's most visible space programmes, supported by institutions, missions, satellite capabilities, and private-sector participation. Its relevance to 4IR goes beyond space exploration. Space data can support climate action, food security, logistics, energy infrastructure, urban planning, and emergency management, making space a cross-sector enabler.

UAE policies and the way ahead. The *National Space Strategy 2030* aims to enhance the space sector's contribution to the national economy and strengthen the UAE's regional and international role in space.[74] The *UAE Space Agency* is also advancing Earth observation and remote sensing capabilities to monitor climate change, vegetation, land use, disasters, and urban planning.[75] The next opportunity is to convert missions and satellite capabilities into downstream applications with commercial, environmental, and public-sector value.

1.5.10 Creative Industries

Why the sector matters for 4IR. Creative industries are being reshaped by digital platforms, AI, immersive media, gaming, virtual production, blockchain, digital rights management, and audience analytics. AI can support content creation, translation, design, editing, and personalisation, while immersive technologies create new formats for entertainment, education, tourism, and cultural heritage. At the same time, digital transformation raises questions about intellectual property, creator income, platform concentration, and responsible use of generative AI.[76,77]

Why the sector matters for the UAE. Creative industries matter for the UAE because they support diversification, talent attraction, cultural identity, tourism, media, design, and the wider knowledge economy.[78,79] The sector is also closely connected to youth, entrepreneurship, and global soft power. As the UAE invests in digital media, cultural districts and creative-economy platforms, 4IR technologies can help local creators reach global audiences and build new business models. The sector's importance lies in combining technology, culture, and commerce.

UAE policies and the way ahead. The UAE's *National Strategy for the Cultural and Creative Industries* aims to promote sector growth and increase its contribution to the national economy.[80] The *Dubai Creative Economy Strategy* aims to make Dubai a global capital of the creative economy and increase the contribution of creative industries to Dubai's GDP.[81] The way ahead will require support for talent, digital skills, intellectual-property protection, responsible AI use, financing, and global market access.

1.6 METHODOLOGY AND SELECTION CRITERIA

1.6.1 Objective of the Mapping Exercise

The mapping exercise was designed to identify and document UAE-based 4IR use cases that demonstrate practical deployment, strategic relevance, and potential for wider learning. Its purpose is not only to showcase innovation but also to highlight examples that reflect the UAE's ability to translate national ambition into implemented solutions. By capturing use cases across priority sectors, the report aims to share best practices, support cross-sector learning, and strengthen the UAE's positioning within global 4IR networks. The exercise also provides a structured evidence base for understanding where advanced technologies are already creating value, where deployment models are emerging, and where future scaling opportunities may exist.

1.6.2 How Use Cases Were Identified

Use cases were identified through a multi-stage process combining desk research, stakeholder engagement, and validation. Desk research was used to build an initial longlist of UAE-based 4IR examples across priority sectors, drawing on public sources such as government strategies, institutional announcements, company materials, industry reports, media coverage, and technology programme documentation. This helped establish the basic profile of each use case, including the technology applied, sector relevance, actors involved, location, maturity, and available evidence of impact.

This was complemented by stakeholder engagement across government, industry, and academia. Government consultations helped identify policy-relevant initiatives and clarify how use cases align with national strategies or emirate-level priorities. Industry outreach helped surface operational deployments, private-sector innovation, and examples of technology adoption within firms, platforms, and infrastructure systems. Engagement with universities and research institutions helped capture use cases where applied research, testbeds, or scientific capability contribute to 4IR deployment.

The process also included a validation stage. Use cases were reviewed to confirm whether they were genuinely connected to the UAE and whether the 4IR technology was central rather than peripheral. Where possible, claims were checked against multiple sources or stakeholder input. Cases based only on announcements, unclear implementation status, or limited evidence were treated cautiously. This helped distinguish between concepts, pilots, operational deployments, and scaled examples, while maintaining a UAE-wide view of the 4IR ecosystem.

1.6.3 Selection Criteria and Scoring Framework

Use cases were assessed using a six-criterion scoring framework. Each criterion was scored from 1 to 5, with equal weighting across all criteria and a maximum total score of 30. The framework was designed to balance technological relevance with UAE significance, implementation maturity, evidence of impact, scalability, and responsible deployment.

The first criterion is **4IR relevance**. This assesses the degree to which 4IR technologies are meaningfully integrated into the use case. A low score indicates that no meaningful 4IR technology is present or that technology is peripheral. A high score indicates that 4IR technology is central to delivery, with the strongest cases showing deep, multi-layered applications such as AI combined with IoT, robotics, digital twins, or advanced analytics. A minimum score of 4 is required for inclusion.

The second criterion is **UAE significance**. This assesses the strength of the use case's connection to the UAE, including whether it is deployed, financed, governed, or strategically relevant in the country. Higher scores are given to cases that respond directly to UAE national priorities or strengthen the country's regional or global positioning in the sector. A minimum score of 3 is required.

The third criterion is **implementation maturity**. This distinguishes between ideas, proofs of concept, pilots, operational deployments, and scaled deployments. A minimum score of 3 is required after adjustment. Where appropriate, an additional point may be applied for substantive government involvement or for university and research-institution participation, recognising their role in public value creation, institutional adoption, and research translation.

The remaining criteria do not act as gates but influence the total score. **Measurable impact** assesses whether there is credible qualitative or quantitative evidence of outcomes. **Replicability and scalability** considers whether the model can be adapted across sites, sectors, emirates, or markets. **Responsible deployment and trust** assesses whether safeguards are in place, including privacy, safety, ethics, cybersecurity, workforce readiness, standards, and interoperability. Weak scores in these areas do not automatically exclude a use case, but they reduce its priority and highlight areas where further evidence or governance may be needed.

1.6.4 Scope and Limitations

The mapping is UAE-wide but non-exhaustive. It provides a structured snapshot of selected 4IR use cases based on available evidence, desk research, stakeholder input, and validation at the time of review. Because the technology landscape is evolving quickly, some initiatives may advance, change scope, or generate new evidence after publication. The report therefore should be read as a practical mapping exercise rather than a complete inventory of all UAE 4IR activity. Assessments of responsible deployment rely on published information and stakeholder input, and have not been independently audited.

This report was produced with the assistance of AI tools. Human–Machine Collaboration icons are included throughout to indicate where AI played a role in the work described.

1.7 CONCLUSIONS

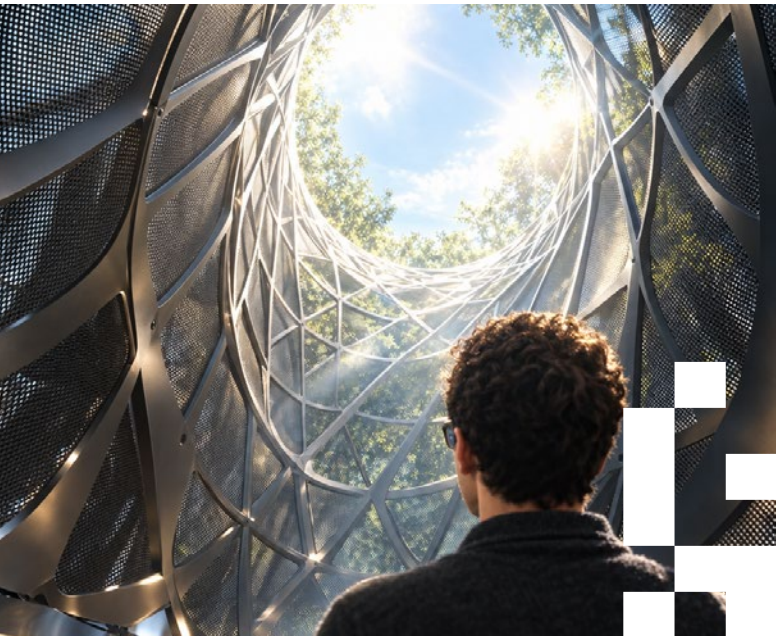
The 100 use cases show that the Fourth Industrial Revolution is a vital part of the economic and technological agenda of the UAE. Across nine sectors, advanced technologies are converging within the country's core operating systems, reshaping how it produces, moves, powers, protects and serves.

What the cases reveal

Three findings stand out. First, the strongest results come from technology convergence around a defined operational problem. Sensors and connected assets generate data; cloud and edge systems process it; AI identifies patterns; and robots, autonomous systems or human operators act on the result. Value is created by the functioning system, not by any single technology in isolation.

Second, institutions determine whether innovation can scale. Of the 100 cases, 61 are classified as public-private or broader cross-sector collaborations. Government provides direction, regulation, infrastructure and demand; companies contribute technology, capital and operating expertise; universities and research institutes add specialist knowledge, validation and talent; and workforce development supplies the skills and certification needed to operate new technology safely. Mature deployments are supported by these relationships. Scale is therefore institutional as well as technical.

Third, the portfolio points to a shift from technology adoption towards domestic capability creation. Locally developed AI models, sovereign Earth-observation systems, applied robotics, precision agriculture and advanced manufacturing show the UAE increasingly designing, adapting and operating complex technologies within its own ecosystem. The strategic value lies in retaining knowledge, improving systems over time and translating research into deployable products and services.



Advances across key sectors

The effects are already visible across major systems. Emirates Global Aluminium has deployed more than 100 AI and data use cases, generating USD 123 million in financial impact since 2021. ADNOC Gas and Immensa have digitised more than 3,500 spare parts, enabling local, on-demand production; dnata has cut a complete warehouse inventory check from about 48 hours to 3 hours; DEWA operates 2.3 million smart meters; and Hassantuk connects more than 25,000 buildings to continuous fire and life-safety monitoring. In healthcare, robotics, genomic sequencing and high-throughput diagnostics are expanding capacity for more connected, data-enabled and personalised care. Together, the cases show advanced technologies becoming part of the operating fabric of key sectors.

Where the next gains could come from

The next opportunity is to extract more value from capabilities already being built. Data, platforms, infrastructure and expertise developed for one application can increasingly support others, turning successful deployments into reusable capabilities. Genomics, digital pathology and AI-supported diagnostics can be combined more systematically in healthcare; controlled-environment agriculture can integrate more deeply with crop genetics, automation, satellite monitoring and precision water management; and space data, local-language AI and digital financial infrastructure can support wider applications across climate monitoring, education, logistics, public services and cross-border commerce. The next phase is therefore about wider reuse, integration and diffusion of proven capabilities.

A recurring evidence base

This report is a baseline, not a finished inventory. Future work could revisit the documented cases, test whether benefits are sustained and explore new applications and sectors, showing which approaches deliver durable economic, social and public value and what enables them to be replicated at scale.

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02
Case Studies

MANUFACTURING

4IR Technologies:
Additive manufacturing, Robotics

Emirate:
Dubai

Maturity:
Operational Deployment

Type:
Public-Private

001

3D Concrete Printing for Construction

ACTORS

3DXB Group
Dubai Municipality
Mohammed Bin Rashid Housing Establishment

SNAPSHOT

3DXB Group used large-scale concrete 3D printing to produce a residential villa in Dubai's Al Awir 1 area, achieving the Guinness World Record for the largest 3D-printed villa in December 2023. The 4-metre-high structure has a built-up area of 303 square metres and was printed in a single continuous session of approximately 190 hours using locally sourced concrete.[1,2] The project was delivered in partnership with Dubai Municipality and Mohammed Bin Rashid Housing Establishment.[3]

4
METRES
structural walls printed in a single continuous session

190
HOURS
to print the villa structure

6 vs
8–12
MONTHS
total project timeline against the conventional UAE villa build

WHY IT MATTERS

Building a residential villa typically requires weeks of formwork, curing cycles, and manual labour across multiple trades. In the UAE, outdoor construction is further affected by seasonal heat restrictions, including the mandatory midday break for work in open spaces and under direct sunlight.[4]

Large-scale concrete 3D printing addresses these constraints by replacing manual formwork and assembly with robotic extrusion guided by digital design files. The technology can reduce construction time, cut material waste, lower labour requirements, and enable geometries that would be difficult or uneconomical with traditional methods. For the UAE, where construction is a major economic sector and labour productivity is a strategic priority, 3D printing offers a pathway to a more automated, digitally driven building industry.

HOW THE TECHNOLOGY WORKS

The 3DXB system uses the MaxiPrinter, a mobile hydraulic robotic-arm concrete 3D printer designed for on-site construction.[5] The printer extrudes concrete layer by layer following a path defined by a digital design file.[6] The villa's structural walls were printed in a single continuous session at 4 metres in height, with locally sourced concrete formulated for the extrusion process.[7] Dubai Municipality and Mohammed Bin Rashid Housing Establishment oversaw regulatory compliance of building materials and processes throughout the project.[8]

IMPACT AND RESULTS

The villa was printed in approximately 190 hours, with a total project timeline of 6 months including conventional foundations and roofing. By comparison, a conventionally built villa of similar size in the UAE typically takes between eight and twelve months to complete.[9] Dubai Municipality identifies shorter construction supply chains as one of the potential economic benefits of 3D-printed construction.[10] The project achieved the Guinness World Record for the largest 3D-printed villa, independently verified in December 2023.[11]

What made the project possible was not only the printing technology but the regulatory pathway behind it. Decree No. 24 of 2021, issued by HH Sheikh Mohammed bin Rashid Al Maktoum, established a regulatory framework for the use of 3D printing in Dubai's construction sector, with Dubai Municipality responsible for overseeing its implementation.[12] In July 2023, the Municipality put the framework into practice by issuing Dubai's first construction licence for a 3D-printed private villa, clearing the way for the Al Awir 1 project to proceed.[13]

WHAT'S NEXT

Dubai's 3D Printing Strategy sets a target of 25% of new buildings to be constructed using 3D printing by 2030.[14] Since the 3DXB villa, the market has begun to move: Nakheel completed a fully functional 3D-printed gatehouse at its Tilal Al Furjan development in 2024.[15] Elsewhere in Dubai, a 2,000-square-metre 3D-printed mosque is under construction in Bur Dubai.[16,17] 3DXB has also reported plans to develop a further 12 villas and an office building in Fujairah Free Zone.[18]

Scaling will require continued development of certification and conformity systems for 3D-printing materials, equipment and production processes,[19] alongside effective integration of printed structures with conventional building systems and project-delivery workflows.[20] The opportunity now is to turn early proof points into a repeatable delivery model, making 3D printing a practical and scalable part of the UAE's construction pipeline on the path to the 2030 target.

"This Guinness World Record is not just about the sheer height of the structure, but also about the innovative approach of printing a four-metre-high building in one session. It is a matter of pride for us to be at the forefront of technological advancements in construction, contributing to the realisation of Dubai's 3D Printing Strategy 2030," said Badar Rashid AlBlooshi, Chairman, 3DXB Group.[21]

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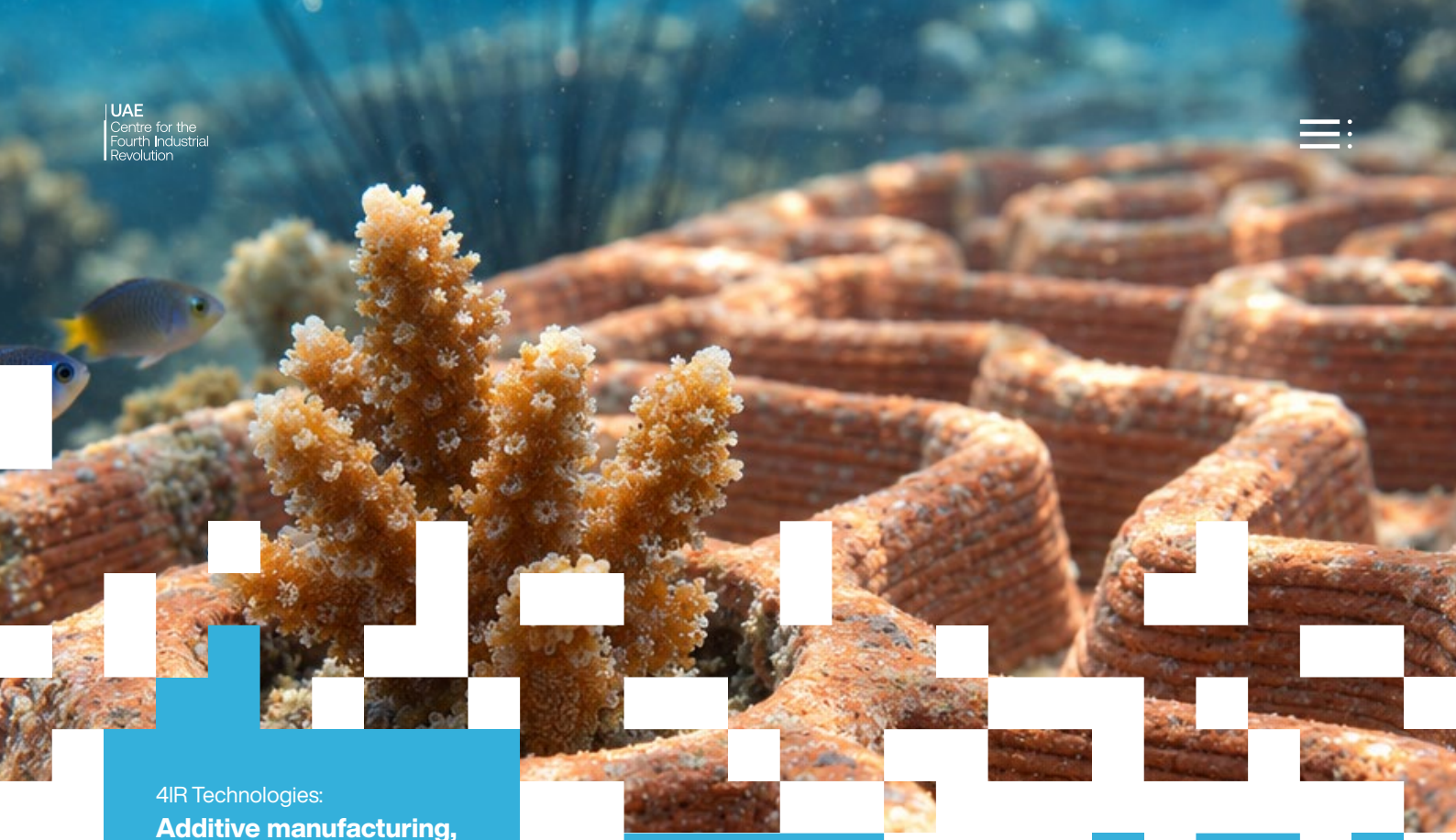


MANUFACTURING

4IR Technologies:
Additive manufacturing, IoT, AI

Emirate:
Abu Dhabi

Maturity:
Pilot Deployment

Type:
Public-Private

002

3D-Printed Reef Tiles for Marine Habitat Restoration

ACTORS

Archireef
ADQ
Environment Agency Abu Dhabi

SNAPSHOT

ADQ, the Environment Agency Abu Dhabi (EAD), and Archireef, a Hong Kong-based climate technology company, have deployed 3D-printed terracotta reef tiles off the shore of Abu Dhabi, marking the first outplantation project of its kind in the UAE and the wider Gulf region. The tiles are manufactured at Archireef's production facility in a KEZAD Group economic zone and deployed at a marine protected area near Um Khorah Island, where 40 square metres of reef structures now house approximately 1,200 coral fragments grown in EAD's own nurseries.[1]

WHY IT MATTERS

Coral reefs face severe global pressure from rising sea temperatures, ocean acidification, and storm damage. The Intergovernmental Panel on Climate Change (IPCC) estimates that 70% to 90% of tropical coral reefs will disappear even if warming is limited to 1.5°C.[2] Abu Dhabi has 700 kilometres of Arabian Gulf coastline supporting some of the region's richest coral habitats, making reef degradation both an environmental and an economic concern for fisheries, coastal protection, tourism, and marine biodiversity.[3] For the UAE, the significance is strategic as well as ecological: Abu Dhabi holds some of the most heat-tolerant corals on the planet,[4] yet they already sit near the limits of that tolerance, with bleaching observed after prolonged exposure to temperatures above 34°C.[5]

Conventional artificial reefs often use pollutant-leaching materials such as concrete or metal structures and can suffer from sedimentation buildup that chokes new coral growth. 3D-printed terracotta tiles address this by replicating the complex branching patterns of natural coral at a precision that conventional methods cannot achieve. The tiles are manufactured from clay, an inert and environmentally benign material, and their geometry is specifically engineered to prevent sediment accumulation while providing the surface textures and micro-habitats that coral larvae need to attach and grow.[6]

HOW THE TECHNOLOGY WORKS

A team of marine biologists and architects designed the reef tile geometry to closely mimic the natural patterns of coral formations. The tiles are produced through custom 3D clay printing at Archireef's production facility in an economic zone under KEZAD Group.[7] Each tile uses three base legs that provide stability, prevent the structure from sinking into the seafloor, and protect against sedimentation.[8]

EAD's coral experts worked with ADQ and Archireef to assess and select the outplantation site and provided coral fragments from the agency's in-situ coral nursery.[9] A team of seven scuba divers installed the Abu Dhabi deployment over 5 days.[10] The wider ADQ–Archireef partnership combines 3D printing, IoT and AI to support marine biodiversity restoration.[11] Following installation, the Abu Dhabi site is continuously monitored to track coral performance and wider ecological recovery. Repeat photography documents changes around the tiles, including the arrival and colonisation of fish within the restored habitat.[12]

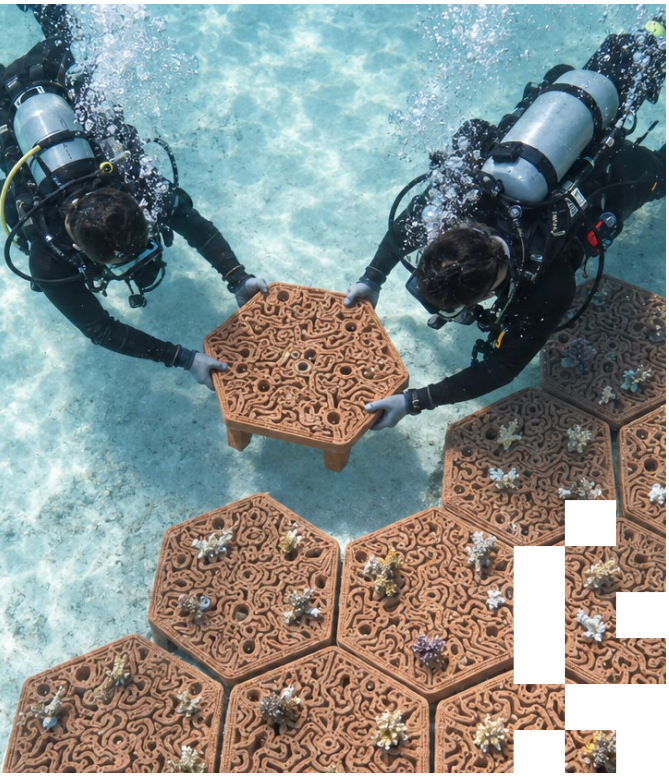
1,200
CORAL FRAGMENTS
housed across the pilot deployment

4 million
CORAL COLONIES
targeted UAE-wide by 2030

IMPACT AND RESULTS

The Abu Dhabi deployment covers 40 square metres of reef tiles housing approximately 1,200 coral fragments at a marine protected area near Um Khorah Island in the Al Dhafra Region. It is the first deployment of its kind in the UAE and the wider Gulf region. Archireef reports a 95% coral survival rate from its comparable terracotta-tile project in Hong Kong, the benchmark it expects the Abu Dhabi deployment to approach.[13]

EAD's marine preservation initiatives were named one of the first 10 UN World Restoration Flagships recognised globally by the United Nations Environment Programme, and the Archireef project adds a technology-driven restoration method to that portfolio.[14,15] In October 2025, EAD signed a Memorandum of Understanding with Archireef to collaborate on coral reef restoration research and projects, with the partnership announced during the IUCN World Conservation Congress Abu Dhabi.[16]



WHAT'S NEXT

Scaling from the current 40-square-metre deployment to larger restoration areas will require higher-throughput tile production, standardised deployment logistics, long-term monitoring infrastructure, and evidence that the tiles perform over years. The ambition around it is substantial: under the directives of Sheikh Hamdan bin Zayed Al Nahyan, EAD has expanded its wider coral rehabilitation programme to outplant more than four million coral fragments by 2030 across more than 900 hectares, making it the largest coral rehabilitation project in the world, and a printed-tile method proven at Um Khorah would have a national programme of that size to grow into.[17]

For the UAE, the case puts additive manufacturing to work on ecological infrastructure, a use outside the industrial production and consumer goods where it is most often found. If the method proves effective at scale, it offers a replicable model for coral restoration across the Gulf and other climate-stressed marine environments, manufactured locally and deployed with the same additive manufacturing, IoT sensing, and AI analysis that this report records across the industrial sectors.

"Our partnership with Archireef brings a unique and innovative coral restoration method to Abu Dhabi to safeguard our Emirate's natural environment and promote sustainable development," said Anas Jawdat Albarguthi, Chief Operating Officer, ADQ.[18]

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MANUFACTURING

4IR Technologies:
Robotics, AI, IoT

Emirate:
Dubai

Maturity:
Proof of Concept

Type:
Public-Private

003

Intelligent Watch Box for Haute Horlogerie

ACTORS

Audemars Piguet
Dubai Future Labs / Dubai Future Foundation

SNAPSHOT

After 2 years of joint development, Audemars Piguet and Dubai Future Labs unveiled an intelligent watch box at Dubai Watch Week in November 2025. The watch is placed inside a box, a computer vision system reads the current positions of all calendar indications on the dial, and a motorised arm interfaces with the crown to automatically set and wind the perpetual calendar to the correct date, eliminating the risk of damage from manual adjustment.[1] Dubai Future Labs, the robotics and applied research arm of the Dubai Future Foundation, designed and integrated the full technological architecture. The intelligent watch box was expected to be available for sale during 2026.[2]

WHY IT MATTERS

A perpetual calendar is one of the most technically demanding complications in watch-making. It tracks the day, date, month, leap year, and moon phase, automatically adjusting for the varying lengths of months for decades without manual correction. The problem comes when the watch stops: resetting all calendar indications to the correct position requires a precise sequence of adjustments that risks damaging the movement if performed incorrectly. For collectors and after-sales departments alike, this has been a persistent usability barrier for one of horology's most admired complications.[3]

Dubai Future Labs brought robotics, computer vision, and AI engineering to a problem that the Swiss watch-making industry had left unsolved for decades. The result is a UAE-designed system that operates at the highest end of precision manufacturing, in a domain where tolerances are measured in fractions of a millimetre and production volumes in hundreds.

HOW THE TECHNOLOGY WORKS

The watch is placed inside the intelligent watch box and the lid is closed. Computer vision identifies the current position of every calendar indication on the dial and calculates the adjustments required to bring each one to the correct date, day, month, and moon phase. A motorised arm then engages the crown, performing the precise sequence of winds and corrections in the safest possible order to protect the movement.[4]

The box is designed specifically for Audemars Piguet's Calibre 7138, the self-winding perpetual-calendar movement inside the 41 mm Royal Oak Perpetual Calendar, introduced in 2025, which routes all corrections through a single crown rather than requiring separate pushers or correctors on the case band. This mechanical innovation made the robotic interface possible: a single point of contact for all adjustments. Dubai Future Labs designed the robotics, sensor integration, and software architecture, while Audemars Piguet provided the horological engineering and movement specifications.[5]

2
YEARS
of joint development between Audemars Piguet and Dubai Future Labs

1st
OF ITS KIND
unveiled at Dubai Watch Week

IMPACT AND RESULTS

The intelligent watch box is a working prototype, not yet a commercial product. Its impact is best assessed as a proof of concept that demonstrates three things. First, that UAE-based robotics and AI capability can deliver precision engineering solutions for one of the world's most demanding luxury manufacturers. Second, that Dubai Future Labs's applied research model can move from government and infrastructure projects to commercial partnerships with global brands. Third, that 4IR technologies can create value in ultra-high-end manufacturing where the challenge is not volume but precision, reliability, and the integration of digital systems with mechanical craft.

The unveiling at Dubai Watch Week 2025, attended by the global horological press and collector community, generated significant international media coverage and positioned Dubai as a credible partner for precision technology development at the highest level of manufacturing.[6]

WHAT'S NEXT

The intelligent watch box is expected to become available during 2026, with pricing and distribution still to be announced. The opportunity is to turn this from a one-off solution into a sustained applied research partnership. That precedent is well established in Switzerland, where public research centres such as CSEM and EPFL's Institute of Microengineering have worked for years with Patek Philippe, Rolex, Richemont, and the Swatch Group on the silicon components and micro-mechanisms behind modern high-end watches.[7] For the UAE, the opportunity is larger still: Dubai Future Labs has entered this territory from outside the traditional watch-making world, and if the model scales it could establish Dubai as a credible partner for precision robotics across luxury manufacturing, medical devices, aerospace components, and other domains where micron-level accuracy and digital-mechanical integration are critical.

"The idea of creating a setting mechanism for the Perpetual Calendar has been a part of Audemars Piguet's vision for years. The innovative all-in-one crown of calibre 7138 has made that dream possible, thanks to a cross-disciplinary collaboration with the Dubai Future Foundation," said Lucas Raggi, Chief Industrial Officer at Audemars Piguet.[8]

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MANUFACTURING

4IR Technologies:
IoT, AI, Cloud computing

Emirate:
Dubai, Abu Dhabi

Maturity:
Operational Deployment

Type:
Public

004
AI-Driven Smart Factory Platform

ACTORS

Blade
Ducab Group

SNAPSHOT

Ducab Group is a UAE cable and metal products manufacturer jointly owned by ADQ and the Investment Corporation of Dubai, operating six facilities across Dubai and Abu Dhabi and exporting to over 75 markets.[1] In June 2023, Ducab launched Blade: an AI-driven smart factory platform built on IoT, cloud analytics, and machine learning that runs across the company's entire manufacturing footprint. IoT sensors along every production line feed an AI system that detects and resolves issues before downtime occurs, governs production planning, and connects Ducab directly to customers for automated stock replenishment.[2,3]

WHY IT MATTERS

Blade addresses a cost structure that leaves little room for inefficiency. Cable and metal manufacturing is highly exposed to volatile raw-material costs, particularly copper and aluminium. Ducab has previously reported increasing its prices in response to rises in raw-material and freight costs, highlighting the importance of operational efficiency and cost control in maintaining competitiveness.[4] A single production line failure can cascade through fulfilment schedules, affecting customers in dozens of markets. Traditional manufacturing management relies on scheduled maintenance, manual inspection, and reactive problem-solving, meaning issues are often identified after they have already caused losses in output, material, or time.

For Ducab competing in over 75 export markets, the ability to predict and prevent production failures, optimise planning across six facilities in real time, and halve delivery times against the market is not a technology upgrade. It is the difference between being a regional supplier and a globally competitive industrial platform.

HOW THE TECHNOLOGY WORKS

Industrial IoT sensors installed along every production line continuously measure thousands of parameters across Ducab's manufacturing operations. The data feeds into Blade's AI engine, which identifies anomalies, predicts potential failures, and triggers corrective action before unplanned downtime occurs.[5] Cloud-based analytics and an integrated data lake bring these inputs together to support production scheduling, capacity allocation and quality control. Automated quality checks span the entire manufacturing process, from raw-material sourcing to final delivery.[6]

The platform extends beyond the factory floor into the supply chain. Blade connects Ducab directly to its customers, enabling automated stock replenishment and demand-responsive production planning. The system processes orders of any size at any time, with AI-driven scheduling ensuring facilities can respond to shifts in demand without manual replanning.[7,8]

30%
LESS ENERGY
consumed across Ducab's operations

20%
LESS WASTE
produced across the group

15%
BETTER RESOURCE USE
credited to Blade

IMPACT AND RESULTS

Ducab's leadership credits Blade with reductions of around 30% in energy consumption and 20% in waste, and a 15% improvement in resource-use efficiency across the group's operations.[9] Those gains sit against the targets Ducab set when Blade launched in June 2023: a 20% increase in output volumes within 2 years, and, within 1 year, a 20% improvement in overall equipment efficiency and a 30% reduction in machine downtime.[10] The programme is aligned with Operation 300bn, the UAE's National Strategy for Industry and Advanced Technology, which incentivises manufacturers to embed 4IR technologies.[11]

WHAT'S NEXT

Blade is designed to integrate Ducab's factory operations into a unified digital ecosystem. The opportunity ahead is to extend the platform's intelligence further into the customer ecosystem, moving from automated replenishment toward predictive demand modelling that anticipates infrastructure project timelines, utility procurement cycles, and regional construction activity.

For the UAE's industrial sector, Ducab's model shows what a nationally owned, export-oriented manufacturer can achieve by committing to digital transformation across its entire footprint. The wider opportunity is for this experience to inform the industrial base, particularly mid-sized manufacturers that lack the scale to build a system like Blade from scratch.

"Our commitment goes beyond manufacturing; it is about building a resilient, sustainable ecosystem underpinned by local talent and the optimisation of national resources. We firmly believe that investing in our local economy is a powerful way to drive long-term innovation and deliver exceptional value to our partners and customers worldwide," said Gert Hoefman, then Interim Group CEO, Ducab.[12]

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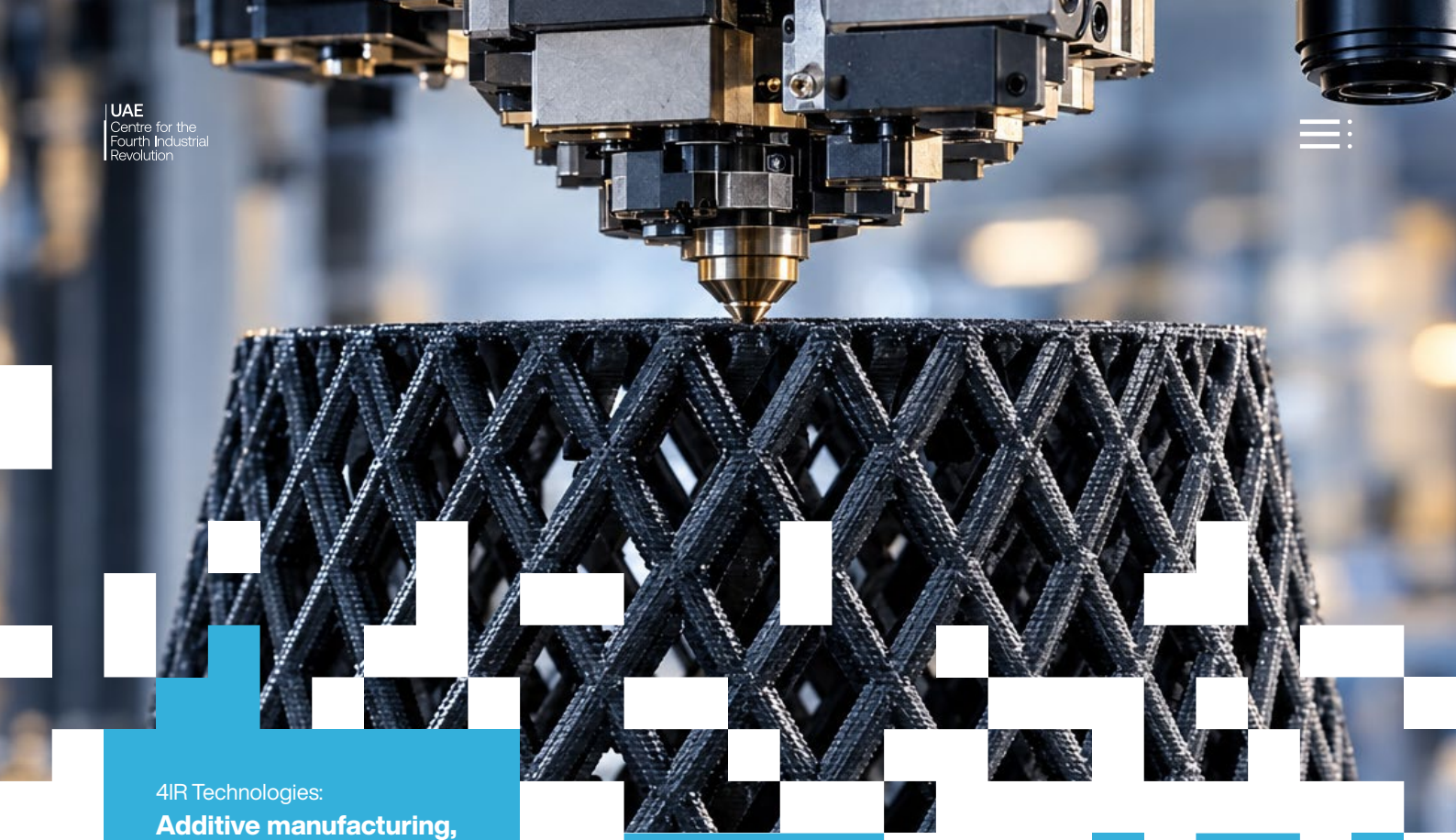

MANUFACTURING

4IR Technologies:
Additive manufacturing, Cloud computing, AI

Emirate:
Abu Dhabi

Maturity:
Operational Deployment

Type:
Public-Private

005

On-Demand 3D Printing of Industrial Spare Parts

ACTORS

Immensa
ADNOC Gas

SNAPSHOT

ADNOC Gas has built one of the energy industry's largest digital libraries of critical components, developed with Immensa, a UAE-based additive manufacturing and digital warehousing company. Over 3,500 parts have been scanned and stored in a secure digital warehouse, ready to be 3D printed on demand in polymers or metals at ADNOC Gas's Das Island and Habshan gas processing sites.[1] The programme has cut production lead times by 50%, has eliminated overseas shipping for replacement parts, and is expected to deliver USD 50 million in savings by 2028.[2]

WHY IT MATTERS

Energy companies globally lose an estimated USD 30 billion annually to inefficient spare parts inventory management.[3] Critical components for offshore and remote gas processing facilities are typically manufactured overseas by original equipment manufacturers, shipped internationally, stored in large on-site inventories, and replaced on long lead times. When a part fails at a facility like Das Island, a small offshore island in the Arabian Gulf about 160 kilometres northwest of Abu Dhabi and one of ADNOC's liquefied natural gas (LNG) export terminals, the cost is not just the component itself; it is the operational downtime, the shipping delay, the inventory carrying cost, and the emissions generated by the logistics chain.

Additive manufacturing changes this model by converting physical parts into digital files that can be printed at or near the point of need. For the UAE's energy sector, which operates large-scale processing infrastructure in remote locations, the value is direct and measurable.

HOW THE TECHNOLOGY WORKS

Immensa's digitisation process uses advanced 3D scanning equipment and proprietary solutions to capture a component's geometry and critical data such as material grade. These inputs are combined into a comprehensive digital part package that enables subsequent production through additive manufacturing and other on-demand manufacturing technologies.[4] When a replacement is needed, the part is 3D printed locally in the required material, whether polymer or metal, without waiting for overseas manufacturing or shipping.

At Das Island, ADNOC Gas has replaced traditionally manufactured air compressor impellers with 3D-printed equivalents, proving the feasibility of additive manufacturing for complex, high-value rotating parts.[5] At Habshan, ADNOC's onshore gas processing complex in Abu Dhabi's Al Dhafra desert region, hundreds of components have been scanned and digitally stored, ready for on-demand production. Immensa became the first company in the MENA region to achieve the DNV-ST-B203 standard for metal additive manufacturing parts in December 2023,[6] and in 2024 partnered with DNV to publish what the two describe as the world's first guideline for digitising spare parts in the energy sector.[7]

3,500+
DIGITISED PARTS
ready to print on demand

50%
SHORTER LEAD TIMES
for replacement parts

USD 50M
SAVINGS
projected by 2028

IMPACT AND RESULTS

Production lead times for replacement parts have been reduced by 50%.[8] The need for overseas shipping has been eliminated for digitised parts, reducing both logistics costs and carbon dioxide emissions.[9] On-site inventories have been reduced because parts no longer need to be physically stockpiled for every possible failure scenario.[10]

ADNOC Gas expects the programme to generate USD 50 million in savings by 2028.[11] The digital warehouse holds over 3,500 components.[12] Immensa's AI-powered assessment process can evaluate up to 500,000 parts in 24 hours to determine their suitability for digitisation and additive manufacturing.[13]

WHAT'S NEXT

ADNOC Gas is exploring on-site 3D manufacturing capability at its processing facilities, which would eliminate the remaining logistics step between printer and point of need.[14] The next opportunity is depth: moving from thousands of digitised parts to tens of thousands across the full asset base and proving that on-demand printing can handle increasingly complex and safety-critical components beyond the air compressor impellers already validated. The DNV guideline published in 2024 provides a framework for other energy operators to adopt the same model, and the opportunity ahead is to prove the results at Das Island and Habshan repeatable at industry scale.[15]

"3D printing provides an advanced digital solution for designing and producing components, optimizing the company's supply chain, enhancing performance, and reducing costs," said Dr Ahmed Alebri, CEO of ADNOC Gas.[16]

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MANUFACTURING

4IR Technologies:
IoT

Emirate:
Ras Al Khaimah

Maturity:
Operational Deployment

Type:
Private

006

Smart Ceramic Slab Manufacturing

ACTORS

Continua+
RAK Ceramics

SNAPSHOT

RAK Ceramics, one of the world's largest ceramics manufacturers with annual revenues of AED 3.28 billion and capacity to produce 118 million square metres of tiles per year across 23 plants globally, launched an AED 100 million next-generation slab production facility in Ras Al Khaimah in May 2025. The facility uses Continua+ PCR 2180 technology, integrating IoT-enabled smart manufacturing, zero manual intervention for quality inspection, and digital glazing into a single production line. Commercial production commenced in July 2025.[1,2] A second Continua+ facility is under development, with production expected to begin during 2026.[3]

WHY IT MATTERS

Ceramic slab manufacturing is a high-volume, high-precision process where surface defects, dimensional inconsistencies, and glazing irregularities directly affect product quality and waste rates.[4] Traditional quality inspection relies on human visual checks along fast-moving production lines, a method that is subjective, fatiguing, and unable to detect micro-level defects consistently across thousands of slabs per day.[5]

Replacing manual inspection with automated machine vision, connecting production equipment through IoT, and digitising the glazing process transforms the manufacturing model from one that catches defects after they occur to one that prevents them in real time. For a manufacturer operating at RAK Ceramics' scale and exporting to more than 150 countries, the gains are in consistency, throughput, waste reduction, and the ability to produce increasingly complex formats without proportionally increasing quality risk.

HOW THE TECHNOLOGY WORKS

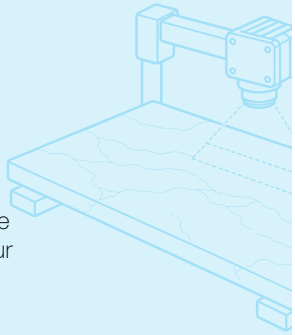
The facility uses the Continua+ PCR 2180 platform with full digital synchronisation at every stage of production. IoT sensors monitor parameters from raw material handling through pressing, glazing, firing, and finishing. The quality inspection system operates with zero manual intervention: automated vision and measurement systems check every slab for surface defects, dimensional accuracy, and colour consistency. Digital glazing enables combined application of inks and materials directly from digital design files, producing high-definition patterns, deep structures, and advanced dry digital glaze and granule effects.[6,7]

The facility also addresses energy efficiency. A seven-layer horizontal dryer operates on total heat recovery from the kiln, significantly reducing fuel consumption. RAK Ceramics describes the new line as more energy-efficient than its existing Continua setup.[8] The system produces over 54 slab formats, from mosaic to large-format panels of up to 162 by 324 centimetres, on a single production platform.[9]

AED 100M INVESTMENT
in a next-generation slab production facility

54+ SLAB FORMATS
produced on a single production platform

100% AUTOMATED INSPECTION
every slab checked for surface defects, dimensions and colour



IMPACT AND RESULTS

The elimination of manual quality inspection addresses both consistency and labour constraints: automated systems inspect continuously without fatigue, at speeds matched to production throughput, and to tolerances that human inspection cannot reliably sustain.[10]

At group level, RAK Ceramics recycled 95% to 98% of key materials across its tiles segment in 2025 and saved 18,000 cubic metres of water. The company also launched the UAE's first industrial carbon recovery and reuse facility in partnership with Gulf Cryo.[11] The group's gross profit margin improved from 39.3% in FY 2024 to 40.0% in FY 2025, with the company citing manufacturing efficiencies and stronger UAE operations as contributing factors.[12]

WHAT'S NEXT

A second Continua+ facility is under development, with commercial production expected to begin during 2026, which indicates that RAK Ceramics is treating the first facility as a model to replicate across the group.[13] The company is also building a greenfield ceramics facility in Yanbu, Saudi Arabia, with expected completion by Q1 2027.[14]

The wider significance lies not in replicating a ceramics-specific platform, but in the industrial model it represents. From Ras Al Khaimah, a UAE-headquartered manufacturer is using connected equipment, automated quality control and more energy-efficient processes to strengthen its position in global markets. Across the emirate's wider industrial base, the opportunity to modernise established production through digital systems remains largely untapped. RAK Ceramics' deployment provides a practical reference for manufacturers seeking to pursue that transition through 4IR technologies.

"As a UAE-headquartered global manufacturer, we embed sustainability across our operations, with a focus on improving efficiency, advancing responsible manufacturing, and optimising resource use," said Abdallah Massaad, Group CEO of RAK Ceramics.[15]

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4IR Technologies:
AI, Autonomous systems, Robotics

Emirate:
Abu Dhabi

Maturity:
Operational Deployment

Type:
Public

MANUFACTURING

007

Applied R&D Platform for Autonomous Robotics Systems

ACTORS

Advanced Technology Research Council
Technology Innovation Institute

SNAPSHOT

The Autonomous Robotics Research Center (ARRC) is one of the nine research centres within the Technology Innovation Institute (TII), which is Abu Dhabi's applied research arm, operating under the Advanced Technology Research Council (ATRC). Founded in 2020 and headquartered in Masdar City, TII is now home for more than 1,000 researchers and engineers, delivering R&D products in the form of client proof-of-concepts that respond to societal and industrial needs. In 5 years, ARRC has delivered more than 25 TRL5+ products, launched four startups, and partnered with international R&D institutions, such as Caltech for advanced research on aerial robots, and NVIDIA to launch the Middle East's first joint AI and robotics research lab.[1,2]

WHY IT MATTERS

As with the other centres in TII, ARRC helps the UAE move from being primarily a buyer of advanced technology to becoming a creator, owner, and exporter of it. That shift requires the applied research infrastructure behind such technologies: the labs, the talent, the computing power, the testing facilities, and the institutional capacity to move from scientific breakthrough to deployable technology.[3]

ARRC develops the core capabilities that make machines genuinely autonomous: perception and computer vision, communications, navigation and control, AI-based decision-making, and swarm coordination. Its systems are designed to work across air, land, surface-water, and underwater environments, including difficult settings where localisation systems, communications and human infrastructure may be unavailable. ARRC describes applications ranging from search and rescue and environmental monitoring to mapping, oil-spill response, and ecosystem restoration.[4]

25+
TRL5+ PRODUCTS
delivered in 5 years

4
STARTUPS
launched from ARRC research

HOW THE TECHNOLOGY WORKS

One of the technologies emanating from ARRC gave rise to the startup SIRBAI. The main product of SIRBAI is the software framework that enables multiple autonomous robots to operate as a coordinated team. The platform combines aerial, ground, surface, or underwater vehicles with distributed AI, onboard sensing, robot-to-robot communications, and adaptive mission-planning software.[5,6]

A human operator begins by defining the mission objective, operating area, priorities, and safety constraints. SIRBAI then distributes the work among the available robots. Instead of remotely piloting every robot, the operator supervises the overall mission while each robot performs its tasks and makes decisions locally.[7]

Each robot uses cameras and other sensors to perceive its surroundings, estimate its position, collect mission data, and act within the environment. Onboard edge computing allows it to process this information without continuously sending everything to a central server.[8]

SIRBAI's main purpose is to test such behaviour under controlled but realistic conditions. Researchers can repeatedly introduce communication failures, inaccessible areas, changing priorities, obstacles, or robot malfunctions and observe whether the swarm continues performing its mission.[9]

In simple terms, SIRBAI works by shifting robotic operations from "one person controlling one machine" to "one person supervising an intelligent, self-coordinating team." Its value lies in demonstrating that a swarm can remain adaptive, scalable, and resilient even when conditions change or individual robots become unavailable.[10]

IMPACT AND RESULTS

SIRBAI is expected to accelerate the development of reliable autonomous robotic swarms for real-world and industrial missions. It will expand operational coverage by enabling multiple robots to work simultaneously across large areas while improving resilience when individual units or communication links fail. Its distributed intelligence will support faster decision-making without constant dependence on a central control system.[11]

The platform could also reduce human exposure to hazardous environments during disaster response, infrastructure inspection and maintenance. As a repeatable testbed, SIRBAI will help researchers validate swarm behaviours under realistic conditions and translate scientific advances into deployable solutions. It will support future applications in environmental monitoring, logistics, public safety, and critical-infrastructure management. Collaboration around the platform should attract international research partners and contribute to developing specialised talent in the UAE. It will also strengthen the country's sovereign capabilities in robotics, physical AI, and autonomous systems. Ultimately, SIRBAI can help turn ARRC's research into scalable technologies that generate economic, strategic, and societal value.[12]

WHAT'S NEXT

The next step for SIRBAI and ARRC is to move from controlled experimentation toward larger pilot deployments in real industrial environments. SIRBAI could support 4IR applications such as smart-factory inspection, autonomous logistics, infrastructure monitoring, environmental sensing, and emergency response. Its swarm architecture will need to integrate securely with industrial IoT platforms, digital twins, edge computing, and AI-driven command systems. Further testing should demonstrate safe and reliable operation under harsh conditions, limited connectivity, and changing mission requirements.[13]

ARRC will work with regulators, industrial partners, and emergency services to establish standards for certification, data governance, cybersecurity, and human oversight. The platform will then evolve into modular solutions that can be adapted to different industries and combinations of aerial, ground, and marine robots. In the longer term, SIRBAI could become an important foundation for sovereign physical-AI capabilities and scalable autonomous operations across the UAE's 4IR economy.[14]

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MANUFACTURING

4IR Technologies:
AI, Additive manufacturing, Robotics

Emirate:
Abu Dhabi

Maturity:
Operational Deployment

Type:
Public

008
AI-Driven Digital Manufacturing Platform

ACTORS

Sindan

SNAPSHOT

Sindan is an Abu Dhabi-based advanced manufacturing company. It uses industrial 3D printing, precision machining and AI-enabled production systems to produce components from digital designs.[1,2] The company hosts more than 40 large-scale metal additive manufacturing systems, over 300 polymer manufacturing systems, and advanced computer numerical control (CNC) machining capabilities, with an AI-enabled digital manufacturing ecosystem being developed to further integrate design, production, and quality management.[3]

40+
large-scale metal additive manufacturing systems

300+
polymer manufacturing systems

WHY IT MATTERS

Industrial 3D printing has moved beyond prototyping into critical aerospace and medical applications, but production-grade use requires formal qualification, repeatable processes, inspection, and post-processing. For critical parts, the challenge is therefore not simply owning printers; it is building the surrounding systems needed to control quality and move consistently from digital design to qualified hardware.[4]

For the UAE, where Operation 300bn is expanding domestic industrial capacity and developing future industries, the value lies in the integrated production environment built around those machines.[5] Sindan positions its platform as that integrated industrial production ecosystem, combining advanced manufacturing and AI to enable certified, scalable production for strategic sectors.[6]

HOW THE TECHNOLOGY WORKS

The manufacturing ecosystem spans three production layers. Metal additive manufacturing uses Direct Metal Laser Sintering to print aerospace-grade titanium, Inconel, stainless steel, copper, and aluminium. Polymer production covers selective laser sintering (SLS), fused deposition modelling (FDM), and resin-based systems for engineering-grade components. CNC machining handles precision finishing and post-processing. Together, these systems can take a part from raw digital file to production-grade hardware without leaving the facility.[7]

What makes this more than a print shop is the AI layer. Sindan's Industrial AI OS is set to connect machine vision, simulation, and predictive analytics across the entire workflow: scheduling production runs, inspecting parts in real time, flagging anomalies, and feeding operational data back into process optimisation. The platform is designed with modular architecture, so production cells can be reconfigured for different sectors and part specifications without rebuilding the software architecture. Sindan has also developed a mobile, containerised manufacturing unit equipped with 30 printers and AI-driven control, designed for on-site deployment at customer locations.[8,9]

IMPACT AND RESULTS

The platform is already drawing aerospace partners. Mubadala Investment Company's assets Sanad and Strata Manufacturing PJSC, which collectively bring 4 decades of aerospace maintenance, repair and overhaul (MRO) expertise, signed an MOU with Sindan at Dubai Airshow 2025 to explore the integration of AI, robotics, and 3D printing across MRO and manufacturing operations.[10]

In May 2026, Sindan signed a partnership with LEAP 71, a Dubai-based computational engineering company. Under the agreement, LEAP 71's Noyron platform generates engine designs computationally from performance requirements, and Sindan manufactures them. LEAP 71 has already hot-fire tested dozens of rocket engines designed this way, including liquid methane systems exceeding 2 tonnes of thrust, with development cycles measured in weeks rather than years.[11]

WHAT'S NEXT

Together, the two companies will develop and manufacture air-breathing jet engines and space propulsion systems, positioning the UAE as a centre for next-generation aerospace development.[12] Sindan's Industrial AI OS is the layer that will join the work, scheduling production runs, inspecting parts in real time, and feeding operational data back into process optimisation. Proving the pipeline at serial-production scale would close the loop from AI-generated aerospace design to hardware manufactured in the UAE.

"Our ambition is to transform how advanced products are designed and manufactured in the UAE by combining digital engineering, advanced manufacturing, and artificial intelligence within a single industrial ecosystem," said Heyuan Huang, Managing Director and CEO, Sindan.[13]

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MANUFACTURING

4IR Technologies:
Robotics, AI, IoT, Cloud computing

Emirate:
Dubai

Maturity:
Scaled Deployment

Type:
Private

009

Collaborative Robotics and AI in Consumer Goods Manufacturing

ACTORS

Unilever Dubai Personal Care Factory
Dubai Industrial City

SNAPSHOT

Unilever's Dubai Personal Care factory integrates collaborative robotics, cloud-based analytics, IoT and AI into the production of brands including Dove, Lifebuoy and Vaseline. Opened at Dubai Industrial City in December 2016, the facility supplies more than 30 markets, primarily across the MENA region.[1] In January 2020, it became the first manufacturing site in the UAE to be designated an Advanced Fourth Industrial Revolution Lighthouse by the World Economic Forum. It was also the first non-energy manufacturing site in the MENA region to receive the designation and was selected from more than 1,000 production sites evaluated globally.[2]

WHY IT MATTERS

Consumer goods manufacturing operates on tight margins with high volume, where production reliability, packaging flexibility, and resource efficiency directly determine competitiveness. A facility producing up to 100,000 tonnes annually across multiple product formats and brands for 30+ export markets cannot afford unplanned downtime, quality inconsistency, or energy waste. Traditional factory management treats automation, quality control, and sustainability as separate upgrade projects. The Unilever Dubai facility treats them as a single integrated system.[3,4]

Unilever Dubai is significant because its technologies have moved beyond isolated pilots into factory-wide deployment. The WEF Lighthouse designation recognises both the scale of adoption and its contribution to operational performance, resilience and sustainability. For the UAE, the facility demonstrated that advanced digital manufacturing could be deployed outside the energy sector. Unilever describes it as a global reference model for emerging technology adoption in manufacturing.[5,6]

HOW THE TECHNOLOGY WORKS

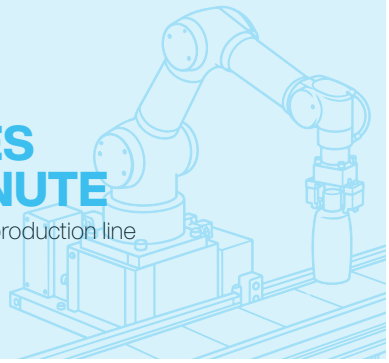
Collaborative robots work alongside operators on assembly lines, assisting with repetitive or physically demanding tasks such as packaging and material handling. IoT control devices and AI tools identify changes in production, locate sources of waste heat and support the shutdown of equipment when it is not required. Cloud-based analytics and an integrated data lake bring production data together to improve cost, productivity and responsiveness.[7,8]

At the end of the production line, automated systems collate bottles, form shrink bundles, pack cases and palletise products across eight bottle sizes at speeds of up to 350 bottles per minute, with changeovers completed in 10 minutes.[9] The factory has also trialled a heat pump integrated with its existing solar thermal system. The system captures low-grade waste heat and compresses it into high-grade heat for reuse in manufacturing, producing three to four units of useful heat for every unit of electricity consumed.[10,11]

25%
LOWER COSTS
through 4IR technology in manufacturing

34%
LESS ENERGY CONSUMED
since opening

350
BOTTLES PER MINUTE
at the end of the production line



IMPACT AND RESULTS

By establishing a factory data lake and deploying 4IR technology at scale, the Dubai facility reduced manufacturing costs by more than 25%.[12] Since opening, it has also cut energy consumption by 34%, eliminated waste sent to landfill and achieved 100% wastewater recycling.[13]

The heat pump trial extended these improvements by reducing gas consumption by a further 16%, demonstrating the potential of waste-heat recovery to reduce the facility's reliance on fossil-fuelled thermal energy.[14]

The Dubai factory also forms part of Unilever's wider 4IR manufacturing network, which now holds 11 Lighthouse designations across 10 sites, more than any other fast-moving consumer goods (FMCG) company.[15]

WHAT'S NEXT

The heat pump trial points to where the next gains lie. Waste-heat recovery distributes reclaimed energy as hot water, so new facilities can design that system in from the start and established plants can add it as a thermal upgrade.[16]

For the UAE, the wider opportunity is for consumer goods, food and light manufacturing operations to adapt the factory's integrated approach to production data, automation and resource efficiency. The relevance lies not in replicating the Lighthouse designation, but in translating factory-wide digital deployment into lower costs and reduced environmental impact.

"DPC is considered a role model for the adoption of emerging tech in Unilever globally," said Ahmed Kadous, Head of Supply Chain at Unilever Personal Care, Middle East and Turkey.[17]

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MANUFACTURING

4IR Technologies:
AI, IoT, Edge computing, Cloud computing

Emirate:
Abu Dhabi, Dubai

Maturity:
Scaled Deployment

Type:
Private

010

AI-Driven Transformation of the World's Largest Premium Aluminium Producer

ACTORS

Emirates Global Aluminium
WEF Global Lighthouse

SNAPSHOT

Emirates Global Aluminium (EGA) has deployed over 100 AI and data use cases across its Al Taweelah smelter in Abu Dhabi and its Jebel Ali smelter in Dubai, generating USD 123 million in financial impact since 2021 and rewiring how the company runs procurement, supply chain, shopfloor operations, sales, and treasury.[1,2] The programme was delivered in 10 waves of 12-week agile sprints by a dedicated 47-person centre of excellence working alongside business product owners.[3] In January 2025, the World Economic Forum designated Al Taweelah as a Global Lighthouse, making EGA the first industrial company in the UAE and the first aluminium company in the world to receive the designation.[4]

WHY IT MATTERS

Aluminium smelting runs continuously. Reduction pots operate around the clock at extreme temperatures. Cranes perform millions of activities per year, each one following strict standard operating procedures where a single deviation can damage a pot or create a safety hazard. Operators walk long distances across vast shopfloors to monitor equipment, enter data, and respond to alarms. Procurement manages volatile commodity markets. Treasury allocates cash across 30 entities and 150 accounts in 15 currencies. Every one of these domains was historically managed through manual processes, spreadsheets, and reactive decision-making.[5]

EGA made a strategic choice to build its own AI solutions rather than buy off the shelf, because off-the-shelf products did not fit the specific demands of aluminium smelting. The result is a transformation that covers every domain of the value chain, delivered in-house, with each wave building on the foundations of the last. The incremental time to add a use case has decreased with every sprint as the data platform, governance, and workforce capability matured.[6]

100+
AI USE CASES
deployed across EGA's smelting operations

92%
REDUCTION
in operator reaction time

HOW THE TECHNOLOGY WORKS

On the shopfloor, a neural network trained on 60,000 frames monitors crane operations across 2,843 reduction pots. The Smart Cranes system tracks nine million crane activities per year performed by over 5,000 operators, detecting compliance deviations during anode setting in real time and alerting operators before deviations damage pot health. A separate computer vision system auto-inspects green anodes at the paste plant with 98% model accuracy, flagging and auto-rejecting defective anodes before they reach the potlines and cause downstream failures.[7]

An in-house mobile application replaces the paper-based, walk-the-floor operating model. Shift attendance, checklists, pot alarm monitoring, data entry, and breakdown tracking run through a single platform, digitising over one million operator activities per year and giving every shopfloor area real-time visibility from one device.[8] In treasury, an AI-driven cash forecasting engine manages liquidity across 30 entities, 150 accounts, 15 currencies, and 3,000 monthly payments, replacing manual spreadsheet allocation with a 30-day AI model that optimises yield across the entire portfolio.[9]

The infrastructure layer makes all of this possible at speed. EGA's hybrid cloud runs AI models at the edge inside the smelter, with response times 13 times faster than cloud-only alternatives and analytics costs reduced by 86%.[10] The company now processes 3,500 times more data annually than before the transformation, supported by over 3,000 Wi-Fi 6 access points and two 100% solar-powered, Tier 3 certified industrial data centres.[11]

IMPACT AND RESULTS

AED 452 million (USD 123 million) in cumulative financial impact,[12] with over 100 use cases deployed to date and AED 129 million (USD 35 million) from 40 use cases in 2024 alone.[13] The results break down across the value chain: 16% reduction in indirect procurement costs, 50% reduction in inbound logistics delays, 18% improvement in shopfloor productivity, 12% improvement in sales margin, and 12.5% improvement in investment returns through AI-driven cash forecasting.[14] In January 2025, this programme earned Al Taweelah a place in the World Economic Forum's Global Lighthouse Network, the first such recognition for any aluminium producer.[15]

At the site level, operational downtime reduced by 50%, overall equipment effectiveness improved 12%,[16] and operator reaction time was cut by 92%.[17] More than 3,000 employees have been upskilled through EGA's digital academy.[18] A Data and AI Community of Practice connects 161 members, 28 data ambassadors across business units, and 100 citizen data practitioners who build solutions alongside the central team.[19]

WHAT'S NEXT

Two new programmes are scaling across operations. Safety AI (SAQR) uses computer vision to detect personal protective equipment (PPE) compliance, safe distances from suspended loads, mobile equipment, and hot metal pouring across four industrial settings, with real-time mobile alerts to prevent harm before it occurs. An Agentic AI platform gives employees self-service access to operational data, safety analysis, root-cause diagnostics, and process optimisation through a unified enterprise agent marketplace.[20]

EGA is also piloting EX, its tenth-generation smelting technology, at Al Taweelah, designed to produce more aluminium with less energy and lower emissions. The first cells started in July 2025, with performance exceeding expectations. EGA plans to apply EX to a new facility in Oklahoma, which would be the first new primary aluminium plant built in the United States since 1980.[21]

"Just over four years ago, we set ourselves a bold aspiration to lead the region and the global aluminium sector in Industry 4.0. Today advanced technologies at EGA are driving industrial process efficiency, quality, safety, and sustainability. I am convinced we are still just scratching the surface of what we can achieve," said Abdulnasser Bin Kalban, Chief Executive Officer of Emirates Global Aluminium.[22]

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UAE Centre for the Fourth Industrial Revolution

4IR Technologies:
Robotics, Autonomous systems

Emirate:
Abu Dhabi

Maturity:
Operational Deployment

Type:
Public

MANUFACTURING

011

Robotic Inspection and Advanced Composite Aerostructure Manufacturing

ACTORS

Strata Manufacturing
Airbus
Boeing

SNAPSHOT

Strata Manufacturing is a Mubadala subsidiary in Al Ain producing carbon-fibre composite aerostructure components for major global aircraft programmes, including Airbus A330 and A350 aircraft and Boeing 777, 777X and 787 aircraft.[1,2] Its output includes wing components, fairings, ribs, vertical fins and other empennage parts manufactured at commercial scale for international aerospace supply chains.[3]

The manufacturing process combines laser-guided composite lay-up, controlled autoclave curing, computer-controlled machining, robotic non-destructive inspection and automated assembly.[4,5] Carbon-fibre composite structures are typically around 20% lighter than equivalent aluminium structures, reducing aircraft weight and contributing to lower fuel consumption during operation.[6]

WHY IT MATTERS

Aerospace manufacturing is one of the most precision-demanding industrial contexts. Structural aircraft components must meet extremely tight tolerances, and quality failures carry safety, certification and supply-chain consequences that make defect control particularly important. FAA guidance requires composite materials and manufacturing processes to be qualified and controlled to produce reliable, reproducible structures.[7]

Composite aerostructures add another layer of complexity. Carbon-fibre materials must be laid, formed, cured, machined, inspected and assembled with precise control over fibre direction, resin behaviour, geometry and structural integrity. Because manufacturing defects can be concealed within the material, production depends on tightly controlled processes and non-destructive inspection alongside skilled manual work.[8,9]

For the UAE, Strata demonstrates that Al Ain can participate directly in global aerospace supply chains through certified, high-value manufacturing. Its aircraft-manufacturer qualifications and NADCAP and EN9100 certifications establish that components produced in the emirate meet international aerospace production and quality requirements. By April 2025, the facility had manufactured 100,000 aerostructure components and expanded to 30 production lines, building domestic capability across composite production, precision machining, non-destructive inspection and quality assurance.[10,11]

HOW THE TECHNOLOGY WORKS

Composite production begins in Strata's ISO Class 8 contamination-controlled area, where temperature, humidity and airborne particles are continuously monitored. Pre-impregnated carbon-fibre materials are cut to size using computer-controlled ply-cutting machines with accuracy of approximately one millimetre. Aerostructure technicians then use laser projection systems to position each ply within the mould according to the engineering design. Vacuum is applied between layers before components are cured in autoclaves under controlled heat, pressure and vacuum.[12]

After curing, five-axis computer numerical control machines trim components to customer specifications with accuracy of up to 0.02 millimetres. Quality inspection combines A-Scan, three-axis and ten-axis C-Scan, X-ray, phased-array and manual testing.[13] Strata has also deployed twin robots for non-destructive inspection and introduced advanced thermography and automated assembly of aircraft structures. Human technicians and engineers remain responsible for lay-up, process control, exception handling, final assembly and compliance with customer and certification requirements.[14]

115,000 COMPONENTS
manufactured by the end of 2025

50% OF A320 AILERONS
supplied from Strata's Al Ain facility

IMPACT AND RESULTS

Strata has been in continuous commercial production at its Al Ain facility since 2010, supplying aerostructure components for Airbus, Boeing, Pilatus and Leonardo programmes.[15,16] By the end of 2025, it had manufactured approximately 115,000 primary and secondary aircraft structural components. Production reached 16,328 components in 2025, representing an increase of nearly 40% from the 11,783 components produced in 2024.[17]

The wider impact is strategic. Composite aerostructures can reduce component weight compared with equivalent aluminium structures, contributing to improved aircraft fuel efficiency over their operating lives.[18] Strata's production milestone and its position as a supplier to major aircraft manufacturers demonstrate that advanced aerospace manufacturing can be localised in the UAE at commercial scale. The company reported in 2025 that UAE nationals accounted for 67% of its workforce, 87% of whom were women.[19]

The A320 aileron agreement signed with Airbus in November 2025 further expanded Strata's manufacturing portfolio into a high-rate narrow-body aircraft programme. Under the agreement, the company will supply 50% of Airbus demand for A320 family ailerons from its Al Ain facility.[20]

WHAT'S NEXT

Strata's next stage of growth is centred on deeper integration with Airbus and Boeing production programmes, expansion into additional composite component categories and continued investment in advanced manufacturing capability. The Strata Syensqo Advanced Materials venture adds an upstream materials layer by producing carbon-fibre prepreg rolls in Al Ain for aerospace applications. Its initial output is intended for the manufacture of Boeing 777X test components under a long-term supply agreement.[21] Strata has also expanded into adjacent aerospace activities through its collaboration with Lufthansa Technik Middle East, which has completed repair and final assembly work on composite aircraft radomes.[22]

The wider opportunity is to connect these capabilities into a broader aerospace manufacturing base spanning advanced materials, composite production, robotic inspection, automated assembly and repair. Further expansion will depend on developing specialised talent, retaining aircraft-manufacturer qualifications and certifications, and meeting evolving production and quality requirements.

"Advanced materials represent a cornerstone of Strata's industrial strategy, enabling us to address today's priorities while shaping the future of advanced manufacturing in the UAE," said Sara Abdulla Al Memari, Acting CEO of Strata Manufacturing.[23]

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4IR Technologies:
Robotics, Autonomous systems, AI, Drones

Emirate:
Dubai

Maturity:
Operational Deployment

Type:
Public

MANUFACTURING

012

Applied Research and Development Lab for Robotics and Automation

ACTORS

Dubai Future Foundation
Dubai Future Labs

SNAPSHOT

Dubai Future Labs (DFL) is Dubai's applied research and development lab for robotics and embodied AI. Established by Dubai Future Foundation and based in Emirates Towers, it works with government and industry partners to identify operational challenges, build robotic systems in house, and validate them in live environments.[1]

DFL initiated and remains custodian of the Dubai Robotics and Automation Programme, launched in September 2022 to position Dubai among the world's 10 leading cities for robotics and raise the sector's contribution to the emirate's gross domestic product to 9% within 10 years.[2] Its analysis of gaps across Dubai's research landscape also contributed to the creation of the Dubai Research, Development and Innovation (RDI) Programme. Several DFL-developed systems are now being tested in operational settings across the city.[3]

WHY IT MATTERS

Robots create economic value when they move beyond demonstrations and perform useful tasks at scale, reducing time, cost or human exposure to risk. The Dubai Robotics and Automation Programme therefore targets the deployment of 200,000 robots across the emirate within 10 years, alongside the 9% contribution target.[4,5]

Those ambitions cannot be met through procurement alone. Many operational challenges in Dubai require systems adapted to local environments, users and regulations. DFL fills that gap by developing solutions where suitable commercial products do not exist, combining researchers, engineers, advanced machinery and testing capabilities within a single facility to move rapidly from concept to deployment.[6]

HOW THE TECHNOLOGY WORKS

DFL develops the core capabilities that underpin different robotic systems, including perception, autonomy, manipulation, multi-agent coordination, unconventional mechanical design and human-robot interaction. Treating these capabilities as reusable building blocks allows the lab to adapt them across multiple platforms, reducing duplication and accelerating development.

Each project begins with an operational need defined with a government or private-sector partner. DFL then sets the system requirements, integrates existing capabilities, develops any missing technology, and designs and builds a bespoke solution. Its facilities include computer numerical control machinery, 3D printers, precision metrology equipment, robotic arms and mobile platforms, enabling teams to fabricate, assemble and test systems on site before live deployment.[7]

The systems are then validated with operating partners. Examples include warehouse automation with DP World,[8] engineering warehouse operations with Emirates Airline, last-mile delivery with Lyve Global,[9] and guidance and wayfinding robots with Majid Al Futtaim at City Centre Mirdif.[10] Where regulation constrains deployment, DFL works with public authorities through the Dubai Experimental Zone. Its first application, the Drone Experimental Zone, was established with Dubai Silicon Oasis, the Dubai Civil Aviation Authority and other entities as what Dubai Future Labs describes as the region's first dedicated framework for testing and certifying beyond-visual-line-of-sight drone operations.[11,12]

25+
ROBOTIC SYSTEMS
developed by Dubai Future Labs

29
PATENTS FILED
from applied research

IMPACT AND RESULTS

DFL has developed more than 25 robotic systems, filed 29 patents and published 34 peer-reviewed papers. Its deployments span logistics, public-facing services, regulated operations and tasks that expose people to avoidable risk.

The movement of goods was an early proving ground. A delivery robot trial in the Meadows[13] led to the deployment of three autonomous delivery robots with Lyve Global at The Sustainable City in July 2024. Carrying orders from local shops and restaurants through car-free residential areas, they remain the only outdoor autonomous delivery robots designed, manufactured and deployed in the UAE.[14] DFL also developed a separate warehouse platform with DP World[15] and a mobile manipulation robot for pick-and-place tasks in Emirates Airline's engineering warehouse. The same technology base has supported collaborative warehouse transport robots, palletising and depalletising systems, pick-and-pack equipment, unmanned aerial vehicles and work on connected autonomous logistics vehicles.[16]

Public-facing deployments test whether robots can operate effectively around people. In May 2025, DFL and Majid Al Futtaim launched two avatar robots at City Centre Mirdif to support wayfinding and accessibility and gather visitor feedback, drawing on an international collaboration under Japan's Moonshot Research and Development Programme.[17] DFL has also deployed shopping assistance with Daiso and trialled robotic coffee delivery at Jumeirah Emirates Towers. A study of more than 1,000 Dubai residents found high overall acceptance of customer-service robots, with preferences varying by robot form, location and task.[18]

Other systems address safety and regulated operations. In 2025, DFL worked with Dubai Municipality on robotic air-quality monitoring inside a perfume factory and with Dubai Central Laboratory on robots that transport laboratory samples. Its autonomous search-and-rescue robot is designed for environments that may be unsafe for people.

The lab's impact also extends beyond individual machines. It originated the Dubai Robotics and Automation Programme, the Dubai RDI Programme and Dubai's regulatory sandbox mechanism, bringing research, engineering, fabrication, live testing and regulatory expertise into one deployment pathway.[19] DFL showcased its work at the 2024 International Conference on Intelligent Robots and Systems, the first edition held in the Middle East and North Africa,[20] and at Make it in the Emirates in May 2026.[21] It also spearheaded the Emirates Robotics and Automation Society, the UAE's first body of its kind.[22,23]

DFL is building the talent base needed to sustain this work. It trains university students and early-career professionals through fellowships and internships and supports three industrial doctorate students across manipulation, perception, autonomy, multi-agent systems and human-robot interaction.[24] Its ROS Camps and Emirates Robotics Competition give university teams applied experience in challenges ranging from navigation and waste collection to the autonomous handling of library returns.[25,26]

WHAT'S NEXT

DFL plans to reorganise parts of its expanding portfolio into focused research entities, allowing each field to develop greater depth. The first will be a service robotics research centre designed to scale citywide deployment rather than produce isolated pilots. As other fields mature, additional centres or labs may follow where there is a demonstrated operational need.

In parallel, Dubai will accelerate the Robotics and Automation Programme, expand the number of robots in operation and move existing deployments into routine service. Regulatory frameworks will continue to evolve alongside the technology, since safe operation in public spaces is essential to scale.[27] This work sits within the wider Dubai RDI Programme, which coordinates leading research institutions with strategic initiatives across the emirate.[28]

The same applied model is now extending into autonomous logistics. In August 2026, Dubai Future Foundation launched the Autonomous Logistics Future Lab through SHIFFT, a joint venture with Oxford-based autonomous vehicle company Oxa. The lab will develop, test and validate autonomous vehicles for ports and airports, targeting its first commercial deployment in Dubai before the end of 2027.[29] Together, these initiatives mark a shift from research and limited trials towards autonomous systems deployed across the economy, strengthening the UAE's position as a developer, not only a buyer, of robotics technology.[30]

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MANUFACTURING

4IR Technologies:
AI, robotics

Emirate:
Dubai

Maturity:
Operational Deployment

Type:
Public

013

AI-Robotic Testing of Construction Materials (Dubai Central Laboratory)

ACTORS

Dubai Municipality
Dubai Central Laboratory

SNAPSHOT

Dubai Central Laboratory, part of Dubai Municipality, uses robots equipped with X-ray technology and AI to carry out automated chemical analysis of cement and other construction materials. Cement composition determines how concrete performs, so each batch has to be verified before it is built into a structure.[1] Testing that previously took 4 working days is now completed in 8 minutes,[2] and the number of samples examined daily has risen by 650%.[3]

Results reach the construction sector through a smart platform for laboratory testing services, allowing consultants and contractors to receive inspection reports on smartphones, tablets, and other mobile devices.[4]

WHY IT MATTERS

Construction is one of Dubai's largest economic sectors, contributing 6.7% of GDP with value added of AED 23.9 billion in the first 9 months of 2025 and growing 8.5% year on year. Every project in that pipeline depends on verified materials. Cement is a core component of concrete mixtures, and the results of cement testing affect the quality and sustainability of buildings and the length of their service life.[5]

The constraint sat in the laboratory rather than on site. When a chemical analysis takes 4 working days, the result governs when a project stage can be signed off, which is why Dubai Municipality frames faster reporting in terms of contractors and consultants completing project stages on schedule.[6]

Automation addresses both halves of that delay: robots using X-ray technology and AI compress the analysis itself, and a connected platform delivers the report to the people waiting for it. Dubai Municipality frames this as part of a wider adoption of digital systems and AI to raise service quality and streamline operations.[7]

HOW THE TECHNOLOGY WORKS

The robots use X-rays to carry out automated chemical analysis of cement and other construction materials, supported by AI technologies.[8] What the analysis establishes is composition, so the check verifies the material before it is built into a structure rather than assessing the structure afterwards.[9]

Automation changes the economics of that verification. A conventional chemical analysis would run as a sequence of manual steps, and that sequence limits how many samples a laboratory can process in a day. Running it robotically compresses an individual test from 4 working days to 8 minutes and raises the number of samples examined daily by 650%.[10]

The cement testing service is linked to Dubai Municipality's smart platform for laboratory testing services, so a completed analysis reaches the customer as an inspection report on a smartphone, tablet, or other mobile device.[11] Dubai Municipality states that the method raises the quality of its construction testing services to align with international standards.[12]

8 minutes
to complete a construction material test vs. a typical 4-day window

650% INCREASE
in samples examined daily

IMPACT AND RESULTS

The gain is in throughput as well as speed. Each test returns in minutes rather than days,[13] and the laboratory examines 650% more samples daily than before the technology was applied.[14]

For the construction sector, that translates into faster submission of laboratory results to consultants and contractors, supporting the completion of project stages within their deadlines.[15]

WHAT'S NEXT

The approach proven on construction materials has since been extended across Dubai Central Laboratory's other testing domains. At GITEX Global 2025, the laboratory launched a smart gold and jewellery testing device, which Dubai Municipality describes as the world's first self-service instrument for verifying the purity of precious metals, combining spectroscopic analysis, X-ray technology, and AI to return results in under a minute without human intervention.[16]

In 2026, the laboratory opened the ViruGenetics Lab, a facility it describes as the first of its kind in the UAE. It uses digital polymerase chain reaction (PCR) and genomic technologies to detect foodborne viruses including norovirus and hepatitis A and E, with capacity for around 60 samples a day rising to 100 during emergencies.[17] New instrumentation for oil and fat quality testing raised daily capacity from six samples to 60, a 900% increase, while removing the chemical consumables that conventional methods require.[18] AI has also been applied to household water testing, shortening the time needed to detect bacterial contamination such as Legionella and E. coli so that corrective action can begin sooner.[19]

Dubai Municipality has also stated that the construction-material testing technology will be used to support specialised research.[20]

"The robots utilise X-rays to precisely carry out chemical analysis of construction materials and cement products used, which allows for effectively meeting the requirements of the construction sector in the emirate of Dubai that is characterised by the superior speed in completing tests with the highest accuracy," said Eng. Hind Mahmoud Ahmed, then Acting Director of the Dubai Central Laboratory Department, Dubai Municipality.[21]

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4IR Technologies:
AI, IoT, Digital twins

Emirate:
Dubai

Maturity:
Scaled Deployment

Type:
Public

ENERGY

014

Dubai's Self-Restoring Smart Electricity Grid (DEWA Smart Grid)

ACTORS

Dubai Electricity and Water Authority

SNAPSHOT

Dubai records the world's lowest average electricity-interruption time per customer, according to Dubai Electricity and Water Authority's (DEWA) international benchmarking. Customer Minutes Lost reached 0.82 minutes in 2025, equivalent to approximately 49 seconds, against about 15 minutes at leading European utilities.[1] It is the output of an AED 7 billion programme running to 2035 that has instrumented the electricity and water networks end to end, with 2.3 million smart meters, more than 15 million units of network data analysed daily, and an automatic restoration system that identifies electricity faults, isolates affected sections, and reroutes supply without human intervention.[2]

WHY IT MATTERS

Reliable power is the foundation of a digital and resilient economy. Traffic signals, digital twins, data centres, and vertical farms all depend on a continuous and stable electricity supply, and Dubai's demand is rising accordingly: DEWA's customer accounts reached 1,292,487 by the second quarter of 2025, up 4.81% year on year.[3]

At the same time, the grid is becoming more complex to operate. Clean energy represents more than 21.5% of DEWA's installed generation capacity and is rising.[4] Solar output is intermittent, and on rooftops it is distributed across thousands of points that a traditional grid was never built to receive power from. Distributed generation and electric-vehicle charging add further complexity by creating new sources and concentrations of electricity flow across the network. Managing this system increasingly depends on continuous measurement, rapid analysis, and automated control.

The programme therefore goes beyond conventional network expansion. DEWA has developed a data-driven grid that monitors operating conditions continuously, identifies emerging risks, and restores supply automatically when disruptions occur.

HOW THE TECHNOLOGY WORKS

A smart grid is an ordinary electricity network with four things added: sensors that measure what is happening across it, a communications layer that carries those measurements back, software that turns them into a picture of network condition, and switches that act on that picture without waiting for a person.

Traditional meters provide only periodic consumption readings and limited visibility of conditions at individual premises. As a result, utilities may depend partly on customer reports to identify local outages. A smart meter reports consumption, voltage, and loss of supply as it happens. By 2020, DEWA had replaced all conventional electricity and water meters with smart meters.[5] Each meter automatically sends a reading every 15 minutes through a wireless communications network installed across Dubai, giving DEWA near real-time visibility of consumption and network conditions. The network, completed in 2017, connects more than 4,200 distribution substations.[6]

The Distribution Network Smart Centre, opened in January 2024, keeps a live picture from that feed: which circuits are loaded, where voltage is drifting, which assets are behaving abnormally. This enables many faults to be identified and assessed remotely before field crews are dispatched.[7] A vast data platform underneath joins grid data to operational systems for forecasting and asset analytics.[8]

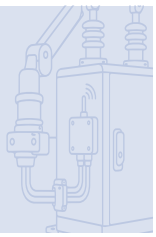
Automated restoration reduces the duration and reach of power cuts. When a fault occurs, DEWA's Automatic Smart Grid Restoration System can identify the affected section, isolate it, and redirect electricity through another available route. Field crews are still required to repair the damaged equipment, but supply can often be restored to affected customers before that work is completed.[9]

DEWA has also piloted a virtual power plant, which coordinates distributed energy resources (such as rooftop solar systems, batteries, chillers, and electric-vehicle chargers) as a single controllable network. The trial combined approximately 3.3 megawatts of flexible capacity that could be managed centrally to support the grid.[10]

0.82
minutes lost per year in 2025, vs ~15 min at leading European utilities

2.3M
smart meters installed across DEWA's network

99.99%+
system reliability and availability



IMPACT AND RESULTS

Customer minutes lost in Dubai fell from 6.88 minutes a year in 2012 to 1.06 in 2023 and 0.94 in 2024,[11] falling further to 0.82 minutes in 2025, as reported in 2026.[12] Electricity transmission and distribution losses stand at 2% against 6% to 7% in Europe and the United States, and water network losses at 4.4%, both among the lowest recorded.[13] System reliability and availability exceeds 99.99%, and DEWA reports ranking first internationally on 13 performance indicators.[14] The distribution automation work was named Smart Grid Project of the Year for the UAE at the Asian Power Awards 2024.[15]

WHAT'S NEXT

Dubai has committed to producing all of its power capacity from clean sources by 2050, and 36% of installed capacity by 2030 against 21.5% today, under the Dubai Clean Energy Strategy 2050 and the Dubai Net Zero Emissions Strategy 2050.[16] Most of that power will come from the Mohammed bin Rashid Al Maktoum Solar Park, which has reached 3,860 megawatts and is expected to exceed 8,000 megawatts by 2030.[17] As solar capacity grows, DEWA will need greater flexibility to balance variable generation with changing electricity demand. Its completed virtual power plant pilot demonstrated one approach by coordinating solar systems, batteries, electric-vehicle chargers, and flexible loads as a single resource. DEWA has identified additional sites, has assessed wider deployment across its distribution and transmission networks, and plans to implement the technology on a larger scale.[18] This expansion will build on DEWA's existing use of artificial intelligence, automation, and smart energy systems under its Smart Grid Strategy through 2035.[19]

Speaking when the 2024 result was announced, HE Saeed Mohammed Al Tayer, Managing Director and Chief Executive Officer of DEWA, placed the result in context: "This emphasises our leadership in innovation and adopting the latest disruptive technologies of the Fourth Industrial Revolution to enhance DEWA's resilience, agility, and readiness to meet the growing demand for electricity and water in Dubai."[20]

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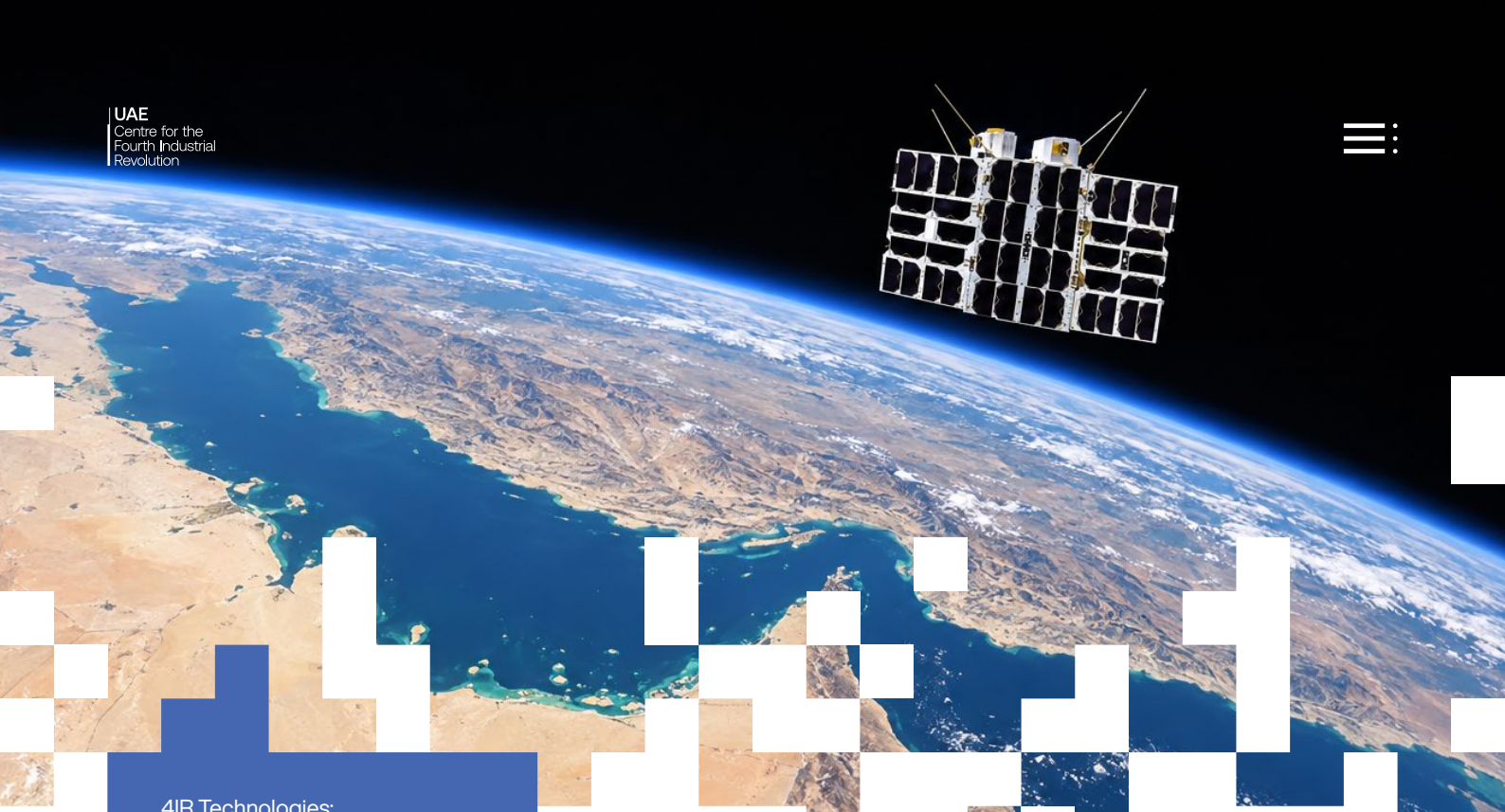


4IR Technologies:
IoT, Space data and Earth observation, AI

Emirate:
Dubai

Maturity:
Operational Deployment

Type:
Public

ENERGY

015

Monitoring Remote Grid and Water Assets from Orbit (Space-D)

ACTORS

Dubai Electricity and Water Authority

SNAPSHOT

Through its Space-D programme, Dubai Electricity and Water Authority (DEWA) became the first utility in the world to launch and operate its own nanosatellites to monitor electricity and water networks.[1] DEWA SAT-1 reached orbit in January 2022 and collects readings from sensors on remote assets; DEWA SAT-2 followed in April 2023, designed and built by Emirati engineers at DEWA's Research and Development Centre, and photographs the network from above.[2] Both report to a ground station at the Mohammed bin Rashid Al Maktoum Solar Park.[3]

WHY IT MATTERS

DEWA must monitor electricity and water assets distributed across a wide geographical area, including sites with limited terrestrial connectivity. Extending ground communications to remote assets can be costly and time-consuming, particularly across difficult terrain. DEWA estimates that a satellite constellation could collect data from these assets at a fraction of the cost and time required to extend terrestrial network coverage.[4]

Space-D therefore complements DEWA's existing IoT network rather than replacing it. Direct-to-satellite communication extends monitoring to assets beyond terrestrial coverage, while remote sensing supports applications such as pre-fault detection, transmission-line surveillance, solar forecasting and water-leak detection. Together, these capabilities can improve network visibility, planning and preventive maintenance across DEWA's electricity and water operations.[5]

HOW THE TECHNOLOGY WORKS

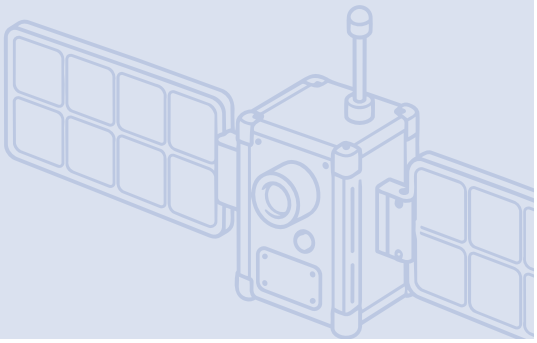
Sensors at remote sites use low-power radio to transmit small amounts of data over limited distances, normally requiring a nearby receiver or gateway. DEWA SAT-1 moves that receiving function into orbit: terminals aboard the satellite collect LoRa signals directly from ground-based sensors, reducing the need for local communications infrastructure.[6] These sensors can transmit readings such as power factor and frequency from low-voltage rooms, temperature, pressure and flow from water pipelines, and power-quality data from remote substations whenever the satellite passes overhead.[7]

DEWA SAT-2 carries multispectral and thermal imaging systems. Because electrical equipment often generates abnormal heat before failure, degrading joints and overloaded connections can appear as distinct thermal signatures. Imaging transmission lines, substations and solar plants from orbit allows DEWA to identify these anomalies and target inspections more precisely.[8] The same instruments can monitor seawater temperature and salinity near desalination intakes and help detect environmental threats such as oil spills and red tides.[9]

Both satellites downlink to the Solar Park ground station, where readings are aggregated and presented to operations staff through dashboards and a dedicated portal.[10]

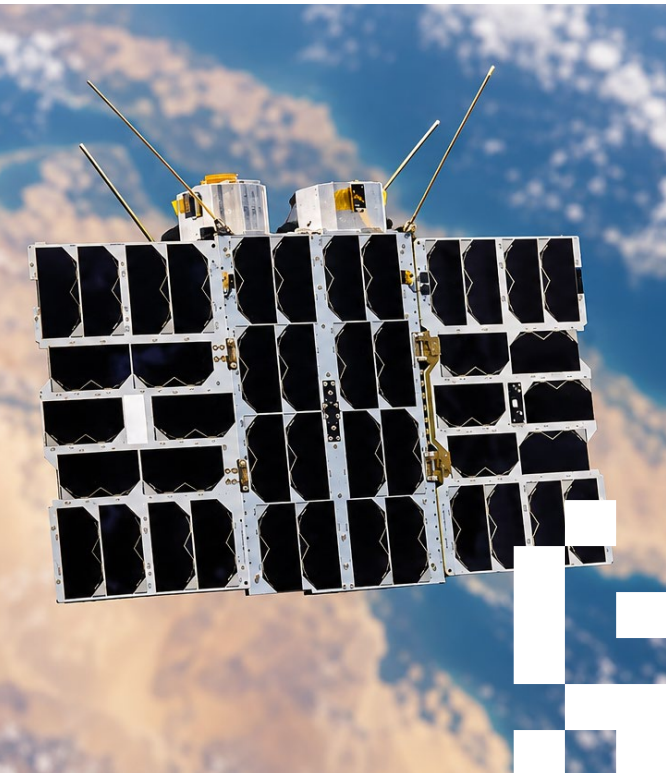
2
SATELLITES
monitoring grid and water assets from orbit

7
RESEARCH PAPERS
produced on direct-to-satellite communication



IMPACT AND RESULTS

DEWA SAT-1 had transmitted 2,690 megabytes of operational data to the ground station by December 2024.[11] The programme has also produced seven research papers with partners on direct-to-satellite communication using LoRa protocols, an area with little prior operational precedent.[12] Current applications include monitoring substation conditions and water transmission lines, estimating and forecasting fog, and tracking construction progress across new assets.[13] DEWA SAT-2 was designed and developed by Emirati engineers at the Research and Development Centre in partnership with NanoAvionics, reflecting the programme's broader aim of building domestic space-technology capability.[14]



WHAT'S NEXT

The programme is being opened to partners with established space heritage. In November 2025, DEWA and the UK Space Agency discussed collaboration on applying space technology to utility infrastructure,[15] and DEWA has said it is pursuing working relationships with the European Space Agency and NASA.[16] The next step is to move successful applications beyond demonstration. A larger satellite constellation could turn uses such as substation fault detection, solar forecasting and transmission-line monitoring into regular operational services across the network.[17]

"Through the Space-D programme, we intend nanosatellite technology to complement the terrestrial IoT communication network to increase the efficiency and effectiveness of DEWA's operations and support the digitisation of our electricity and water networks," said HE Saeed Mohammed Al Tayer, Managing Director and Chief Executive Officer, Dubai Electricity and Water Authority.[18]

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4IR Technologies:
AI

Emirate:
Abu Dhabi

Maturity:
Operational Deployment

Type:
Public-Private

ENERGY

016

Agentic AI Across Upstream Oil and Gas Operations (ENERGYai)

ACTORS

AIQ
Abu Dhabi National Oil Company (ADNOC)

SNAPSHOT

ENERGYai is an agentic AI platform for subsurface engineering, developed by AIQ, Abu Dhabi's specialist energy-AI company, for ADNOC in collaboration with G42, Microsoft and SLB, the global energy-technology company formerly known as Schlumberger. Built on around 70 years of ADNOC field data, it combines a large language model with specialised AI agents for technical workflows including geology, seismic interpretation and reservoir modelling. Engineers can direct the system in plain language and question its outputs.[1]

The agents coordinate specialist applications that AIQ had already developed and deployed across ADNOC. In an early test covering two fields and 15% of ADNOC's data, a seismic agent completed interpretation 10 times faster and improved precision by 70%.[2] In March 2025, AIQ announced a 3-year, USD 340 million contract to deploy ENERGYai across ADNOC's upstream operations.[3]

WHY IT MATTERS

A field development plan determines which wells ADNOC will drill, where they will be located, and in what sequence they will be brought online. Preparing one can take 1 to 2 years, yet the decisions it contains may shape production for decades.[4] Much of that time is spent simulating how oil, gas, and water will move through the reservoir under different development scenarios. Because large-field simulations are slow and computationally intensive, engineers can assess only a limited number of options before a plan is approved.

The reservoir models behind those simulations also depend on extensive manual interpretation. Specialists analyse seismic surveys, classify rock samples, and identify the orientation of geological layers in borehole images. Abu Dhabi's carbonate reservoirs are particularly complex and heterogeneous, making this work difficult to standardise. Different specialists may interpret the same evidence differently, introducing variation into models that support long-term investment decisions.[5]

ENERGYai addresses both constraints. AI accelerates geological interpretation and reservoir-model construction, while machine-learning surrogate models approximate the most computationally demanding simulations. This allows engineers to compare more development scenarios in less time and make decisions from a broader, more consistent evidence base.[6]

10x FASTER
seismic interpretation

70% PRECISION
gain

HOW THE TECHNOLOGY WORKS

Over several years, AIQ developed and deployed a suite of specialist AI applications across ADNOC's subsurface operations, each designed to automate a defined technical task.[7] ENERGYai adds an agentic layer above them. It combines a large language model with specialised agents that can interpret an engineer's objective, select the appropriate applications, run them in sequence, and return results that can be questioned in plain language.[8]

The agents coordinate several underlying applications, each responsible for a different part of the technical workflow. AR360 brings a field's subsurface data into a single environment for reservoir visualisation and performance analysis. It uses AI to support field development planning by assessing new wells, existing-well performance, and injection and production rates.[9]

DRIVE addresses the simulation bottleneck by training machine-learning proxy models on a limited set of full reservoir simulations. Engineers can then use the faster proxy to compare and rank additional development scenarios without running a complete physics-based simulation each time.[10] RockInsight and WellInsight automate parts of geological interpretation. RockInsight analyses thin-section images to estimate properties such as porosity and rock structure, while WellInsight reads borehole images and drilling data to map geological layers and assess wellbore stability.[11]

These applications operate on a shared data foundation. The Open Subsurface Data Universe gives well logs, seismic volumes, and production records a common structure, while Microsoft provides the underlying infrastructure. Since August 2025, SLB's Lumi data and AI platform has provided the layer through which ENERGYai accesses and works with those records.[12]

IMPACT AND RESULTS

ENERGYai's underlying applications are already in operational use across ADNOC. AR360 was first deployed at the Bab and Umm Shaif fields in early 2024 and had expanded to more than 30 reservoirs across ADNOC's upstream operations by October that year.[13] ADNOC and its partners report that the application improved engineer productivity during full reservoir-model reviews by 75% while maintaining model quality.[14]

Published results for the agentic platform begin with its test phase. Using 15% of ADNOC's data across two fields, a seismic agent completed interpretation 10 times faster and improved precision by 70%.[15] AIQ and Presight have also reported broader gains across the wider application suite, including faster evaluation of development scenarios.[16]

The programme has also moved into large-scale commercial deployment. The 3-year contract announced in March 2025 is valued at USD 340 million.[17] During its first-quarter 2026 earnings call, Presight said ENERGYai had entered its second year of delivery, with applications being approved and introduced into live upstream operations.[18]

WHAT'S NEXT

AIQ is rolling ENERGYai out across ADNOC's upstream operations. Beyond this initial deployment, the platform is designed to extend into midstream, downstream and sustainability use cases across the wider energy value chain.[19] Alongside ENERGYai, ADNOC is expanding its broader AI portfolio. AiPSO, developed with SLB and launched in November 2025, is already being used to optimise production across several fields, with wider deployment planned across ADNOC's onshore and offshore operations.[20]

Beyond ADNOC, AIQ is targeting international growth. AIQ Chief Executive Dennis Jol has identified the United States, Canada, and the North Sea as priority markets, with several use cases developed inside ADNOC already being tested through overseas pilots.[21]

Speaking at the Semafor Gulf Live event in Abu Dhabi in June 2026, Jol put the ambition plainly: "We've proven that we can do it here in the UAE. Now it's time for us to export."[22]

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ENERGY

4IR Technologies:
AI, Autonomous systems, IoT, Cloud computing

Emirate:
Abu Dhabi

Maturity:
Scaled Deployment

Type:
Public-Private

017

Autonomous Well Control (RoboWell)

ACTORS

AIQ
Abu Dhabi National Oil Company (ADNOC)
Halliburton

SNAPSHOT

RoboWell is a software-based autonomous well-control system. It reads live data from a gas-lifted oil well, calculates how much gas to inject to keep production near its optimal rate, and automatically adjusts the well's gas-injection control within limits set by engineers.[1] AIQ built it with ADNOC's Thamama Excellence Center and Halliburton, the first system of its kind for gas-lifted wells.[2] It went live onshore at North East Bab in 2023, offshore at NASR in 2024, and by April 2026 was running on more than 500 wells.[3]

WHY IT MATTERS

ADNOC is raising crude production capacity to five million barrels per day by 2027, a quarter more than its 2020 level.[4] Much of that has to come from fields already decades old, which Upstream Chief Executive Musabbeh Al Kaabi said at ADIPEC in November 2025 need continual infill drilling and redevelopment to offset natural decline.[5]

Old wells need help to flow. Once reservoir pressure can no longer lift the fluid column, gas is injected to lighten it, and from then on everything depends on the injection rate.[6] Getting that rate right has always been slow work, so operators concentrated on the wells with most to gain and left the rest at whatever setting they were last given.[7]

The two errors cost differently. Too little gas and the well produces below what a national capacity target needs. Too much and the surplus is burned in a country working towards gas self-sufficiency.[8] Offshore, changing the setting at all means sending people out by boat or helicopter, which adds emissions at a company that sells Murban crude on a carbon intensity less than half the industry average.[9] RoboWell removes the interval between adjustments. The rate is held continuously in software, so every well is optimised rather than only those worth a specialist's time.[10]

HOW THE TECHNOLOGY WORKS

A gas-lifted well does not settle down. Gas and oil rising together make the flow surge and then fall away in cycles, so pressure and production keep swinging instead of holding steady. The setting that produces the most oil sits inside that swing, which means that no single injection rate, however carefully chosen, will keep a well there.[11] The rate has to move as the well moves, and moving it correctly means knowing what the well is about to do.

RoboWell does that with machine-learning models of well behaviour, built by AIQ and Halliburton with ADNOC and hosted in the cloud. Each model takes a live feed from its well and predicts how the well will respond to a change in gas injection. The control layer acts on that prediction, then compares what happened with what the model expected and adjusts again.[12] AIQ built the link between the models and the real-time data pipeline, which is what lets the loop run continuously rather than in batches.[13]

Engineers set the limits the well must stay inside, and RoboWell optimises within them, moving to keep the well out of unstable flow rather than waiting for it to trip.[14] A dashboard shows operators what it is doing and why, which spreads gas lift judgement beyond the few specialists who held it.[15]

500+
WELLS
on RoboWell by April 2026

30%
OPTIMISATION
of gas lift consumption

100%
HSE RELIABILITY
in commercial operation

IMPACT AND RESULTS

The first deployment was at North East Bab, ADNOC's first smart field, across both naturally flowing and gas-lifted wells. Scaling it there cut gas lift consumption by 30% and halved the number of well movements.[16]

In commercial operation AIQ reports up to 30% optimisation of gas lift consumption, up to 5% higher production from existing wells, and 100% health, safety, and environment reliability.[17]

Deployment has moved from one field to the estate. NASR, 130 kilometres north-west of Abu Dhabi, took RoboWell offshore for the first time anywhere, beginning with 10 wells against a plan for more than 300 across ADNOC's onshore and offshore operations that year.[18] By April 2026 the figure had passed 500.[19]

WHAT'S NEXT

International deployment is where the growth lies, and the channel for it is in place. Under a partner agreement signed in July 2024, RoboWell is distributed worldwide through Halliburton's Landmark iEnergy cloud, its distribution platform for exploration and production software.[20]

AIQ has named the United States, Canada, and the North Sea as target markets, with 14 of more than 200 use cases developed inside ADNOC now running as pilots abroad.[21] Gas lift is common in mature fields everywhere, which is the condition RoboWell was built for, so the addressable estate extends well beyond the 500 wells it now runs in the UAE.

Abdulmunim Saif Al Kindy, ADNOC Upstream Executive Director, set out the ambition that RoboWell serves: "ADNOC's aim is to become the world's most AI-enabled energy company, integrating AI from the control room to the board room to maximize efficiency and move towards autonomous operations."[22]

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4IR Technologies:
AI, Digital twins, Autonomous systems

Emirate:
Dubai

Maturity:
Operational Deployment

Type:
Public-Private

ENERGY

018

AI-Optimised Solar Tracking at Dubai's Solar Park (TrueCapture)

ACTORS

Nextpower (formerly Nextracker)
Dubai Electricity and Water Authority (DEWA)
Shanghai Electric

SNAPSHOT

TrueCapture applies machine learning to the control of utility-scale solar trackers. These systems rotate photovoltaic panels to follow the sun and maximise energy capture. Conventional systems typically move every row in a solar field to the same angle at the same time. TrueCapture instead controls each row independently, combining panel-mounted sensors, a digital model of the site and machine learning to determine the most effective angle from one minute to the next.[1] The software operates on trackers designed with independent-row architecture. Nextpower, then operating as Nextracker, supplied more than 1 gigawatt of these systems to the fifth phase of the Mohammed bin Rashid Al Maktoum Solar Park through Shanghai Electric.[2]

WHY IT MATTERS

Under the Dubai Clean Energy Strategy 2050 and the Dubai Net Zero Carbon Emissions Strategy 2050, Dubai aims for 100% of its energy production capacity to come from clean sources by 2050. The Mohammed bin Rashid Al Maktoum Solar Park is a key project supporting that transition and is now planned to exceed 8,000 megawatts of capacity by 2030.[3] At that scale, even a small improvement in yield translates into a substantial amount of additional electricity over the life of the asset. Solar fields are not perfectly flat or uniform. Variations in terrain and construction height can cause rows to shade one another when the sun is low. Conventional tracking systems move all rows to the same angle, limiting their ability to account for these local differences.[4]

Desert conditions create both opportunities and constraints. Highly reflective ground can increase the amount of light reaching the rear surface of bifacial panels, improving output in high-albedo environments.[5] Dust and haze can have the opposite effect by scattering sunlight across the sky. Under those conditions, the angle that best captures direct sunlight may no longer produce the highest yield.[6]

Row-level control allows each tracker to respond to the conditions around it. The system can adjust individual rows to reduce shading and, during periods of diffuse light, move panels towards a flatter position to capture more light from across the sky.[7]

HOW THE TECHNOLOGY WORKS

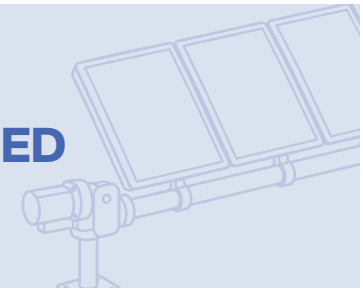
The system begins with a digital twin of the solar plant, modelling the terrain, array layout, and tracker geometry so the software can understand how each row sits in relation to its neighbours and the surrounding ground.[8] Sensors on the panels then report real-time shading conditions, allowing the digital twin to reflect how the site is performing in operation rather than only how it was designed.[9]

The control loop runs continuously. Irradiance and weather data are processed through machine-learning algorithms, which calculate the most effective angle for each tracker row.[10] Those instructions are sent to self-powered wireless controllers and coordinated with the plant's supervisory control system.[11]

Several optimisation modes can operate simultaneously. Row-to-row shade avoidance adjusts individual trackers to reduce morning and evening shading, while diffuse-light tracking moves panels towards a flatter angle when scattered light produces more energy than direct tracking.[12] Split Boost applies to compatible half-cell modules. It allows controlled shading across the lower half of a panel so that the upper half remains fully exposed.[13] Zonal Diffuse adds higher-resolution sensing, enabling trackers to respond to cloud cover moving across different parts of the plant.[14]

UP TO 6% YIELD INCREASE
in annual energy output

1GW+ TRACKERS SUPPLIED
to Solar Park Phase 5



IMPACT AND RESULTS

Nextracker's filings with the United States Securities and Exchange Commission estimate that TrueCapture can increase annual energy yield by 1% to 3% on most projects, with gains of up to 6% at sites where terrain, construction variation, plant design, and weather create greater scope for optimisation.[15] Its current product literature cites gains of up to 4%.[16]

Independent assessments have also recorded measurable improvements. At the 40-megawatt Beacon 5 solar plant in California's Mojave Desert, Black & Veatch measured a 2.2% increase in energy yield relative to a control group.[17] ICF reviewed four utility-scale projects in the United States, England, and Australia and reported gains at each site.[18]

At the Mohammed bin Rashid Al Maktoum Solar Park, DEWA increased the rated capacity of the first project in Phase 5 from 300 megawatts to 330 megawatts, attributing the increase to the combination of bifacial modules and single-axis tracking.[19]

WHAT'S NEXT

Nextracker renamed itself Nextpower in November 2025, signalling a broader shift from solar tracking towards integrated power-plant technology. It also announced a new line of utility-scale power-conversion systems, with first shipments expected in 2026.[20] TrueCapture and the rest of its software portfolio continue under the new brand.

Across the region, the software is being deployed alongside the tracking hardware. TrueCapture was selected with Nextracker systems for the first phase of Saudi Arabia's 450-megawatt Sudair solar plant, applying the same combination under comparable desert conditions.[21] For Dubai, where several gigawatts of single-axis tracking are already installed, row-level optimisation offers a way to increase output from existing plants through software rather than new construction.[22]

Marco Garcia, Chief Commercial Officer of Nextracker, set out why the technology particularly suits this part of the world: "Bifacial optimized trackers and TrueCapture technology are particularly well suited to maximize solar energy production on power plant facilities in desert environments. The desert has a very high albedo, or brightness of the ground. Over the life of a solar plant, this makes a significant difference in the total amount of energy produced."[23]

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4IR Technologies:
Robotics, AI, IoT

Emirate:
Abu Dhabi

Maturity:
Operational Deployment

Type:
Public-Private

ENERGY

019

Robotic Inspection and Predictive Maintenance of Gas Infrastructure

ACTORS

Gecko Robotics
ADNOC Gas
AIQ
Al Masaood Energy

SNAPSHOT

Gecko Robotics uses crawling robots, drones, and fixed sensors to inspect industrial equipment and assess when it may require repair or replacement. Its systems collect data from tanks, boilers, pipelines, and pressure vessels,[1] which is then analysed through Cantilever, Gecko's AI platform for physical assets. The platform combines inspection data with engineering designs and operating records to model asset condition, identify emerging risks, and prioritise maintenance.[2] ADNOC Gas became Gecko's first customer in the UAE in 2023. The relationship expanded with a contract worth up to USD 30 million in April 2024 and a 3-year programme involving Gecko and AIQ announced in November 2025.[3]

WHY IT MATTERS

ADNOC Gas supplies around 60% of the UAE's sales gas[4] and operates assets that have been in service for decades, including the Das Island LNG plant, which began production in 1977.[5] Over time, corrosion can reduce the thickness of steel equipment, making accurate inspection essential to safe and reliable operations.

Traditional inspections rely on manual ultrasonic readings, often requiring scaffolding and shutdowns, and cover only selected points on an asset.[6] Robotic inspection can scan larger areas continuously, work at height, and assess some equipment while it remains online.[7]

This produces a more complete picture of asset condition and helps maintenance teams identify critical weaknesses before they lead to failure.

HOW THE TECHNOLOGY WORKS

For pressure equipment, the primary inspection tool is a wall-climbing robot. It attaches magnetically to carbon-steel surfaces and carries ultrasonic probes that measure wall thickness by sending pulses through the metal and timing their return. As the robot moves across the asset, it converts individual readings into a detailed thickness map that reveals areas of corrosion.[8] Drones and fixed sensors inspect assets the robots cannot reach, adding visual, acoustic, and LiDAR data.[9]

A single inspection shows the asset's condition at one point in time. Cantilever, Gecko's cloud platform, compares successive inspections and combines them with historical readings, design files, and operating data. Its Data Systems layer applies machine learning to estimate corrosion rates and the remaining life of each area.[10,11]

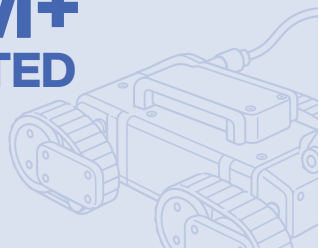
These estimates support condition-based maintenance by helping teams prioritise repairs and capital spending according to asset condition rather than fixed inspection schedules.[12]

Under the November 2025 agreement, Gecko leads system integration and predictive analysis through Cantilever, while AIQ applies the outputs across ADNOC's wider operations.[13]

99.6%
MORE ASSET COVERAGE
vs manual inspection

93%+
INSPECTION EFFICIENCY
improvement

USD 300M+
PROJECTED SAVINGS
over 5 years



IMPACT AND RESULTS

During the initial pilot with ADNOC Gas, Gecko's robots increased asset coverage by 99.6% compared with manual inspection, nearly doubling the area measured, while improving inspection efficiency by more than 93%.[14] Eliminating scaffolding from parts of the process was also projected to reduce lost-time injury rates by 33%.[15]

The commercial relationship expanded from a contract worth up to USD 30 million, awarded in April 2024 to Gecko and its UAE delivery partner Al Masaood Energy,[16] to a 3-year programme signed with AIQ and ADNOC Gas in November 2025.

WHAT'S NEXT

The 3-year programme will be delivered in stages. The first year focuses on joint deployment and data modelling, while years two and three expand access to the platform and introduce continuous optimisation. The stated aim is to reduce unplanned outages and extend asset life across ADNOC Gas facilities, and ADNOC Gas expects the platform to deliver more than USD 300 million in maintenance and inspection savings over 5 years.[17,18]

The programme formed part of three agreements signed by ADNOC and Gecko in November 2025. A second agreement covers the wider use of robotics and AI analytics across the ADNOC group, including the potential manufacture of Gecko robots in the UAE. A third establishes training programmes for UAE nationals through the ADNOC Technical Academy.[19] Gecko has said that anticipated demand from ADNOC Gas and the wider group could support local production, and it has already manufactured its first robot in the country.[20]

Dennis Jol, Chief Executive of AIQ, said the programme extends the company's capabilities from cloud-based analysis into field operations by embedding AI directly into robotic systems and inspection workflows. In his words, it creates a continuous path "from inspection to insight to action" and lays the groundwork for more autonomous operations.[21]

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4IR Technologies:
AI, Digital twins, IoT

Emirate:
Abu Dhabi

Maturity:
Scaled Deployment

Type:
Public-Private

ENERGY

020

Predictive Maintenance of Rotating Equipment (CPAD)

ACTORS

ADNOC
ADNOC Gas
Honeywell

SNAPSHOT

CPAD, ADNOC's Centralized Predictive Analytics and Diagnostics programme, monitors critical rotating equipment for early signs of failure. It continuously analyses sensor data from turbines, pumps, compressors, generators, and engines, using machine learning to identify patterns associated with developing faults before equipment breaks down.[1] The programme began as a proof of concept at ADNOC Gas in 2017 and was later expanded across the company's sites.[2] That deployment provided the basis for a group-wide rollout. In November 2019, ADNOC signed a 10-year agreement with Honeywell to extend CPAD to as many as 2,500 critical machines across its operating companies.[3]

WHY IT MATTERS

ADNOC Gas supplies around 60% of the UAE's sales gas through processing plants designed to operate continuously.[4] Those plants depend on turbines, pumps, and compressors running reliably under demanding conditions. When a critical machine fails unexpectedly, the process it supports may stop with it.

Traditional maintenance relies heavily on fixed service intervals. That can lead to unnecessary work on healthy equipment while still allowing faults to develop between inspections.[5] A calendar shows when a machine was last serviced, but not how its condition is changing.

CPAD addresses that gap by continuously analysing the vibration, temperature, and performance data generated by the equipment itself. By identifying patterns associated with developing faults, it gives maintenance teams earlier warning and more time to intervene before a breakdown occurs.[6]

HOW THE TECHNOLOGY WORKS

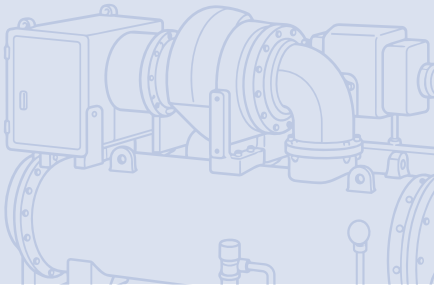
CPAD automatically collects operating data from turbines, pumps, generators, compressors, and engines, then applies machine-learning models tailored to each equipment type.[7] Live readings are compared with historical data from the same machine and similar assets, allowing the system to identify unusual behaviour rather than relying only on fixed thresholds.[8]

The platform uses Honeywell Forge Asset Monitor, which creates a digital twin of each machine. This software model estimates how the equipment should perform under current conditions and highlights deviations that may indicate a developing fault.[9] Continuous monitoring combines these models with machine-learning analytics to give engineers early warning of potential failures.[10]

That warning creates time to act. Maintenance teams can plan repairs around production schedules and take equipment offline at a controlled moment, rather than responding after an unexpected breakdown.[11]

2,500 MACHINES
covered under the Honeywell agreement

500+ ROTATING ASSETS
critical assets monitored at ADNOC Gas alone



IMPACT AND RESULTS

CPAD runs at national scale. At ADNOC Gas it monitors more than 500 critical rotating assets across the company's processing plants, while a group-wide agreement provides for central monitoring to expand to as many as 2,500 critical rotating machines across ADNOC companies, making it one of the largest predictive-maintenance programmes in the oil and gas industry.[12] ADNOC Gas reports that the analysis lets it identify anomalies and the need for maintenance early, minimise unplanned maintenance and downtime, and produce significant savings.[13]

The clearest result is the change in how the company maintains its plants. ADNOC Gas states that CPAD moved its processing operations from reactive and scheduled maintenance to a predictive approach, letting teams act on a developing fault while there is still time to plan the work around production rather than react to a breakdown.[14] It cites the programme as a demonstration that machine learning can be applied in complex and challenging industrial environments, and its own experience with CPAD drove the subsequent rollout across the ADNOC group.[15]

WHAT'S NEXT

The 10-year agreement with Honeywell, signed in 2019, runs to 2029 and provides for CPAD to expand to as many as 2,500 critical machines under central monitoring across the ADNOC group.[16] ADNOC Gas presents the programme as a foundation for wider use of artificial intelligence in its operations, using the existing deployment to support further expansion.[17]

CPAD also forms part of ADNOC's broader Oil and Gas 4.0 strategy, which applies predictive analytics and automation across activities ranging from subsurface modelling to well control.[18]

Announcing the programme, Sultan Ahmed Al Jaber, Managing Director and Group Chief Executive of ADNOC, placed it within the company's wider technology shift: "ADNOC's predictive maintenance project is significant in scale and in its application of AI technology, and marks an important technological milestone for the industry."[19]

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4IR Technologies:
AI, Digital twins, Autonomous systems

Emirate:
Abu Dhabi, Dubai

Maturity:
Scaled Deployment

Type:
Public-Private

ENERGY

021

Autonomous AI Control of a Major District Cooling Network

ACTORS

Tabreed (National Central Cooling Company)
ENGIE Digital

SNAPSHOT

Tabreed operates one of the world's largest fully autonomous district cooling schemes in Downtown Dubai, where four interconnected plants serve 80 buildings, including the Burj Khalifa and Dubai Mall. Its Nemo platform, developed with ENGIE Digital, forecasts demand and autonomously determines chilled-water flows, temperature settings, equipment sequencing and how cooling is distributed across the network.[1] The scheme is part of a wider network of 92 plants operated by Abu Dhabi-based Tabreed across six countries. Using the same digital operating model, the plants are monitored and controlled remotely from a central command centre.[2]

WHY IT MATTERS

Cooling is the largest source of peak electricity demand in the UAE, accounting for as much as 70% of the total energy demand.[3] District cooling is already significantly more efficient than installing separate chillers in individual buildings, so further gains depend on operating central plants more intelligently.[4]

Manually coordinating a district cooling plant is complex. Each plant must coordinate chillers, pumps, cooling towers, and, in some cases, thermal storage, while demand and outdoor conditions change throughout the day. Operators typically preserve a safety margin to protect reliability, but that margin can increase energy use.[5]

Automated control allows the plant to operate closer to its most efficient point. By forecasting demand and adjusting equipment continuously, the system can reduce excess energy use across multiple plants at the same time.[6]

HOW THE TECHNOLOGY WORKS

The Downtown Dubai network uses Nemo, an autonomous control platform developed with ENGIE Digital. Its algorithms forecast cooling demand across connected buildings, then determine how much chilled water to circulate, at what temperature, which chillers and pumps to operate, and how to distribute load across the four plants serving the network.[7] These decisions are updated continuously, allowing the system to operate without routine manual control.[8]

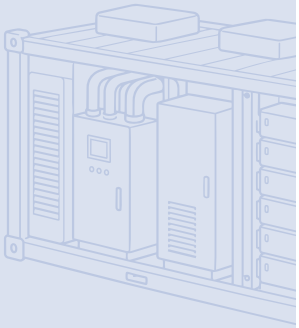
The platform draws on more than 27 years of Tabreed operating data to train its machine-learning models.[9] It also uses a digital twin of the production plants and distribution network, enabling operating strategies to be tested and refined virtually before they are applied to the live system.[10]

Automation reduces the need for operators to make repeated control adjustments and allows them to focus on oversight and exceptions. Tabreed has extended the same model to other plants, which are monitored and controlled around the clock from its central operations centre on Saadiyat Island.[11]

2.31B
KWH SAVED
across Tabreed's network in 2022

1.38M
TONNES CO_2 AVOIDED
in emissions

92
PLANTS
managed remotely from one Abu Dhabi control centre across 6 countries



IMPACT AND RESULTS

The Downtown Dubai network has capacity of up to 235,000 refrigeration tonnes and was described by Tabreed when Nemo was deployed as the world's largest fully autonomous district cooling scheme.[12]

Across its wider network, Tabreed reported energy savings of 2.31 billion kilowatt-hours in 2022, enough to power about 132,000 GCC homes, and avoided emissions of 1.38 million tonnes of carbon dioxide, equivalent to removing roughly 300,000 cars from the road.[13] These figures reflect the benefits of district cooling overall, with automation improving the performance of that underlying system.

The scale of centralised operation is itself significant. From a single control centre in Abu Dhabi, Tabreed manages 92 plants across the UAE, Saudi Arabia, Oman, Bahrain, India, and Egypt, delivering more than 1.3 million refrigeration tonnes of cooling capacity.[14] Tabreed attributes this level of remote control to the full automation of plant operations.[15]

WHAT'S NEXT

Tabreed's next step is to move beyond automation towards continuous optimisation, using AI not only to operate plants reliably but also to improve their performance proactively.[16]

Tabreed expects district cooling to play a larger role in serving other facilities as well (such as data centres), extending its operating model to some of the region's most energy-intensive infrastructure.[17] Its network already incorporates a range of energy sources, including a geothermal-powered cooling plant at Masdar City.[18]

Atef Al Breiki, Senior Vice President of Operations at Tabreed, tied the automation directly to the company's long record: "Over the past decades, Tabreed has accumulated unparalleled district cooling engineering and operations expertise, generating massive amounts of OT and business process data. Tabreed has implemented a digital strategy, investing in its IT infrastructure and OT side systems to unlock value from its legacy and long track record in the business. The collaboration with ENGIE Digital and success of Nemo integration is a direct result of this strategy."[19]

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ENERGY

4IR Technologies:
AI

Emirate:
Abu Dhabi

Maturity:
Pilot Deployment

Type:
Public-Private

022

Turning Solar into Round-the-Clock Power

ACTORS

Masdar
Emirates Water and Electricity Company (EWEC)

SNAPSHOT

Masdar and EWEC are developing a solar-and-storage project in Abu Dhabi designed to deliver a steady 1 gigawatt of electricity around the clock – enough to power an estimated 500,000 to one million homes.[1,2] The project combines a 5.2-gigawatt solar plant with a 19-gigawatt-hours battery energy-storage system and a control platform that will operate as both a single and a dispatchable source of power. It broke ground in October 2025, reached financial close in July 2026, and is scheduled to begin operations in 2027.[3]

WHY IT MATTERS

Solar power is abundant but variable. Output falls with cloud cover and stops after sunset, limiting the extent to which the grid can rely on it without storage or other sources of flexible generation.[4]

The UAE Energy Strategy 2050 aims by 2030 to triple the contribution of renewable energy, increase installed clean-energy capacity to 19.8 gigawatts, and raise the share of clean-energy generation to 32%.[5] At the same time, electricity demand is rising, including from data centres that require continuous, high-quality power.[6]

Large-scale battery storage helps bridge that gap by shifting solar electricity generated during the day into the evening and night. This allows solar to provide a more consistent, dispatchable supply and support round-the-clock demand with less reliance on gas-fired generation.[7]

HOW THE TECHNOLOGY WORKS

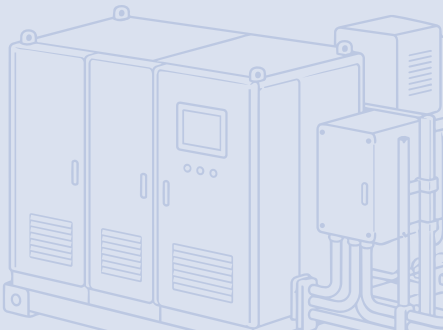
The physical idea is straightforward: the solar array generates more than the grid needs during the day, the surplus charges the battery, and the battery discharges through the evening and night to hold output steady at 1 gigawatt. The 19 gigawatt-hours of storage is what carries the plant across the hours the sun is down.[8]

What turns that arrangement into a dependable power station is the control layer, and it is where the project's 4IR technology sits. The design uses AI-enhanced forecasting to predict both weather and demand, and intelligent dispatch to decide moment by moment how much to draw from the panels, how much to store, and how much to release, so that a variable input produces a constant output.[9]

The project is also designed to support the grid in ways normally associated with conventional power stations. Grid-forming controls help stabilise frequency and voltage, while black-start capability allows the plant to contribute to restarting the network after an outage.[10] A virtual power plant layer coordinates the solar array and battery as a single controllable and dispatchable resource.[11]

1 GIGAWATT
of round-the-clock power targeted, powering up to 1 million homes

10,000+ CONSTRUCTION JOBS
expected



IMPACT AND RESULTS

The project is a pilot now under construction. Its central objective is to deliver up to 1 gigawatt of renewable power continuously using a 5.2-gigawatt solar plant and a 19-gigawatt-hours battery system.[12]

Once operational in 2027, it is expected to avoid around 5.7 million tonnes of carbon dioxide emissions each year while supplying power at what Masdar describes as a globally competitive tariff.[13]

The commitment behind the project is already substantial. It represents more than USD 6 billion in investment, reached financial close in July 2026, and is expected to create over 10,000 construction jobs.[14]

WHAT'S NEXT

The immediate task is delivery: completing the 5.2-gigawatt solar plant and 19-gigawatt-hours battery system and bringing the project into commercial operation in 2027. Its performance can then be measured against the target of supplying 1 gigawatt of renewable power around the clock.[15]

Masdar and EWEC have positioned the project to support the UAE's AI-driven growth by providing the continuous power required by data centres and other energy-intensive digital infrastructure.[16] If the model performs as designed, it could demonstrate that solar and storage can provide firm power at a scale previously associated with conventional baseload generation.[17]

Ahmed Ali Alshamsi, Chief Executive of EWEC, said the project would support the UAE's position as a centre for artificial intelligence by meeting the sector's growing energy needs more sustainably.[18]

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4IR Technologies:
AI

Emirate:
Abu Dhabi

Maturity:
Scaled Deployment

Type:
Public

ENERGY

023

Panorama: Running an Entire Oil Company from One AI Command Centre

ACTORS

Abu Dhabi National Oil Company (ADNOC)

SNAPSHOT

Panorama is ADNOC's central command centre in Abu Dhabi, bringing real-time data from 14 subsidiaries and joint ventures into a single operational view. It applies artificial intelligence, big-data analytics, and predictive models to identify issues, compare performance, and support operating decisions across the group.[1]

Operational since 2017, Panorama connects 65 sites across ADNOC's network. By 2020, the company reported that the platform had generated more than USD 1 billion in business value. The figure reflects logged savings realised from efficiencies identified through the platform.[2]

WHY IT MATTERS

ADNOC operates across the full oil and gas value chain, from exploration and production to refining, shipping, and sales, through 14 subsidiaries and joint ventures spread across dozens of sites.[3] Historically, those businesses relied on separate systems and data, making it difficult to maintain a single, current view of group-wide performance. Senior decisions therefore depended on information that was often fragmented, delayed, or manually consolidated.

That matters because each part of the value chain affects the others. Refinery operations depend on upstream production, logistics, and market demand, all of which change continuously. Without a live, integrated view, opportunities to improve margins, resolve bottlenecks, or respond to market shifts can be harder to identify.

Panorama was built to close that gap by bringing operational data into one real-time platform and applying analytics across it, allowing ADNOC to monitor and optimise the value chain as a connected system rather than as a collection of separate businesses.[4]

HOW THE TECHNOLOGY WORKS

Panorama integrates data from across ADNOC's business systems into a single real-time environment. AVEVA's System Platform and InTouch Operations Management Interface provide the underlying integration layer across ADNOC's enterprise resource planning (ERP), business, and IT applications, giving decision-makers a consolidated view of performance across the group.[5] AI and big-data analytics are then applied to that integrated data to generate operational insights and recommendations.[6] Panorama also runs what-if scenarios against ADNOC's business plans, allowing teams to assess how changes in operations or capital allocation could affect the wider value chain before decisions are made.[7]

When identified efficiencies are implemented, ADNOC records the resulting savings as part of the business value generated by the platform. Those savings contributed to the more than USD 1 billion attributed to Panorama by 2020.[8]

65
SITES CONNECTED
across ADNOC's network

14
SUBSIDIARIES
and joint ventures integrated into one operational view

USD 1B+
BUSINESS VALUE
generated by 2020

IMPACT AND RESULTS

By 2020, ADNOC reported that Panorama had generated more than USD 1 billion, equivalent to approximately AED 3.67 billion, in business value since its launch. The figure reflects savings realised from efficiencies identified through the platform.[9]

Panorama also supported ADNOC's response during the COVID-19 pandemic. Its real-time data, remote-access capabilities, and scenario-planning tools allowed leadership to track critical information across business units, assess "what-if" production and operational scenarios, and support business continuity while working remotely.[10]

The platform received external recognition in 2021, when the Offshore Technology Conference awarded Panorama its Distinguished Achievement Award for using AI, big data, and advanced technologies to improve efficiency and create value.[11]

WHAT'S NEXT

Panorama's scope continues to widen. The platform incorporates a health, safety, and environment information system that provides real-time readings across multiple environmental performance indicators, and ADNOC has continued to expand its wider portfolio of AI, digital modelling, and blockchain initiatives.[12]

The move from integrated visibility towards greater automation is already under way. Panorama gave ADNOC a real-time view of the business and the ability to test decisions across the value chain, and later work builds on that foundation: in March 2025 AIQ announced a USD 340 million contract for large-scale deployment of agentic AI across ADNOC operations, enabling systems to carry out defined tasks as well as generate recommendations.[13]

Abdul Nasser Al Mughairbi, then Senior Vice President for Digital at ADNOC, described Panorama as the company's "eyes on the ground", providing the speed, accessibility, and integration needed for better decision-making.[14]

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4IR Technologies:
Autonomous systems, IoT, AI

Emirate:
UAE-wide

Maturity:
Scaled Deployment

Type:
Private

ENERGY

024

Autonomous Solar-Hybrid Microgrids for Off-Grid Industry (Enlite)

ACTORS

Enerwhere

SNAPSHOT

Enerwhere is a Dubai-based energy company that develops and operates solar-hybrid microgrids for commercial and industrial sites without stable grid access. Its modular systems combine solar power, battery storage and diesel generators to supply construction sites, mines, islands, industrial facilities and other remote operations.[1]

At the centre is Enlite, Enerwhere's proprietary software platform for designing, controlling and analysing hybrid power systems.[2] It determines how solar, batteries and generators should be used, monitors their performance and applies operating data to the design of future systems. Enlite reports that more than 150 sites have been commissioned, deployed and managed through the platform since 2020.[3]

WHY IT MATTERS

A great deal of economic activity happens where there is no reliable grid: a quarry in the mountains, a construction site awaiting its permanent connection, an island resort or an industrial plant in a free zone. These sites have traditionally relied on diesel generators, which are expensive to fuel, noisy and polluting.[4]

Solar offers a direct route to lower diesel use, and capturing that value depends on integrating it cleanly into a generator-based system. Demand can change sharply when equipment such as a tower crane or rock crusher starts or stops, while solar output varies with the weather. Without careful coordination, the generators may run unnecessarily when solar power is available, or the electricity supply may become unstable when a cloud passes or demand suddenly increases. Solar therefore delivers its full value only if the system can balance the different power sources quickly enough to keep the supply stable.[5]

Enerwhere built its model around solving that control problem. Its technology balances solar power, battery storage and diesel generation in real time, while remote monitoring allows each installation to be managed from Dubai. Through power-purchase agreements, Enerwhere can also finance and operate the system itself, allowing customers to adopt the technology without paying the upfront cost.[6]

HOW THE TECHNOLOGY WORKS

Enlite consists of three connected applications. Enlite SIM models a site's expected demand and compares different combinations of solar panels, batteries and generators. Enlite VPO controls the operating microgrid, deciding how each power source should respond. Enlite DAT analyses high-resolution operating data to identify performance problems and improve future system designs.[7]

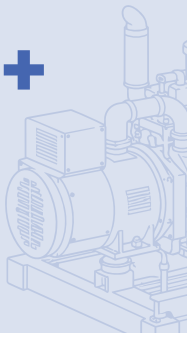
At the operating level, Enerwhere's hybrid controller continuously measures electricity demand, solar output, the residual load on the generators and the spinning reserve available to respond to sudden changes. When one of these parameters changes, the controller can adjust generator output within milliseconds.[8]

Where batteries are installed, they store surplus solar electricity, respond immediately to short bursts of demand and allow generators to be switched off when sufficient renewable power is available. Sensors at each installation transmit performance data to Enerwhere's control centre in Dubai, enabling the company to monitor its fleet remotely and investigate many faults without dispatching a technician to the site.[9]

150+
SITES
commissioned and managed through the platform

33GWh+
SOLAR GENERATED
across installations

66,000+
TONNES CO_2 AVOIDED



IMPACT AND RESULTS

Across installations managed through Enlite since 2020, the platform reports more than 33 gigawatt-hours of solar generation, 25 million litres of diesel displaced and over 66,000 tonnes of carbon dioxide avoided compared with diesel-only power.[10]

At the Uptown Dubai construction site, Enerwhere deployed an approximately 500 kWp solar-diesel microgrid to power offices, utilities, tower cranes, hoists and pumps. The company reported that the system had avoided more than 300 tonnes of carbon dioxide and saved over AED 200,000 since its commissioning in March 2019.[11]

At Al Dhafra Recycling Industries in Abu Dhabi, Enerwhere combined 114 solar trackers with battery storage and a customised energy-management system. The installation achieved renewable penetration of up to 80%, with reported annual savings of approximately USD 125,000 and 1,510 tonnes of carbon dioxide.[12]

WHAT'S NEXT

Enerwhere is continuing to expand the model across permanent industrial operations. In September 2025, it installed a solar-hybrid microgrid at ARIA Bio Industries' bitumen-processing facility in Sharjah's Hamriyah Free Zone. The system combines a 110 kWp solar array, battery storage, smart metering and Enlite. It is expected to reduce energy costs by up to 20%, improve fuel efficiency from 0.7 to approximately 0.55 litres per kilowatt-hour and avoid around 720 tonnes of carbon dioxide equivalent annually.[13]

The broader opportunity extends beyond sites that are entirely off-grid. Modular microgrids can also supply industrial facilities where electricity demand is growing faster than grid connections or network reinforcement. Matt Brittain, Chief Investment Officer at ARIA Commodities, described them as "a logical and scalable solution, especially in regions facing grid bottlenecks and rising industrial loads."[14]

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4IR Technologies:
IoT, Digital twins, AI

Emirate:
Dubai

Maturity:
Operational Deployment

Type:
Private

ENERGY

025

The Office Building That Manages Itself

ACTORS

Schneider Electric

SNAPSHOT

Schneider Electric built its Dubai headquarters as a full-scale demonstration of an office that can respond to the people inside it. Across the 10,000-square-metre NEST, sensors track occupancy, temperature and air quality. The building uses that information to adjust cooling, ventilation, lighting and power automatically, instead of relying on fixed schedules or constant intervention from facilities staff.[1]

Opened in May 2025 and designed for more than 1,000 employees, the NEST is the first site in Schneider Electric's global Impact Buildings programme. It is both a working regional headquarters and a live demonstration of how the company's connected equipment, software and automated controls operate together across an occupied building.[2]

WHY IT MATTERS

Building operations account for about 30% of global energy use and roughly a quarter of energy-related carbon emissions.[3] A significant share could be optimised: cooling, lighting, and other systems often follow fixed schedules rather than actual occupancy, leaving empty spaces conditioned and illuminated unnecessarily.[4]

In the UAE, that inefficiency is amplified by the heavy energy demand of cooling. Improving building performance is therefore essential to the country's net-zero ambitions, particularly as new offices continue to add long-lived demand to the electricity system.[5]

The underlying problem is limited visibility into how a building is being used. At the NEST, sensors track occupancy and environmental conditions in real time, allowing building systems to respond to actual demand rather than a preset timetable.[6]

HOW THE TECHNOLOGY WORKS

The NEST runs on Schneider Electric's EcoStruxure platform, which connects the building's monitoring, control, and workplace-management systems. EcoStruxure Building Operation controls core equipment, Power Monitoring Expert tracks electricity use at circuit level, the Building Data Platform brings information from different systems into a single environment, and Planon manages how office space is used.[7]

What ties them together is real-time data. Sensors throughout the building continuously measure occupancy, temperature, and air quality. The platform uses that data to adjust cooling, ventilation, and lighting in real time, matching energy use to actual demand rather than fixed schedules.[8]

Schneider describes this integration of connected equipment, software, and automated control as Electricity 4.0. At the NEST, Gensler, JLL, and Cundall worked with Schneider to incorporate AI, automation, and digital twin capabilities into the building from the design stage rather than adding them later.[9]

37%
LESS ENERGY USE
targeted reduction in the building's energy use

572
TONNES CO_2 AVOIDED
annually vs a conventional office

3
MONTHS
to achieve carbon neutrality after opening

IMPACT AND RESULTS

The automation is designed to reduce the building's energy use by up to 37% and avoid approximately 572 tonnes of carbon dioxide emissions each year compared with a conventional office of similar size.[10]

Schneider reported in September 2025 that the NEST had achieved carbon neutrality within 3 months of opening, supported by the building's monitoring and control systems.[11] In January 2026, it received LEED Platinum certification for interior design and construction, as well as WELL Equity certification, providing independent recognition of its environmental and workplace performance.[12]

The NEST also serves as a live demonstration site. Its Global Innovation Hub allows customers to see EcoStruxure systems operating in a working building before considering them for their own facilities.[13]

WHAT'S NEXT

The NEST is the first site in Schneider Electric's global Impact Buildings programme, through which the company plans to apply the same automated operating model across its own real-estate portfolio. Each building will serve as both a workplace and a full-scale demonstration of the technologies Schneider offers to customers.[14]

The NEST also sits within a wider shift towards intelligent buildings in the UAE. DEWA's Al Shera'a headquarters in Dubai, inaugurated in 2026, uses an integrated AI- and IoT-enabled system with more than 110,000 sensors to monitor environmental and operational conditions and automatically adapt building systems to actual use.[15]

Schneider presents the NEST as a benchmark for intelligent, future-ready buildings in the Middle East, demonstrating how advanced building technologies can improve environmental performance while supporting employee well-being and workplace performance.[16]

Olivier Blum, Chief Executive of Schneider Electric, framed the building as an argument rather than an address: "The NEST is more than a building. It is a statement of intent. We are honored to have inaugurated this landmark project in the UAE, which demonstrates how digitalization and electrification can accelerate national net zero goals while creating world-class environments for people to collaborate, innovate, and grow."[17]

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4IR Technologies:
IoT

Emirate:
Abu Dhabi

Maturity:
Operational Deployment

Type:
Public-Private

ENERGY

026

Smart Metering of Water and Power Networks

ACTORS

Almar Water Solutions
Datakorum
TAQA

SNAPSHOT

Abu Dhabi's utility network offered a substantial base to build on: around 80,000 water and electricity meters, spanning 70 models from 35 manufacturers and using seven different communication protocols.[1] Datakorum, an IoT company backed by Almar Water Solutions, was contracted through e& Enterprise to connect that installed base to TAQA's advanced metering infrastructure.[2] During 2023, the gateways were deployed across TAQA's distribution network, allowing the existing meters to be read remotely and in real time.[3]

WHY IT MATTERS

A utility can manage its network effectively only when it can measure demand frequently and remotely. Regular meter data shows where water and electricity are being used, how consumption is changing and where leaks or other losses may be occurring. Where meters must be read manually, staff need to visit individual devices and the data may be collected at different intervals, limiting its value for real-time operations.[4]

In Abu Dhabi, the opportunity lay not in the number of meters but in connecting the variety already installed. The network included around 80,000 water and electricity meters, spanning roughly 70 models from 35 manufacturers and using seven different communication protocols.[5] A common interface would allow all of them to be connected and managed as a single system.

The project creates that interface as a communications layer between the meters and the utility's digital platforms.[6] This allows devices from different manufacturers to transmit data in a common format, turning a diverse meter base into a unified, real-time view of the network.

HOW THE TECHNOLOGY WORKS

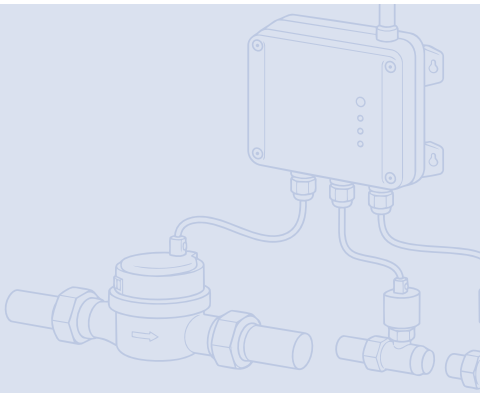
Datakorum's PIPE 5G gateways connect existing meters and sensors to the utility's digital systems. They can work with devices from different manufacturers using protocols such as Pulse, M-Bus and Modbus, collect readings at set intervals and transmit them over NB-IoT or LTE-M networks.[7] A single gateway can connect both water and electricity meters at a property, while Datakorum's BASE CAMP software guides installers through setup and connection checks.[8]

The gateways form the communications layer of the advanced metering infrastructure. They collect data from individual meters and send it over the mobile network to TRANGO IoT, an on-premises platform that monitors gateway health, manages incoming data in real time and allows firmware to be updated remotely.[9]

The gateways are designed for long battery life and reliable coverage in difficult locations, including basements and underground meter chambers. SIM-based authentication and encryption help protect the data being transmitted.[10]

80,000
METERS CONNECTED
onto one platform

70
METER MODELS
from 35 manufacturers, unified into one system



IMPACT AND RESULTS

Datakorum describes the deployment as one of the UAE's largest IoT projects. During 2023, gateways were installed across TAQA's distribution network in Abu Dhabi to enable remote reading of around 80,000 meters.[11]

Datakorum reports that the deployment helped reduce unbilled electricity and water, while improving metering efficiency and extending asset life. The company also says that access to detailed, real-time consumption data improved customer service.[12]

For Almar, the project marked a shift into digital water infrastructure. Its investment in Datakorum added an IoT capability to a business previously centred on desalination and water-treatment assets, extending its role from building infrastructure to managing it through data.[13]

WHAT'S NEXT

The connected meter network is intended as a foundation for wider smart-grid functions. Once data flows continuously from across the system, the same infrastructure can support demand management, capacity control and faster outage detection and response.[14]

In November 2025 Datakorum partnered with the satellite operator Sateliot to add non-terrestrial 5G coverage, extending the same connectivity to meters and pipeline assets in parts of the country terrestrial networks do not reach. Coverage is the precondition for remote metering and pipeline monitoring, so closing that gap is what allows a metering deployment to serve as network infrastructure.[15]

Almar sees connected infrastructure as a broader growth platform across the water, energy and mobility sectors.[16]

Carlos Cosín, Chief Executive of Almar Water Solutions, described the move as a widening of what the company offers: "We have a strong presence in the Middle East developing non-conventional water infrastructure for water supply. We can now also provide solutions that go further, ensuring smart communications."[17]

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4IR Technologies:
AI, Autonomous systems

Emirate:
Dubai

Maturity:
Operational Deployment

Type:
Public-Private

ENERGY

027

Self-Optimising District Cooling Plant (EmSMART)

ACTORS

Empower
Za'abeel District Cooling Plant
DIFC District Cooling Network

SNAPSHOT

At Empower's Za'abeel district cooling plant, a machine-learning system tests 360 operating combinations and automatically applies the one predicted to minimise combined chiller and condenser-pump power. Between June 2024 and February 2025, it saved 2.08 million kilowatt-hours and AED 915,951 while the plant produced 46% more cooling than during the comparison period.[1]

Deployed from 19 June 2024, the project forms part of Empower's EmSMART optimisation suite. It connects machine-learning models directly to the controls of a live plant serving Dubai's DIFC cooling network.[2]

WHY IT MATTERS

Cooling is the largest single call on Dubai's electricity, accounting for around 70% of peak demand, and the emirate is targeting 40% of its cooling from district systems by 2030 under the Demand Side Management Strategy, which seeks a 30% cut in electricity and water use. Efficiency at plant level is therefore a matter of national energy policy as much as operating cost. Chillers, pumps, and cooling towers consume energy together. A setting that saves electricity in one machine can increase consumption elsewhere, while the best balance changes with weather and cooling demand. EmSMART continuously searches for the combination that minimises the combined power required by the chillers and condenser pumps.[3]

The potential gains are magnified by the plant's scale. Za'abeel's first phase has a cooling capacity of 27,750 refrigeration tons (RT) and is connected to Empower's DIFC plant, creating a combined network capacity of 112,000 RT. Optimising the plant can therefore reduce energy use across a district-scale cooling network rather than within a single building.[4]

The important leap is from analysis to action. Once the system identifies the most efficient combination, it sends the settings directly to the plant's controllers, which adjust pump speeds and cooling-tower operation without waiting for an operator. This allows the plant to respond continuously as weather and cooling demand change.[5]

HOW THE TECHNOLOGY WORKS

Empower trained the model using operating data collected since the Za'abeel plant entered service in December 2021. The data covered cooling demand, weather, and conditions within the plant's evaporator, condenser, and compressor systems. Readings from equipment start-ups and shutdowns, together with statistical outliers, were excluded so the model learned from stable operating periods representative of normal plant performance.[6]

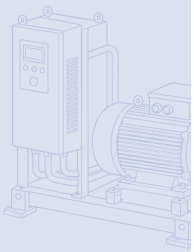
During operation, the software predicts chiller and pump power across 360 combinations of condenser-water flow and temperature. It selects the combination with the lowest total demand and sends the corresponding settings to controllers governing the condenser pumps and cooling-tower fans.[7]

The system records its predicted savings against actual plant performance and is retrained monthly using new operating data. Persistent differences between predicted and actual consumption can also indicate that equipment requires inspection. Safety limits are built into both the application and the plant controls, which automatically return the facility to its conventional operating mode if the software or communications fail.[8]

2.08M KWH SAVED
over 9 months

AED 915,951 COST SAVINGS
on electricity in the same period

46% MORE COOLING
produced in the same window



IMPACT AND RESULTS

Across the 9-month reporting period, Empower calculated that EmSMART saved 2,081,708 kilowatt-hours and reduced electricity costs by AED 915,951. The company reports that these electricity savings avoided 945,512 kilograms of carbon dioxide. Monthly efficiency improvements reached 8.9%, despite the plant producing 46% more cooling than during the same months of the previous year.[9]

Empower developed the application internally and ran it on existing computing infrastructure, reporting no additional implementation cost.[10] In June 2025, the International District Energy Association gave the project an Innovation Award Honourable Mention.[11]

WHAT'S NEXT

Empower plans to convert EmSMART from a plant-specific application into a standard deployment package. The same optimisation framework could then be installed elsewhere and trained using each plant's equipment configuration and operating data. The company is also developing machine-learning control for the secondary pumps that move chilled water from its plants to customer buildings. This system would determine how many pumps should operate and at what speed to meet demand using the least electricity.[12]

With 90 district cooling plants and 1.66 million RT of connected capacity, Empower has a substantial portfolio of potential sites for wider deployment.[13]

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4IR Technologies:
AI, Robotics, IoT

Emirate:
Sharjah

Maturity:
Scaled Deployment

Type:
Public-Private

ENERGY

028

Turning Residual Waste into Grid Electricity (Sharjah Waste to Energy)

ACTORS

BEEAH
Emirates Waste to Energy Company
Tadweer Group

SNAPSHOT

Sharjah diverts 93% of its waste from landfill. The final stage in reaching that figure is the Sharjah Waste to Energy plant, which takes the material recycling cannot use and turns it into electricity for the public grid.[1]

The plant opened in 2022 as the first commercial-scale facility of its kind in the region, and has since passed a million tonnes of waste processed. It supplies 30 megawatts of low-carbon electricity to the Sharjah grid and is operated by the Emirates Waste to Energy Company, a joint venture between BEEAH and Tadweer Group.[2]

WHY IT MATTERS

Buried waste continues to generate emissions as it decomposes, principally methane. BEEAH notes that landfill emissions account for 60% of the greenhouse gases produced by the UAE's waste management sector, which makes diverting waste from landfill one of the larger levers available for reducing the sector's emissions.[3]

Recycling alone cannot close the gap. Sorting recovers the materials that have a market, but a residual fraction is always left, which the joint venture describes as hard-to-recycle waste. What happens to that fraction determines how high a diversion rate an emirate can reach.[4]

Sharjah has moved from 20% diversion at the start of BEEAH's work to 93% today.[5,6] Recovering materials took the emirate to 76%; adding waste-to-energy carried it past 90%.[7] The residue that recycling cannot use still contains energy, and burning it under controlled conditions converts a disposal cost into grid supply.

1M+ TONNES
of waste processed by 2026

30 MEGAWATTS
of low-carbon electricity to the Sharjah grid

HOW THE TECHNOLOGY WORKS

What reaches the plant is determined by everything upstream of it, and that chain is instrumented from the point of collection. BEEAH's WastePro+ system uses radio-frequency tagged, wi-fi enabled collection points so waste can be tracked from disposal through to the sorting facilities, with the resulting data used to optimise collection routes and reduce vehicle mileage and fuel use.[8]

At the waste management complex in Al Saja'a, the commercial and industrial facility applies what BEEAH describes as the region's first AI-operated robotic recovery system. A robot with AI vision automatically detects, identifies, and separates different waste types, recovering more than 10 material streams including aluminium, high-density polyethylene, plastic car parts, wood, tyres, polyethylene terephthalate, paper, carton, metals, and mixed film. At full capacity it processes around 156,000 tonnes of mixed recyclables a year, roughly 500 tonnes a day, at a 34% recovery rate.[9,10]

The material the robots reject does not go straight to the furnace. It passes instead to a solid recovered fuel facility, which BEEAH describes as the first of its kind in the region and which converts it into an alternative to the coal used in cement production, yielding up to 73,000 tonnes of fuel and diverting 85,000 tonnes of waste from landfill each year.[11]

Only what survives all of that reaches the waste-to-energy plant, which the joint venture describes as handling hard-to-recycle waste.[12] A plant of this kind burns residual waste to raise steam and drive a turbine, which is how the residue finally becomes electricity.

IMPACT AND RESULTS

The plant handled 100,000 tonnes of waste in its first year of operation. By April 2026 it had processed one million tonnes in total, a quantity BEEAH puts at the combined weight of two Burj Khalifas.[13]

Every year it offsets 450,000 tonnes of carbon dioxide emissions, which BEEAH attributes to diverting that waste from landfill.[14]

Its wider value shows in the emirate's diversion rate. BEEAH credits the plant with a transformative role in reaching 93%, working alongside the recycling operations at Al Saja'a,[15] and has described Sharjah's rate as a first in the region and one of the highest in the world.[16]

WHAT'S NEXT

The plant is advancing into a second phase, which will add a duplicate plant adjoining the existing facility.[17] Formalised in January 2025, the expansion will raise annual processing capacity from 300,000 tonnes to nearly 600,000, lift output from 30 megawatts to nearly 60, and displace up to one million tonnes of carbon dioxide a year. On completion the plant will produce enough power to meet the yearly energy requirements of the equivalent of nearly 60,000 homes.[18]

The ownership changed while the expansion was being prepared. The agreement was signed with Masdar, BEEAH's original partner in the joint venture.[19] Later in 2025 Tadweer Group acquired Masdar's stake and took its place, and the Emirates Waste to Energy Company now intends to replicate the model with further projects across the UAE and the wider region.[20]

Hamza Al Jefri, Chief Executive Officer of the Emirates Waste to Energy Company, framed the milestone in these terms: "Reaching the 1,000,000-ton milestone demonstrates the feasibility of our waste-to-energy model in addressing landfill dependency and clean energy needs."[21]

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4IR Technologies:
Robotics

Emirate:
Abu Dhabi

Maturity:
Scaled Deployment

Type:
Public-Private

ENERGY

029

Waterless Robotic Solar-Panel Cleaning (Noor Abu Dhabi)

ACTORS

Sweihan PV Power Company
TAQA
Marubeni
JinkoSolar
Emirates Water and Electricity Company

SNAPSHOT

Noor Abu Dhabi is a 1.2-gigawatt solar photovoltaic plant in Sweihan. Owned and operated by Sweihan PV Power Company, it began commercial operation on 30 April 2019 and supplies electricity to the Emirates Water and Electricity Company (EWEC).[1] The plant contains more than 3.3 million solar panels[2] across an allocated project area of approximately 7.8 square kilometres.[3]

Cleaning this array is handled by 1,430 programmed robots. The fleet travels around 800 kilometres each day and cleans the panels without water.[4] The robots sweep the array twice daily, making cleaning a continuous part of plant operations.[5]

WHY IT MATTERS

Dust presents a fundamental operating problem for desert solar plants. Particles accumulating on a panel reduce the amount of sunlight reaching its photovoltaic cells and therefore lower electricity production. Tests using dust samples collected from seven locations in the UAE found efficiency reductions of up to 41.45% under the conditions examined.[6]

Removing that dust from millions of panels creates a second problem. Regular washing would require water in a country where water resources are scarce. Noor Abu Dhabi therefore uses mechanical sweeping to protect solar output without consuming water during cleaning. The plant's operator describes the system as a response to both the technical requirements of the panels and the UAE's environmental constraints.[7]

HOW THE TECHNOLOGY WORKS

The array is laid out in fixed rows, half tilted five degrees to the east and half to the west,[8] an arrangement that catches the morning and afternoon sun in turn and spreads generation more evenly across the day than a single orientation would.[9] That geometry also sets the terms for cleaning: the robots have to travel a fixed, repeating path across rows of known angle and spacing, and the system was built for this plant rather than adapted to it.[10]

The robots use small brushes to sweep dust from the panels and are programmed to operate twice daily.[11]

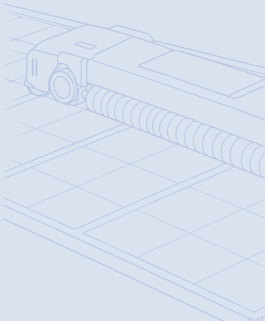
The process is dry and uses no water. Before deployment, Sweihan PV Power Company tested systems from different manufacturers and worked with JinkoSolar to confirm that the cleaning system would not damage the module surfaces.[12]

Robotic cleaning sits within Noor Abu Dhabi's wider maintenance system. The plant uses an online supervisory control and data acquisition system and applies historical data and frequent testing to anticipate problems across 828 inverters, 207 medium-voltage transformers, and nearly 85,000 photovoltaic strings.[13]

1,430
ROBOTS
in the panel-cleaning fleet

3.3M+
SOLAR PANELS
cleaned by the robotic fleet

800
KM DAILY
travelled by the fleet, without using water



IMPACT AND RESULTS

The 1,430-robot fleet cleans more than 3.3 million panels and travels approximately 800 kilometres each day without using water.[14]

By September 2020, after completing its first full year of commercial operations, Noor Abu Dhabi had generated 2,000 gigawatt-hours of net electricity and reported an energy-availability rate of 93%.[15]

The Green Bond Framework projects that Noor Abu Dhabi will displace approximately 16 million gigajoules of gas-fired generation annually and reduce carbon emissions by around one million tonnes per year. It projected nine million tonnes of avoided carbon dioxide between 2020 and 2030.[16]

Noor Abu Dhabi established the approach, and it has since been adopted at larger scale. The two-gigawatt Al Dhafra Solar PV plant, operating since 2023, uses waterless cleaning robots powered by the plant itself across almost four million panels.[17]

WHAT'S NEXT

Noor Abu Dhabi is committed for the long term. In January 2022, Sweihan PV Power Company issued a USD 700.8 million green project bond and extended its power-purchase agreement with EWEC from 25 to 30 years, with the bond reaching final maturity in January 2049. The plant, and the cleaning system that protects its output, is contracted to run into the late 2040s.[18]

The open opportunity is how widely the method scales. The 1.5-gigawatt Al Ajban plant began installing three million modules in February 2026, with commercial operation targeted for that year,[19] EWEC plans to add an average of 1.4 gigawatts of solar capacity a year between 2027 and 2037, against targets of 10 gigawatts installed by 2030 and 18 gigawatts by 2035,[20] and three further plants at Al Faya, Al Khazna, and Al Zarraf are approved, adding 4.5 gigawatts.[21]

Those panels will stand in the same desert, gathering the same dust, in a country with the same water scarcity. Whatever cleans them cannot rely on water, which makes the method proven at Noor Abu Dhabi a condition of maintaining the emirate's solar programme rather than a feature of one plant.

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4IR Technologies:
AI, Cloud computing

Emirate:
Abu Dhabi

Maturity:
Scaled Deployment

Type:
Public-Private

ENERGY

030

AI-Enabled Real-Time Drilling Operations Centre

ACTORS

ADNOC
ADNOC Drilling
SLB

SNAPSHOT

In August 2026, the Abu Dhabi National Oil Company (ADNOC) and SLB announced the deployment of an AI-enabled Real-Time Operations Centre across more than 120 onshore and offshore drilling rigs. The platform brings live operational data from ADNOC Drilling's fleet into a common environment, allowing business, asset, and drilling teams to monitor activity and identify emerging risks.[1]

The deployment uses SLB's DrillOps intelligent well-delivery and insights solutions. The platform replaces multiple tools and combines automated dashboards, advanced analytics, and AI-powered insights. ADNOC reports that it has reduced engineering effort by 30% to 40%, enabling individual engineers to maintain oversight of two to three times as many rigs.[2]

The platform was developed in the UAE and operates within ADNOC's sovereign cloud environment. This keeps operational data and digital workflows inside the country while providing a scalable foundation for additional AI-enabled workflows.[3]

WHY IT MATTERS

Drilling rigs generate continuous streams of operational data. Engineers must interpret this information, recognise developing problems, and coordinate decisions between drilling teams, operating companies, and specialist functions. When data is distributed across separate systems or compiled manually, establishing what is happening across a large fleet takes longer.

The Real-Time Operations Centre brings live information from more than 120 rigs into one environment. Automated dashboards provide a common operational view, while analytical tools identify rigs and activities that may require closer attention. This allows engineers to spend less time assembling information and more time supporting drilling operations.[4]

AI accelerates the analysis of incoming data and highlights potential issues before they escalate. By converting large volumes of drilling data into operational insights, the platform allows teams to supervise more rigs and direct their attention towards activities requiring investigation.[5]

HOW THE TECHNOLOGY WORKS

Live data from ADNOC Drilling's onshore and offshore rigs flows into the Real-Time Operations Centre. SLB's DrillOps technology organises this information within a common platform serving ADNOC Onshore and ADNOC Offshore. Business, asset, and drilling teams can view the same operational information instead of relying on separate tools and reports.[6]

Automated dashboards present activity across individual rigs and the wider fleet. Advanced analytics examine the incoming data for patterns that may indicate an emerging operational problem, while AI-powered insights direct engineers towards the rigs or activities requiring investigation.[7]

The shared operational view helps business, asset, and drilling teams identify risks earlier, improve coordination, and make faster decisions. Automated dashboards also shorten the time required to prepare and distribute operational reports.

The platform is hosted within ADNOC's sovereign cloud environment. Critical data and digital workflows remain in the UAE and under UAE jurisdiction, supporting data security, operational resilience, and long-term digital independence.[8]

120+
DRILLING RIGS
onshore and offshore, connected to the platform

30–40%
LESS ENGINEERING EFFORT
per rig

2–3x
MORE RIGS
a single engineer can now oversee

IMPACT AND RESULTS

The Real-Time Operations Centre had been deployed across more than 120 rigs in ADNOC Drilling's onshore and offshore fleet by August 2026, when the two companies announced it. ADNOC reports that the deployment has reduced engineering effort by between 30% and 40%, enabling individual engineers to support two to three times more rigs while maintaining operational oversight.[9]

The reported gains also include faster analysis and reporting. Analytical tasks that previously required a full day can now be completed within minutes, while reporting cycles that took several days have been shortened to hours. This provides operational teams with more current information and reduces the engineering time devoted to preparing routine reports.[10]

According to ADNOC, earlier identification of potential issues has reduced incident-response time by between 4 and 12 hours. The platform can also help avoid 1 to 2 days of rig downtime when operational problems emerge.[11]

The deployment applies a common monitoring and analytical environment across ADNOC Drilling's onshore and offshore fleet. Business, asset, and drilling teams can therefore use shared dashboards, operational information, and AI-assisted workflows across more than 120 rigs.[12]

WHAT'S NEXT

ADNOC and SLB describe the Real-Time Operations Centre as a scalable foundation for additional AI-enabled drilling workflows. With data from more than 120 rigs already connected, new analytical functions can be introduced through the existing platform and applied across the fleet.[13]

Further development is expected to increase the role of AI in operational-risk detection, drilling support, and routine analysis. The partners also identify progression towards more autonomous operations as a longer-term direction.[14]

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4IR Technologies:
Autonomous systems, AI, Drones, IoT

Emirate:
Dubai

Maturity:
Operational Deployment

Type:
Public-Private

SMART CITIES

031

Autonomous Last-Mile Delivery: Ground Robots and Aerial Drones

ACTORS

noon/Yango
Keeta Drone/Meituan
Robot.com
talabat
Dubai Future Labs

SNAPSHOT

Multiple autonomous last-mile delivery programmes have moved through pilot and operational stages across Dubai, on the ground and in the air. Yango's electric robots carried meals during a 4-month pilot at Expo City Dubai from May 2025.[1] In December 2025, the company began its first commercial roll-out with noon, fulfilling noon Minutes orders in Sobha Hartland.[2] In February 2023, seven talabat robots began a 3-month food-delivery pilot serving approximately 300 homes in Dubai Silicon Oasis.[3] In The Sustainable City, three autonomous robots designed and built locally by Dubai Future Labs delivered orders from restaurants and shops across the car-free community during a trial in July and August 2024.[4,5] In the air, Keeta Drone holds Dubai's first commercial beyond-visual-line-of-sight drone-delivery licence. After launching in December 2024, it completed its first full year of commercial operations with routes across Dubai Silicon Oasis and Nad Al Sheba.[6]

WHY IT MATTERS

Last-mile delivery is one of the most expensive and emissions-intensive segments of urban logistics.[7] In a city like Dubai, where on-demand delivery is a core part of daily life, food-delivery and quick-commerce platforms rely on large motorcycle fleets moving through dense urban traffic at high volume, which places sustained demand on road capacity and makes rider safety a continuing priority.[8]

Autonomous ground robots and delivery drones attack this from two directions. Ground robots take the rider off the road for the final journey inside a community, navigating pavements and residential streets using AI and onboard sensors. Their role is additive rather than substitutive: by absorbing short trips inside gated communities, campuses and mixed-use districts, they free riders for longer routes where motorcycles remain more efficient. They can also reach pedestrianised areas that motor vehicles cannot enter, including The Sustainable City's residential clusters. The robots are electric and produce no tailpipe emissions at the point of use.[9]

Drones apply the same logic in another dimension, flying direct routes unaffected by traffic and suiting light, time-critical items such as meals and medicines over a few kilometres, while road vehicles keep the heavier and longer consignments. For Dubai, which aims for a quarter of all trips to be autonomous by 2030, last-mile delivery is where autonomous systems meet everyday consumer demand at scale.[10]

HOW THE TECHNOLOGY WORKS

Yango's fully electric robots navigate independently using high-definition maps, onboard sensors and AI-powered route planning. They identify obstacles, adjust their routes and give way to pedestrians. For the noon service, customers select robot delivery at checkout, track the robot in real time and unlock its secure compartment by smartphone on arrival.[11]

The talabat pilot used six-wheel robots equipped with radar, lidar, sensors and algorithms to detect obstacles and navigate around vehicles, kerbs, pedestrians and animals. The seven robots served approximately 300 homes in Cedre Villas, with deliveries typically completed in up to 15 minutes. Customers ordered through the talabat app, tracked the robot and opened its temperature-controlled compartment using a unique access code.[12]

Dubai has also hosted separate robot deployments at Expo City. Yango's 4-month 2025 pilot used three robots to carry meals from participating restaurants to a designated delivery point at the Al Wasl Plaza offices.[13] Later in May 2025, Robot.com launched a separate fleet serving orders placed through the Expo City Eats app, using GPS, cameras and AI navigation to move through the pedestrian district.[14]

At The Sustainable City, Dubai Future Labs took a different approach by designing and building the robots completely in-house in Dubai. DFL developed a camera-led autonomy architecture intended to improve cost efficiency by reducing reliance on the more expensive laser-scanning hardware used by some imported platforms. Its engineers integrated navigation, fleet management, real-time tracking and secured compartments accessible only by the customer, while Lyve Global supplied the order-fulfilment and delivery-operations backend.[15]

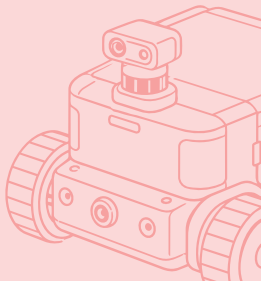
Three DFL robots were deployed across The Sustainable City's car-free residential clusters during July and August 2024. The setting provided a controlled public environment in which to test navigation, customer handover and charging behaviour. The robots were designed to navigate pavements independently, locate charging stations when required and complete deliveries from community shops and restaurants in under 30 minutes.[16]

Keeta Drone operates through fixed take-off points, approved flight corridors and automated drone ports. Its intelligent control platform manages dispatch, route assignment, separation between aircraft and rerouting to alternative landing sites when necessary. The six-rotor Keeta Drone Gen 4 carries up to 2.4 kilograms, has a maximum range of 10 kilometres and cruises at 10 metres per second. Its drone ports can store 19 orders and support approximately 60 deliveries per hour.[17]

The aircraft uses six-directional obstacle detection, emergency-landing functions and IP45-rated protection for operation in heat, wind, rain and sand. Keeta completed Dubai Civil Aviation Authority validation testing between May and August 2024 and received Dubai's first commercial BVLOS drone-delivery certificate in December 2024. Sheikh Hamdan bin Mohammed bin Rashid Al Maktoum placed the inaugural order from Rochester Institute of Technology Dubai.[18]

84%
FEWER EMISSIONS
per package in 2025

7
MINUTES
average dispatch-to-handover time



IMPACT AND RESULTS

The combined deployments span two transport modalities across multiple Dubai communities. By December 2025, Yango's robots had completed more than 1,500 kilometres of autonomous travel during Dubai deployments.[19] At Expo City, its three-robot fleet covered more than 800 kilometres and averaged 7 minutes between dispatch and handover. A separate Sobha Hartland pilot with ROOTS covered more than 500 kilometres and averaged 14 minutes.[20]

Keeta Drone completed its first full year of commercial operations in December 2025, with multiple routes across Dubai Silicon Oasis and Nad Al Sheba. The service moved drone delivery beyond a demonstration into scheduled operations under a commercial BVLOS licence.[21] Keeta reports that its drone-delivery system produces 84% fewer greenhouse-gas emissions per package than delivery by diesel truck.[22]

DFL's Sustainable City trial moved a locally developed autonomous platform from laboratory development into an inhabited residential community. Designed and manufactured in Dubai, it is the only autonomous delivery platform in the UAE developed and built locally. The trial strengthened local capability across robot engineering, autonomous navigation, fleet management and deployment testing.[23]

Commercial ground and aerial services are active in Dubai, while DFL's locally developed system and the earlier talabat and Robot.com deployments have contributed additional technical and operational learning.

WHAT'S NEXT

In October 2025, Dubai Civil Aviation Authority (DCAA) Director General Mohammed Abdulla Lengawi said Dubai aimed to cover 30% of the city with drone-delivery services in 2026 and expand coverage to 70% within 5 years.[24] Keeta has since signed an agreement with Dubai Municipality covering selected parks and beaches and an MoU with Sobha Realty to introduce drone delivery across its residential communities, beginning with Sobha Hartland.[25]

On the ground, Yango and noon plan to expand into additional Dubai communities before moving into the wider UAE and GCC markets. "Partnering with Yango Group lets us bring a future-ready delivery option straight to our customers. Autonomous robots add a smart, sustainable layer to our last-mile network," said Ali Kafil-Hussain, Chief Business Officer, noon.[26]

At the system level, Dubai Future Labs is identifying the technical, operational and regulatory challenges that could constrain unmanned urban mobility across ground and aerial platforms. Its Dubai Experimental Zone provides a sandboxed environment for addressing these barriers. The first application, the Drone Experimental Zone, established regulations and a certification process for testing BVLOS drone operations in preparation for commercial deployment.[27]

DFL is also framing the next challenge as a multimodal handover. A package could be flown by drone to a designated landing point, collected by a ground robot and transferred to an indoor platform for delivery to a specific floor. Each leg is technically possible in isolation, but the transitions require custody, identification and liability to pass between autonomous systems operating across controlled airspace, public footpaths and privately managed buildings. DFL notes that no existing framework governs such a journey from end to end.[28]

To address this, DFL intends to work with the relevant public authorities, operators and property managers on the digital and regulatory layer needed for coordinated delivery. Priorities include shared identification and authentication, interoperable custody and tracking, common interfaces between delivery operators and building systems, and clearer standards for airspace access, pavement use and automated handovers. Establishing this foundation would allow autonomous last-mile delivery to develop as connected urban infrastructure rather than as a collection of separate ground and aerial services.[29]

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SMART CITIES

4IR Technologies:
AI, IoT, Cloud computing

Emirate:
Dubai

Maturity:
Pilot Deployment

Type:
Public-Private

032

Electric Air Taxis and Urban Vertiport Network (Dubai)

ACTORS

Joby Aviation
RTA Dubai
Skyports

SNAPSHOT

Dubai is building an integrated electric air taxi service, combining piloted electric aircraft that take off and land vertically with dedicated vertiports, digital fleet management and a new aviation regulatory pathway. In November 2025, Joby Aviation completed the UAE's first point-to-point electric air taxi flight, with a commercial passenger service targeted for 2026.[1] The initial network covers four locations: Dubai International Airport, Dubai Mall, Atlantis The Royal, and the American University in Dubai. The vertiport near Dubai International Airport, which Skyports describes as the world's first commercial facility of its kind, reached technical completion in April 2026.[2,3]

WHY IT MATTERS

Urban mobility is reaching a physical limit in many global cities. Roads can be expanded only so far, metro systems require long capital cycles, and surface congestion imposes persistent costs in time, productivity, and emissions: in the most congested cities, drivers now lose more than 100 hours a year to traffic.[4] Dubai's aerial taxi programme addresses that constraint by adding a new transport layer above the city rather than extending mobility only along the ground.

The 4IR significance lies not in the aircraft itself, but in the system being built around it. Dubai is testing how electric propulsion can be integrated with digital fleet management, charging infrastructure, vertiports, real-time airspace coordination, passenger handling and aviation regulation to create a functioning urban air mobility network. While dozens of electric vertical take-off and landing (eVTOL) companies worldwide are developing aircraft,[5] Dubai is focused on building the operating environment required to deploy them at scale. This model is anchored in a 6-year agreement granting Joby the exclusive right to operate air taxis in the emirate, alongside coordination among the Roads and Transport Authority (RTA), Joby, Skyports, and the General Civil Aviation Authority (GCAA) on infrastructure, transport integration, and certification.[6] For a city that already aims, under its Self-Driving Transport Strategy, for 25% of all journeys to be autonomous by 2030, aerial mobility adds a new dimension to that ambition.[7]

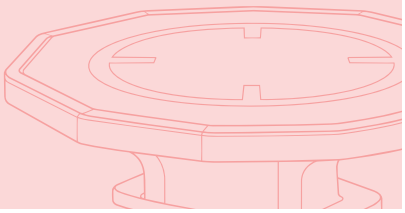
HOW THE TECHNOLOGY WORKS

Joby Aviation manufactures the aircraft: an all-electric, five-seat vehicle that lifts off vertically using distributed electric propulsion, transitions into wing-borne flight, and lands at dedicated vertiports without a runway. It carries one pilot and four passengers at speeds up to 321 kilometres per hour, with a range of up to 161 kilometres.[8] The aircraft is piloted, not autonomous, and commercial operations remain subject to UAE regulatory certification, including an Air Operator Certificate issued by the General Civil Aviation Authority (GCAA).[9]

Skyports is building the ground infrastructure. The vertiport near Dubai International Airport has two take-off and landing stands, charging systems, passenger processing, and ground transport connections.[10] Joby's ElevateOS software platform coordinates scheduling, passenger flow, pilot operations, and fleet management across the network, functioning as the digital operating system that connects aircraft, vertiports, and passengers.[11]

17
MINUTES
flight time from Margham to Al Maktoum Airport, vs ~50 min by car

4
LOCATIONS
in the initial Dubai network



IMPACT AND RESULTS

The project is pre-commercial, so impact is best measured through deployment milestones. In November 2025, Joby completed the UAE's first piloted point-to-point electric air taxi flight, flying from Margham to Al Maktoum International Airport in 17 minutes.[12] The flight connected Margham, a desert test site on the Dubai–Al Ain Road, with Al Maktoum International Airport in Dubai South. The same journey would take around 50 minutes by car.[13] In April 2026, the vertiport that Skyports describes as the world's first commercial facility of its kind reached technical completion near Dubai International Airport.[14]

The expected passenger benefit is shorter journey times on routes where road travel is slow. RTA has stated that a trip from Dubai International Airport to Palm Jumeirah could take approximately 10 minutes by aerial taxi, compared with around 45 minutes by car.[15] The wider impact is institutional: Dubai is building not only an aircraft service but the infrastructure, operating model, and regulatory pathway for advanced air mobility at city scale.

WHAT'S NEXT

Joby's UAE Air Operator Certificate process and aircraft approvals remain the critical gates before a paid passenger service can begin. The UAE aviation regulator has reportedly set a target of completing air taxi certification by the third quarter of 2026, making the second half of 2026 decisive for launch readiness.[16]

The opportunity extends beyond one route or one aircraft. If certification, vertiport infrastructure, trained personnel, digital systems, and airspace governance mature together, Dubai could set the operating template for advanced air mobility globally: electric, digitally coordinated, regulator-enabled, and embedded into a city's public transport system.

"By working alongside the RTA, other government agencies and infrastructure partners, we've been able to streamline development of the world's first air taxi service and are closer than ever to making urban air transport an everyday reality for residents and visitors across the UAE," said JoeBen Bevirt, founder and CEO of Joby Aviation.[17]

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4IR Technologies:
Autonomous systems, AI, IoT

Emirate:
Abu Dhabi, Dubai, Ras Al Khaimah

Maturity:
Operational Deployment

Type:
Public-Private

SMART CITIES

033

Driverless Robotaxis on Public Roads

ACTORS

Various Operators
Integrated Transport Centre Abu Dhabi
RTA Dubai

SNAPSHOT

The UAE became home to the first fully driverless commercial robotaxi deployment outside the United States and China, with the service launched in Abu Dhabi in November 2025.[1] WeRide, deployed on the Uber platform, is the furthest developed: holder of the UAE's first national self-driving licence, it received a federal driverless permit in October 2025 and now covers roughly 70% of Abu Dhabi's core,[2] charges fares in Dubai's Jumeirah and Umm Suqeim districts,[3] and runs a robotaxi and robobus pilot in Ras Al Khaimah.[4] In January 2026, Baidu's Apollo Go, with UAE partner AutoGo, began fully driverless commercial rides on Abu Dhabi's Yas Island,[5] while Pony.ai began driverless testing under Dubai's Roads and Transport Authority (RTA) in April 2026, ahead of a fare-charging service.[6]

WHY IT MATTERS

Urban ride-hailing is one of the fastest-growing transport segments in the UAE, and its emirates have set explicit autonomous-mobility targets. In Dubai, 153 million trips were made across public transport, shared mobility, and taxis in 2024, with shared-mobility users up 28% year on year,[7] and, under its Self-Driving Transport Strategy, the emirate aims for 25% of all journeys to be autonomous by 2030.[8]

Scaling ride-hailing through human drivers hits predictable limits: recruitment, training, vehicle maintenance, peak-hour supply gaps, and the cost floor that human labour imposes on every trip. The opportunity is for autonomous vehicles to serve real passenger demand at commercial quality and cost, rather than looping around test tracks. Rather than relying on a single provider, the UAE is developing a multi-operator autonomous-mobility ecosystem, with several companies progressing through trials and commercial deployments across different emirates.[9]

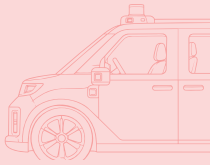
HOW THE TECHNOLOGY WORKS

The robotaxis deployed in the UAE use Level 4 autonomous-driving systems that combine multiple sensors, onboard computing, and AI-based decision-making to navigate public roads within approved operating areas. WeRide's GXR uses more than 20 sensors, including LiDAR and high-definition cameras, together with its onboard high-performance computing platform.[10] Apollo Go's RT6 uses more than 40 sensors, including LiDAR, multi-band radar, and cameras, supported by AI-based autonomous decision-making and real-time processing.[11]

Admitting autonomous vehicles onto public roads requires a layered regulatory architecture. At federal level, the UAE issued its first national self-driving licence, covering all vehicle types, to WeRide in July 2023.[12] At emirate level, Abu Dhabi's Integrated Transport Centre and Dubai's RTA oversee local approvals and deployment, while UAE-based fleet partners support the operation of individual services.[13,14]

70%
OF ABU DHABI
covered by WeRide's driverless robotaxi

60+
VEHICLES
piloted in Dubai by September 2025



IMPACT AND RESULTS

Abu Dhabi moved first and now hosts more than one fully driverless commercial service. WeRide has operated robotaxis in the emirate since 2021, launched its ride-hailing partnership with Uber in December 2024, and switched to fully driverless commercial operations on Yas Island in November 2025.[15] In January 2026, Apollo Go and AutoGo launched their own fully driverless commercial service on Yas Island, with phased expansion planned to Al Reem, Al Maryah, and Saadiyat and a stated goal of building the emirate's largest fully driverless fleet.[16] A separate luxury robotaxi service using Mercedes-Benz vehicles and Momenta's Level 4 autonomous-driving system is also planned for Abu Dhabi in 2026.[17]

Dubai pursued several operators in parallel. RTA's pilot programme involved WeRide, Apollo Go, and Pony.ai, with more than 60 self-driving vehicles operating in Jumeirah and Umm Suqeim by September 2025.[18] WeRide progressed from a supervised public service in December 2025 to fully driverless, fare-charging operations in March 2026.[19] Apollo Go also entered fully driverless commercial service in Dubai in 2026, with an initial rollout of 50 vehicles in the first year and plans to expand to more than 1,000 vehicles over the following years.[20]

In Ras Al Khaimah, WeRide and the RAK Transport Authority launched robotaxi and robobus pilots in October 2025, extending autonomous-mobility deployment to a third emirate.[21]

The deployments are also beginning to test the economics and user experience of autonomous ride-hailing. WeRide says its fully driverless Abu Dhabi operations are on track to achieve unit-economics breakeven.[22] Its "Autonomous" option on the Uber app was the platform's first dedicated autonomous ride category globally.[23] Apollo Go's launch added another fully driverless commercial operator to Abu Dhabi's autonomous-mobility ecosystem.[24]

WHAT'S NEXT

With commercial driverless services now operating in both Abu Dhabi and Dubai, the next phase is scale. Dubai's first commercial rollout includes 100 autonomous taxis across WeRide and Apollo Go, with gradual expansion planned in the coming years.[25]

The regulatory opportunity is to scale oversight alongside the fleets themselves. Dubai's autonomous-vehicle law establishes licensing, permits, technical inspections, operator obligations, and RTA oversight for autonomous vehicles,[26] while Abu Dhabi's Integrated Transport Centre monitors autonomous-vehicle movements and operations through a centralised digital platform.[27] Together, these frameworks provide the institutional foundation for additional operators and larger fleets to progress from testing into commercial service.

"This collaboration underscores the RTA's commitment to engaging with global technology leaders," said Mattar Al Tayer, Director General and Chairman of the Board of Executive Directors of RTA.[28]

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4IR Technologies:
AI, IoT, Cloud computing, Edge computing, Robotics

Emirate:
Dubai

Maturity:
Operational Deployment

Type:
Private

SMART CITIES

034

AI-Driven Sustainable District Energy and Smart-City Infrastructure

ACTORS

Expo City Dubai Authority
LG Electronics
Siemens

SNAPSHOT

Expo City Dubai, the legacy city of Expo 2020, operates one of the region's largest deployments of connected building infrastructure: more than 130 buildings linked through Siemens' MindSphere industrial IoT platform, functioning as the site's central nervous system for energy, water, comfort, and security operations.[1] Around 80% of the Expo's built infrastructure was retained after the event and now anchors a permanent district in which 123 buildings hold LEED certification, including seven at Platinum level.[2] In November 2025, Expo City signed a strategic partnership with LG Electronics covering AI data centre cooling, smart home systems, and robotics-based manufacturing solutions.[3]

WHY IT MATTERS

Most cities digitise by retrofitting: sensors bolted onto old buildings, management systems layered over infrastructure that was never designed to generate data. The results are partial, expensive, and hard to scale. The harder question is what urban operations look like when a district is instrumented from the start, with every major building connected to a common data platform before the first resident moves in.

Expo City is one of the few places in the world where that question has an operational answer. The site was built as a World Expo with digital infrastructure designed in, then converted into a permanent city that inherited it, making the district a working blueprint for how connected infrastructure performs beyond a 6-month event.[4]

HOW THE TECHNOLOGY WORKS

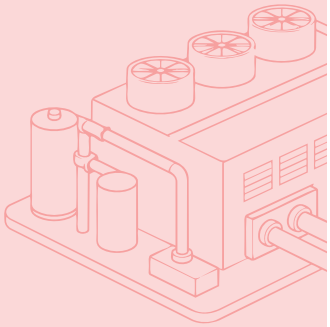
The digital backbone was installed during construction. Siemens, the Expo's Premier Infrastructure Digitalisation Partner, deployed its Desigo CC building management system across the site's three thematic districts and connected 137 buildings to Navigator, a cloud-based energy analytics platform, in one of the world's largest installations of its kind.[5] MindSphere, Siemens' industrial IoT operating system, aggregates data from buildings, machines, and facilities across the site, giving operators real-time analytics for decisions on energy efficiency, water use in irrigation, visitor comfort, and security.[6]

Water infrastructure is engineered as a closed loop. Greywater from wash basins, ablution, and floor drains is treated in plants across all districts, with up to 70% recycled and reused in the cooling towers that serve the site's on-site chiller-based cooling. Condensate from air conditioning units is captured and mixed with greywater for treatment, treated sewage effluent supplies irrigation, and a sustainable urban drainage system manages stormwater across the site.[7]

The LG partnership adds the next layer. Under the November 2025 agreement, LG will supply AI data centre cooling solutions, smart home systems powered by its AI Home Hub platform, and high-efficiency heating, ventilation and air conditioning (HVAC), and has committed to providing built-in appliances for 3,000 households currently under construction in the district.[8]

130+
BUILDINGS CONNECTED
through Siemens' industrial IoT platform

33%
ENERGY DEMAND
reduction vs international standards



IMPACT AND RESULTS

Within the 80% of retained built infrastructure, 123 buildings have achieved LEED certification: seven Platinum, 105 Gold, nine Silver, and two Certified, alongside eight infrastructure projects rated 'Excellent' under BREEAM Infrastructure.[9] The Expo event itself delivered a 33% reduction in energy demand compared with international standards and a 53% reduction in building water demand.[10]

Operational water recycling reaches up to 70% of greywater reused in cooling towers, significantly reducing reliance on potable water.[11] Expo City is the first community in the region registered under the WELL Community Standard, targeting WELL Community Gold certification.[12] The district has published a decarbonisation roadmap with interim targets on its path to net zero by 2050.[13]

WHAT'S NEXT

The LG agreement points to where the district goes next: AI-managed data centre cooling as compute demand grows, AI Home Hub systems in 3,000 new residences, and robotics-based manufacturing solutions, positioning Expo City within the UAE's broader goals on smart city expansion, carbon neutrality, and energy-efficient infrastructure.[14]

The opportunity lies in replication. Expo City had the rare advantage of digital infrastructure designed in from day one, funded by a World Expo. Whether its operating model (a common IoT platform, closed-loop water systems, and certified building stock managed as a single district) can be exported to developments that lack that inheritance will determine whether it remains a showcase or becomes a template.

"We set out to make the Expo site the basis for a sustainable, human-centric smart city long after the event is over. We're proud to work together with Siemens to create the nucleus of District 2020, which will be an integrated, mixed-use community that carries on and fulfils Expo's founding vision to be an ecosystem to connect, create and innovate," said Mohammed Alhashmi, Chief Technology Officer, Expo 2020 Dubai.[15]

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SMART CITIES

4IR Technologies:
AI, Digital twins, IoT

Emirate:
Dubai

Maturity:
Operational Deployment

Type:
Public

035

AI and Digital Twin Traffic Management

ACTORS

Roads and Transport Authority (RTA), Dubai

SNAPSHOT

In February 2025, Dubai's Roads and Transport Authority (RTA) began upgrading the emirate's central traffic signal control system to UTC-UX Fusion, a next-generation platform that combines AI, predictive analytics, and digital twin technology to optimise signal timings in real time.[1] By September 2025, the first corridors converted to the system, including Jumeirah Street and Al Badaa Street, and recorded improvements in traffic flow through their intersections of between 16% and 37%.[2] A second stage, planned for 2027 to 2028, will extend the system into a vehicle-to-everything (V2X) network covering around 620 signalised intersections, transmitting live signal data directly to vehicle dashboards.[3]

WHY IT MATTERS

Dubai's roads are under measurable strain: daytime vehicle volumes have reached 3.5 million, and motorists lost up to 35 hours each to congestion in 2024.[4] Registered vehicles are growing by around 10% a year against a global average of 2% to 3%, and the RTA's leadership has been explicit about the limits of construction as the answer.[5] This shifts the focus to extracting more capacity from the existing network, with traffic signals serving as its critical control points: each intersection timed to live conditions releases road capacity that is already in place.

This is the gap that adaptive signal control addresses. Instead of running fixed cycles, the system continuously retunes signal timings against live and predicted traffic, and its digital twin allows every adjustment to be tested virtually before it reaches a real road, extracting more throughput from the same intersections. The stakes extend beyond congestion: the Dubai Autonomous Transportation Strategy has a target of 25% of all transportation in the emirate operating autonomously by 2030.[6] Autonomous vehicles already drive in Dubai on their own sensors; what they cannot do is see beyond their own line of sight. RTA positions UTC-UX Fusion as the infrastructure side of that equation: the system is built to support Cooperative Intelligent Transport Systems and vehicle-to-everything (C-ITS/V2X) communication, enabling traffic signals to share their status directly with connected vehicles so that coordination happens across the network rather than within each car alone.[7]

HOW THE TECHNOLOGY WORKS

The platform dynamically adapts to real-time traffic changes by analysing live data and using AI and predictive analytics to optimise signal timings. Its digital twin technology allows signal adjustments and traffic scenarios to be simulated, and their effects assessed, before field implementation. The system also enables priority-based traffic management and is designed to incorporate future data from road sensors and other smart devices, supporting more precise traffic analysis and signal optimisation over time.[8]

The first deployment phase demonstrated the operating pattern in the field: the system detected congestion patterns as they formed, responded proactively, and adjusted signal timings to improve coordination between intersections, cut waiting times, and prioritise emergency vehicles, public transport, and pedestrians.[9]

A subsequent phase, planned for 2027 to 2028, will add V2X connectivity to the upgraded signal network, allowing traffic infrastructure to send signal, speed, and incident information directly to connected vehicles. RTA is working with car manufacturers on built-in connectivity, while older vehicles may connect through retrofit devices or smartphone integration.[10]

IMPACT AND RESULTS

RTA reports that Phase 1 of the system upgrade improved road efficiency and traffic flow at converted intersections by between 16% and 37%, with operational trials recording gains of up to 37% at Jumeirah Street intersections, 29.4% at Al Badaa Street, 16.9% at Kuwait Street, and 16.4% at Omar Bin Al Khattab Street.[11] Overall travel times improved by 10% to 20%, in line with the target set at the system's launch.[12]

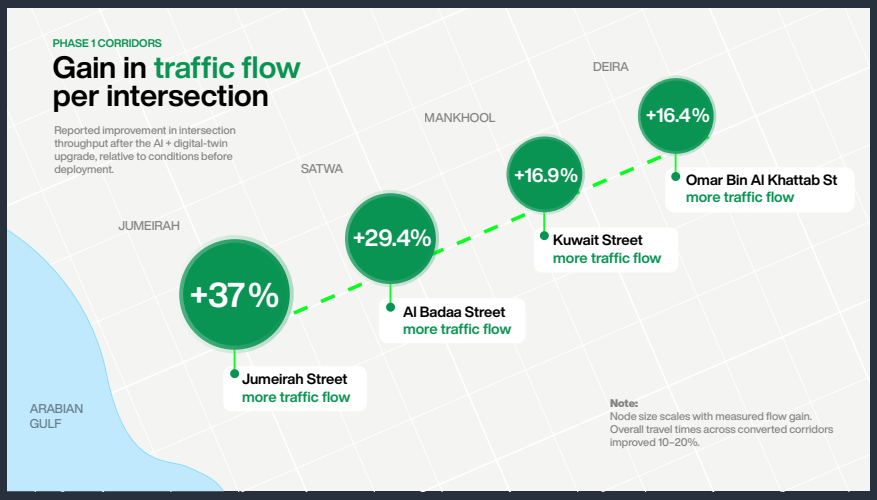

Figure 1: Traffic-flow improvements at selected Dubai intersections following the Phase 1 system upgrade.

The rollout continues in phases, with around 300 traffic signal intersections across Dubai expected to be converted to the new-generation system during 2026, serving private vehicles, public transport, pedestrians, and cyclists.[13]

WHAT'S NEXT

Between 2027 and 2028, the V2X network is planned to extend across all of Dubai's approximately 620 signalised intersections, using AI-powered cameras and computer vision to monitor vehicles, cyclists, and pedestrians and to adjust signals in real time. The infrastructure foundation is expected by 2027, followed by integration with automotive brands and a pilot phase before full deployment.[14]

The larger significance is what this infrastructure enables. For instance, Robotaxis already navigate Dubai's roads independently; connecting them to the signal network is what turns individual autonomy into coordinated, city-scale mobility.

"The UTC-UX Fusion system dynamically adapts to real-time traffic changes by analysing data and making intelligent decisions to optimise signal timings. It also supports future technologies and initiatives, such as Cooperative Intelligent Transport Systems (C-ITS/V2X), which facilitate communication between smart vehicles and traffic signals to enhance traffic flow efficiency," said Hussain Al Banna, CEO of the Traffic and Roads Agency, RTA.[15]

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SMART CITIES

4IR Technologies:
AI, Robotics, IoT

Emirate:
Dubai

Maturity:
Operational Deployment

Type:
Public-Private

036

Autonomous Police Patrol Vehicle (DPR-02)

ACTORS

Dubai Police
Micropolis Robotics

SNAPSHOT

Dubai Police has put an autonomous patrol vehicle into live service. DPR-02 entered operational duty at Global Village on 15 October 2025, the first official deployment of the vehicle with its full set of technologies.[1] The patrol was conceptualised, engineered, and manufactured in the UAE by Micropolis Robotics in collaboration with the General Headquarters of Dubai Police.[2] It began its first mission as Global Village opened its 30th season, covering the venue's avenues and open spaces while connected in real time to police operations.[3]

WHY IT MATTERS

Dubai's safety record is one of its defining assets, and defending it remains a critical imperative as the city grows. Destinations like Global Village, which opened its 30th season in October 2025, concentrate large crowds in open public spaces, and covering venues of that size with human patrols alone forces a trade-off between density of presence and cost, with no shift pattern delivering uninterrupted attention.[4]

An autonomous patrol vehicle helps close this coverage gap by operating continuously and remaining connected in real time to Dubai Police's Command and Control Centre, extending surveillance while officers assess incidents and coordinate the response.[5] DPR-02 was conceptualised, engineered, and manufactured in the UAE by Micropolis, which developed its mechatronics, embedded systems, AI software, and autonomous-driving technology in-house.[6] The collaboration began in 2018, when Dubai Police commissioned the company to develop autonomous patrol units. Before DPR-02 entered service, the force tested the earlier M1 model for a year in high-density areas and restricted zones.[7]

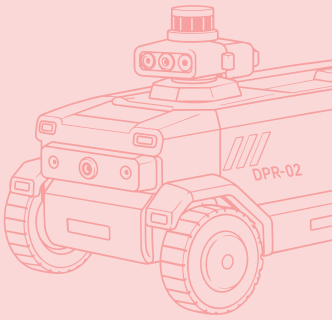
HOW THE TECHNOLOGY WORKS

DPR-02 navigates autonomously using AI-powered navigation, 360-degree surveillance cameras, and advanced sensors, and is engineered for continuous performance in both crowded and open environments, feeding real-time, data-based insights to support rapid decision-making.[8] Its AI stack runs detection and recognition models that identify people, vehicles, and suspicious activities in real time, alongside behaviour analysis systems and a suspect matrix that analyse movement patterns and detect anomalies.[9]

The command layer keeps humans in control. A mission planner, a tele-operator, and fleet management software allow the command centre to monitor, coordinate, and take remote control of the vehicles, while the patrol continuously monitors its surroundings and streams live intelligence and situational awareness back to Dubai Police.[10] The unit maintains a direct, real-time connection to the Command and Control Centre and is explicitly positioned to complement human officers, shortening response times rather than replacing police judgement.[11]

30TH SEASON
of Global Village that DPR-02 began patrolling live

USD 9.3M EXPANSION DEAL
to develop autonomous vehicles for African markets



IMPACT AND RESULTS

Since entering service at Global Village during its 30th season, DPR-02 has patrolled the venue daily, extending security coverage across its avenues and open spaces while providing real-time support to police operations on the ground.[12] The deployment marks the first time the vehicle has operated with its full set of technologies active in live service rather than in trials, and it stands as one of the first real-world implementations of fully autonomous policing technology in the UAE.[13] Dubai Police plans to continue assigning it operational duties throughout the year, extending its role beyond the venue to support security initiatives across the emirate.[14]

WHAT'S NEXT

Micropolis has described the Dubai Police deployment as "just the beginning", with further unmanned ground vehicles in development.[15] The company has stated that the platform's final testing phase established the foundation for broader deployment in public safety and smart city initiatives.[16] In May 2026 the company unveiled its next-generation M1.5 high-endurance robot at Make it in the Emirates, the UAE's national industrialisation exhibition held in Abu Dhabi, and its institutional roster now includes the UAE National Guard, DP World, and Aramco across security, logistics, and infrastructure applications.[17]

The same platform family is spreading into new domains and markets. In June 2026, Abu Dhabi's Department of Municipalities and Transport signed a 5-year agreement with Micropolis for an autonomous urban cleaning ecosystem, with Khalifa University collaborating on research and validation.[18] In March 2026, the company signed a commercial agreement worth approximately USD 9.3 million with AfricAI to develop three customised autonomous-vehicle models for public safety, agriculture, and border surveillance, with multi-year distribution covering several African markets,[19] and it has pointed to prospective deployments in the United States.[20] Each of these builds on the platform proven in police service at Global Village.

"We are proud to partner with Dubai Police in bringing this technology to life. This collaboration demonstrates how UAE-born innovation can transform the way cities approach public safety and intelligent mobility. The deployment of our patrol vehicles by Dubai Police is a significant milestone for Micropolis and just the beginning, as we continue to develop innovative unmanned ground vehicles that are at the forefront of how robotics can change the world," said Fareed Aljawhari, Founder and CEO, Micropolis Robotics.[21]

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SMART CITIES

4IR Technologies:
AI, IoT

Emirate:
Abu Dhabi

Maturity:
Pilot Deployment

Type:
Public-Private

037

AI-Powered Public Safety and Urban Intelligence Platform

ACTORS

Presight
Abu Dhabi Police

SNAPSHOT

Abu Dhabi Police is integrating a modular AI platform across its operations. In July 2025, the force's General Headquarters signed a strategic cooperation agreement with Presight to deploy the company's AI-Policing Suite, which combines generative AI, AI agents, and advanced data analytics for law enforcement and smart city operations.[1] The suite spans real-time traffic enforcement, a law enforcement platform running more than 150 AI models, a generative AI detective assistant, and an IoT intelligence layer drawing on sensors across the urban environment.[2] Presight is an Abu Dhabi company listed on the Abu Dhabi Securities Exchange, with G42 as its majority shareholder.[3]

WHY IT MATTERS

Abu Dhabi has been ranked the world's safest city for 10 consecutive years in Numbeo's crowd-sourced Global Safety Index.[4] Supporting that position is a security infrastructure developed over many years: the police's Safe City programme integrates sensors and cameras covering around 85% of the city's infrastructure into an AI-enabled operations room, while predictive analysis of crime patterns helps determine where patrol vehicles are deployed.[5] The scale is now the opportunity. Thousands of cameras and more than 250,000 vehicles generate more data than human teams can review directly, shifting the operational constraint from collecting information to converting it into timely decisions.[6]

The AI-Policing Suite is built for that conversion. It consolidates diverse, multi-source data into a unified ecosystem in which AI handles search, pattern-finding, and triage, while officers retain responsibility for operational decisions.[7] Developed by Abu Dhabi-based Presight, the platform also adds a locally built capability to the emirate's policing technology infrastructure.[8]

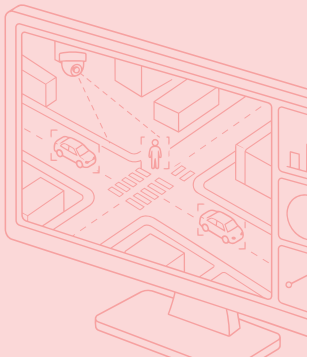
HOW THE TECHNOLOGY WORKS

The suite is organised in four modules. A traffic control module detects violations in real time, including speeding, red-light running, illegal turns, and helmet and seatbelt offences, alongside incident monitoring and congestion management.[9] A law enforcement platform runs more than 150 AI models for intelligent search, profiling, relationship mapping, and predictive analytics that identify suspects and forecast crime hotspots.[10] A detective assistant powered by generative AI works with investigators through natural dialogue.[11] An IoT intelligence module draws real-time data from sensors across urban and public environments for anomaly detection, environmental monitoring covering pollutants, smoke, and vaping, and access control.[12]

Together, the modules are designed to enable proactive crime prevention, real-time threat detection, digital forensics, and predictive analytics within Abu Dhabi Police's existing operations.[13] Presight launched the AI-Policing Suite at the World Police Summit in Dubai in May 2025, 2 months before the Abu Dhabi agreement.[14]

150+
AI MODELS
running inside Abu Dhabi Police's law enforcement platform

10
YEARS
consecutively where Abu Dhabi was ranked the world's safest city



IMPACT AND RESULTS

The agreement was signed on 28 July 2025, and integration of the suite with Abu Dhabi Police's operational systems is underway.[15] The problems it targets are defined: faster officer response, smarter and faster decision-making, modernised investigative methods, and the overall security of Abu Dhabi.[16] Detailed KPIs are under development, with emergency response times, measurable reductions in crime rates, and the accuracy of real-time threat detection identified as the likely indicators.[17]

WHAT'S NEXT

The near-term focus is operational deployment: Abu Dhabi Police and Presight will expand the suite's modules across police operations and evaluate their performance against agreed measures, including response times, detection accuracy, and operational efficiency.[18] Their agreement also includes work on ethical frameworks for AI in policing, placing governance alongside technical deployment.[19]

"Our partnership with Presight helps us benefit from world-leading artificial intelligence technologies that will enhance our policing capabilities and take them to new heights. This collaboration supports our efforts to maintain public safety through innovation, which means strengthening our officers' ability to respond faster, make smarter decisions, and make Abu Dhabi a safer and more secure place," said Major General Nasir Sultan Al-Yabhouni, Director of the Leadership Affairs Sector, Abu Dhabi Police.[20]

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4IR Technologies:
AI, Blockchain, Cybersecurity

Emirate:
UAE-wide

Maturity:
Scaled Deployment

Type:
Public

SMART CITIES

038

National Digital Identity and Digital Signature Infrastructure (UAE PASS)

ACTORS

TDRA
Digital Dubai
Department of Government Enablement

SNAPSHOT

UAE PASS is the country's national digital identity: one verified account through which citizens, residents, and visitors log in to services, sign documents digitally, and share official records from a digital wallet.[1] More than 11 million people use it,[2] across more than 15,000 services from over 350 entities, including 140 from the private sector, with over 2.6 billion digital transactions processed since launch.[3] Launched at the Gulf Information Technology Exhibition (GITEX) 2018 as a collaboration between the Telecommunications and Digital Government Regulatory Authority (TDRA), Digital Dubai, and Abu Dhabi's Department of Government Enablement,[4] it is mandated by the UAE Cabinet as the official platform for digital identification, digital signature, and document sharing.[5]

WHY IT MATTERS

The UAE moved early on digital government, launching its eGovernment initiative in 2013,[6] and individual emirates built identity platforms of their own, like the SmartPass in Abu Dhabi and DubailD in Dubai.[7] The constraint that emerged was not capability but interoperability. The platforms operated in parallel, each verifying users against its own registry, and every additional digital service meant another integration, another credential, and another verification process. Identity, the transaction on which every other digital transaction depends, did not scale.

UAE PASS resolves this at the level of national architecture. It establishes a single trust framework, one verified identity, one signature standard, and one authenticated document format, recognised in common by federal, local, and private-sector systems, and the Cabinet mandate makes that recognition a matter of policy rather than of each institution's discretion.[8] Interoperability of this kind is what allows the government's Zero Bureaucracy Strategy to function in practice: verified digital documents replace paper because every connected counterparty can accept them.[9]

HOW THE TECHNOLOGY WORKS

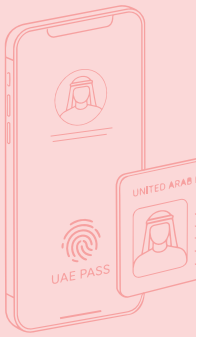
Registration is built on biometrics. A user scans their Emirates ID, verifies their identity through facial recognition, and sets a security PIN, creating a fully verified account in under 5 minutes, a process that took 20 minutes and an in-person visit to a service centre before facial ID was introduced. Visitors can register using their passports, and GCC citizens and residents with their national IDs.[10] The facial recognition is enhanced by artificial intelligence for secure and seamless identity verification.[11]

The verified identity underpins three functions. A single sign-on gives access to federal and local government and to private-sector services through one account. A digital signature service lets users sign documents from the app, replacing ink and notarisation visits. A digital vault, powered by blockchain for traceability and security, stores verified official documents for instant sharing with any connected service.[12] Underneath, the system connects more than 350 government and private-sector entities.[13]

11M+
USERS
registered on UAE PASS

2.6B
TRANSACTIONS
digitally processed since launch

AED 3.5B
SAVINGS
estimated yearly from the blockchain document vault



IMPACT AND RESULTS

Adoption has more than doubled in 2 years: 5 million registered users in 2023,[14] 7.2 million by early 2024,[15] and more than 11 million by 2025,[16] with user satisfaction at 96%.[17]

The transaction volumes describe a system in daily national use. By the UAE Cabinet's mid-2025 review, over 20 million verified digital documents had been added to users' wallets, and the system had recorded over 600 million logins and 2.6 billion digital transactions.[18] In 2024 alone, more than 16 million verified documents were exchanged, advancing the government's Zero Bureaucracy Strategy.[19]

The ecosystem's blockchain document vault alone saves an estimated 21.9 million working hours and AED 3.5 billion annually across employee time, printing, and transportation, eliminates the printing of 33.4 million documents, and avoids around 76,000 tonnes of carbon dioxide emissions each year.[20] These gains carry regulatory force. The UAE Central Bank has designated the vault as the golden source of documents, requiring banks and financial institutions to accept its digital records as equivalent to physical originals, and the UAE Prime Minister's Office has extended the same requirement to government entities.[21]

WHAT'S NEXT

UAE PASS is now extending from individuals to businesses. In December 2025, TDRA introduced five digital trade licence documents to the wallet in partnership with the Abu Dhabi Registration Authority, the Jebel Ali Free Zone Authority, Fujairah Municipality, and the Department of Economic Development in Umm Al Quwain, enabling companies to present verified licences in place of paper.[22] From May 2026, Dubai Customs' Mirsal platform adopted UAE PASS in place of digital-certificate authentication for declarations on Dubai Trade, carrying the national identity layer into the country's trade infrastructure.[23]

The government has indicated a further stage: a biometric verification system intended to remove the need for physical identity documents altogether.[24] Each AI-enabled service the government introduces from now will draw on the same trust layer, verified identity, legally valid signatures, and authenticated documents, through a single integration. The platform functions less as an application than as national infrastructure.

"The achievements of the UAE PASS are a tangible reflection of the collaboration of government entities. Together, we have established a results-driven, people-centered government model. Today, we reach a new milestone that sets the stage for even greater progress in the UAE's digital transformation journey," said Majed Sultan Al Mesmar, Director General, Telecommunications and Digital Government Regulatory Authority.[25]

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SMART CITIES

4IR Technologies:
AI, Digital twins

Emirate:
Dubai

Maturity:
Pilot Deployment

Type:
Public

039

AI-Driven Construction and Real Estate Management at City Scale (Dubai Live · DANA)

ACTORS

Dubai Municipality

SNAPSHOT

Dubai Municipality has moved construction and real estate oversight onto a live record of the city. Dubai Live, launched in October 2025, is the citywide operations platform, monitoring and controlling city operations in real time.[1] DANA, launched alongside it, applies Geographic Information Systems (GIS) and artificial intelligence to the building stock, assembling data on individual buildings for both office staff and field inspectors, so that inspectors arrive on site already equipped with a building's complete profile rather than compiling it on location.[2]

WHY IT MATTERS

Overseeing construction and real estate in Dubai is work at industrial scale. In the first half of 2025 alone, Dubai Municipality conducted more than 25,000 field inspections of construction activity, a 36% increase on the previous year, covering over 18,800 buildings under construction and more than 36 million square metres of built-up area at a 96% compliance rate.[3] Building permit applications grew 20% in the same period, exceeding 30,000.[4] The workload rises with the city: Dubai's 2040 Urban Master Plan projects the population growing from 3.3 million to 5.8 million, which means still more construction to oversee and more records to keep current, even as those assembled through periodic surveys and site visits fall out of date between one inspection and the next.[5]

Dubai Municipality's answer is to hold these records digitally and update them continuously, so that a licensing officer, a planner, and an inspector each work from the city as it stands, not as it was last surveyed.

HOW THE TECHNOLOGY WORKS

Dubai Live consolidates construction data, pulled from the municipal databases, department systems, and IoT feeds across the city, from licensing through to completion; draws on the Urban Planning Observatory for analytics on buildings, facilities, infrastructure, and demographic and economic densities, with forecasts of future requirements; and connects to the systems monitoring vehicle, aviation, and marine movements.[6] Built on digital twin technology (a continuously updated virtual replica of the city that lets planners test decisions and see their likely effect before acting), artificial intelligence, and advanced analytics, it gives operators a single real-time view of the city: live oversight that speeds up and coordinates emergency responses, asset and resource data that sharpens urban planning, and forecasts of how a proposed development or disruption would play out, which inform strategic and investment decisions.[7]

DANA is the specialist system for buildings and real estate. It integrates GIS and AI to identify specialised buildings within the real estate sector, namely individual structures that need detailed, building-by-building profiling rather than area-level records, and to assemble building-level data, with interactive tools for display, auditing, measurement, and monitoring.[8] In the field, a voice-control assistant converts spoken commands into text, so inspectors work with the system directly on site.[9]

25K+
INSPECTIONS
conducted by Dubai Municipality in H1 2025

2
DISTRICTS
where DANA's building-level AI profiling is live in phase one

96%
COMPLIANCE
recorded across inspections

IMPACT AND RESULTS

Dubai Live is in operation, fully integrated with Dubai Municipality's internal systems and consolidating live municipal data into a single command interface for real-time planning, service delivery, and emergency response across the emirate.[10] DANA is deployed in two districts, Jumeirah Village Circle and Emirates Hills, as a first phase, having been trained across real-world municipal scenarios before a planned expansion to further areas and datasets across Dubai.[11] The municipality reports that the platform's voice-control assistant, which lets inspectors query the system by speaking rather than typing on site, has reduced response times in monitoring and management operations.[12]

WHAT'S NEXT

Dubai Municipality's stated next applications for Dubai Live are inspection and monitoring systems, asset and resource management, and emergency response.[13] DANA will extend from Jumeirah Village Circle and Emirates Hills to additional areas and new datasets across Dubai.[14]

"Dubai Municipality plays a central role in advancing the emirate's digital transformation through its innovative projects and services. By building advanced digital infrastructure, we ensure readiness for future shifts and deliver real-time, predictive, and efficient services that enhance customer satisfaction, reduce costs, and contribute to community happiness," said Eng. Marwan Ahmed bin Ghalita, Director General, Dubai Municipality.[15]

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SMART CITIES

4IR Technologies:
Digital twins, AI

Emirate:
Dubai

Maturity:
Operational Deployment

Type:
Public

040

A City-Scale Digital Twin as Public Infrastructure (Dubai Digital Twin Platform)

ACTORS

Dubai Municipality

SNAPSHOT

Dubai Municipality has completed a digital replica of Dubai. The Dubai Digital Twin Platform, launched in July 2026, integrates spatial and operational data from multiple government entities into a unified virtual model of the city.[1] The project was delivered in phases; the launch marked the completion of its third phase.[2]

WHY IT MATTERS

Dubai is planning for growth with few modern precedents. Between 1960 and 2020, the emirate's population multiplied 80 times, from 40,000 to 3.3 million, while its urban and built area increased 170-fold from 3.2 square kilometres.[3] The city passed four million residents in August 2025 and is projected to reach 5.8 million by 2040.[4] The pressures are climatic as well as demographic: in June 2024, Dubai approved the AED 30 billion Tasreef programme to raise the emirate's rainwater drainage capacity by 700% in phases running to 2033, designed against future climate impacts such as increased rainfall.[5] Decisions on where housing, infrastructure, and services are placed are taken against that trajectory, and at this pace a planning mistake is built into the city before it can be corrected.

A digital twin gives planners a place to test those decisions before they reach the ground. The platform unifies spatial and operational data so that future scenarios can be simulated and analysed before commitments are made on the city itself.[6] The project is aligned with the objectives of the Dubai Economic Agenda D33.[7]

HOW THE TECHNOLOGY WORKS

The platform is a virtual replica of the emirate, incorporating data on buildings, residential units, infrastructure, facilities, landmarks, and master plans, updated continuously.[8]

The model runs below the street as well as above it. A programme launched in 2023 used three-dimensional scanning to capture underground service lines – the irrigation, sewage, and rainwater networks maintained by the municipality, together with road lighting, power, and water line data – feeding the geospatial database and speeding the operations that depend on it, including no-objection certificates for construction near services.[9]

The data is unified within a single platform, so spatial and operational records can be read together and future scenarios simulated and analysed against them.[10] Access runs through the Dubai Here portal, developed by the municipality's Geographic Information Systems Centre, which opens the geospatial data to government entities, partners, private companies, and students.[11]

195K+
BUILDINGS MODELLED
across the emirate

330K+
PUBLIC FACILITIES
included in the platform

IMPACT AND RESULTS

The third phase converted more than 195,000 buildings across the emirate into three-dimensional models, together with more than 280,000 infrastructure assets and more than 330,000 public facilities.[12] The platform now incorporates more than 1,500 geospatial data layers and over 100 two- and three-dimensional applications supporting a wide range of government sectors.[13]

WHAT'S NEXT

The next phase will focus on expanding integration with partners and increasing the use of data to support key sectors across the emirate.[14] The applications reviewed for the new phase cover urban planning, infrastructure and asset management, rainfall simulation, and digital decision-support tools.[15] Dubai Municipality has signed memoranda of understanding with Al-Futtaim Group and Huawei to support the next phase, strengthening collaboration in digital twin technologies, research, and future foresight.[16]

"The completion of the Digital Twin project represents a strategic milestone in Dubai's journey towards building a smarter and more sustainable city. It embodies the leadership's vision of leveraging advanced technologies and data to enhance government services, improve the efficiency of asset and infrastructure management, and elevate quality of life. This achievement is the result of integration and collaboration among various government entities and strategic partners," said Eng. Marwan Ahmed bin Ghalita, Director General, Dubai Municipality.[17]

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4IR Technologies:
AI, IoT, Cloud computing, Edge computing

Emirate:
Abu Dhabi

Maturity:
Pilot Deployment

Type:
Public-Private

SMART CITIES

041

Urban Air Mobility with eVTOL Aircraft (Archer Midnight)

ACTORS

Archer Aviation
Abu Dhabi Investment Office
Abu Dhabi Aviation
GCAA

SNAPSHOT

Archer Aviation's Midnight, a 12-rotor electric aircraft built to carry four passengers across a city, flew in the UAE for the first time in July 2025 at Abu Dhabi's Al Bateen Executive Airport.[1] By November it had completed a full in-country test campaign, from vertical take-off through transition to wing-borne flight over the desert,[2] and in May 2026 the UAE's General Civil Aviation Authority (GCAA) admitted it to a Restricted Type Certificate programme, the first eVTOL on that track in the country, with a defined route to carrying paying passengers.[3] The goal, set in a framework agreement with the Abu Dhabi Investment Office valued in the hundreds of millions of dollars, is to make Abu Dhabi the first market in the world where Midnight enters commercial service.[4]

WHY IT MATTERS

The idea of the air taxi is not new. What has changed is that electric propulsion has made it commercially plausible, and the foundations of a new industry, including its first passenger services, certification pathways, and production capacity, are now being established. Abu Dhabi is competing to become one of the places where that industry takes root. The emirate has kept congestion comparatively low by expanding transport capacity ahead of demand, but with the population projected to reach 5.4 million by 2040 and no metro yet in operation, preserving that advantage will require new forms of mobility.[5] An electric vertical take-off aircraft adds a new layer to the transport network, offering faster journeys than road travel, lower noise, and no direct operating emissions.[6]

The aircraft is one part of the system. The rest is certification, a licensed operator, trained pilots, vertiports that serve as take-off, landing, and passenger terminals for electric air taxis, and clear airspace rules, together with the public confidence that comes from operating a new layer of traffic safely overhead. Abu Dhabi's answer is to build the whole system at once. The emirate's advanced air mobility plan runs under the Integrated Transport Centre, with more than 10 vertiport sites announced,[7] and Archer and the GCAA are working through eight workstreams, from certification and crew training to airspace integration and security, backed by the Abu Dhabi Investment Office.[8] The programme is one half of a national story, with Joby Aviation preparing commercial services in Dubai while Archer prepares Abu Dhabi,[9] and Archer expects the first passengers ever to board a Midnight to do so in Abu Dhabi, ahead of its home market in the United States.[10]

HOW THE TECHNOLOGY WORKS

Midnight is piloted, seats four passengers, and cruises at up to 241 kilometres per hour, with charging fast enough to turn the aircraft around between short urban trips.[11] It flies in three regimes: vertical take-off and landing on rotor lift, a transition phase, and wing-borne cruise, with the wing carrying the aircraft between vertiports. Its 12 rotors are fully independent, providing redundancy the company says exceeds what is typical for aircraft of its weight.[12]

Archer proved the design where it will operate. Test flights at Al Bateen from July 2025 put vertical take-off and landing through high heat, humidity, and dust,[13] and by November the aircraft had demonstrated all three flight regimes over desert terrain, delivering, in the company's account, the results it expected across every phase of flight.[14]

Ground infrastructure is advancing on the same timeline. The GCAA has issued rules for vertiports that serve helicopters and eVTOLs together, and conversion of the Abu Dhabi Cruise Terminal into the first of them has begun.[15] Zayed International and Al Bateen airports will also host sites in the vertiport network.[16] Etihad Aviation Training has received Archer's first flight simulator and begun training the first pilots,[17] and the GCAA has initiated design and production organisation approvals alongside the certification programme.[18]

12
ROTORS
on the Midnight aircraft, carrying 4 passengers per flight

1ST
eVTOL ADMITTED
to the GCAA's Restricted Type Certificate programme

IMPACT AND RESULTS

Midnight flew in the UAE for the first time in July 2025 at Al Bateen Executive Airport.[19] Four months later, the in-country test campaign concluded with the full flight envelope demonstrated.[20] In May 2026, the GCAA admitted Midnight to its Restricted Type Certificate programme, the first eVTOL on that track, opening a defined route to commercial service.[21]

Commercial payments have begun. Archer is receiving revenue under its definitive agreement with Abu Dhabi Aviation for the Launch Edition programme,[22] and pilot training is underway with Etihad Aviation Training.[23]

WHAT'S NEXT

Commercial service is targeted for 2026,[24] with the steps to it sequenced: trial flights first, with Midnight flying its commercial missions without paying passengers,[25] then entry into service with Abu Dhabi Aviation within the limited operations the Restricted Type Certificate permits.[26] The 2024 framework also sets a pathway to manufacturing Midnight in the UAE.[27] If both programmes hold their schedules, the UAE would open the sector's first commercial eVTOL services in two cities at once.[28]

"This flight marks a significant step towards realizing Abu Dhabi's ambition to lead the world in advanced urban air mobility. Through the Smart and Autonomous Vehicles Industry Cluster, we are enabling companies like Archer to test, certify, and scale next-generation air mobility solutions, reinforcing our position as a global launchpad for innovation and a hub for transformative technologies," said H.E. Badr Al-Olama, Director General, Abu Dhabi Investment Office.[29]

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4IR Technologies:
IoT, AI, Cloud computing

Emirate:
UAE-wide

Maturity:
Scaled Deployment

Type:
Public-Private

SMART CITIES

042

Hassantuk Connected Fire and Life-Safety Network

ACTORS

Ministry of Interior
Injazat Data Systems
Etisalat by e&
Civil Defence Authorities
du
Software AG

SNAPSHOT

Hassantuk is a UAE-wide fire and life-safety network that connects alarms in buildings and homes to central receiving centres and Civil Defence command rooms. The Ministry of Interior launched the system with Injazat Data Systems in 2017 and describes the programme as targeting more than 500,000 buildings and private homes at federal level. The commercial-buildings operations room opened the following year, when Hassantuk for Homes was also operational.[1,2]

When a connected fire or life-safety system is triggered, Alarm Transmission Equipment sends the signal to Hassantuk for verification and onward reporting to emergency services. By September 2022, the upgraded Internet of Things platform connected more than 25,000 buildings to the Hassantuk Alarm Receiving Centre.[3]

WHY IT MATTERS

Conventional fire alarms primarily warn people inside a property. If a building is empty, its occupants are asleep, or nobody can call for help, emergency services may not learn about a fire until it has grown. Equipment faults can also leave a property less protected without immediately attracting attention. Hassantuk addresses both gaps by reporting verified emergencies to Civil Defence and routing maintenance alerts automatically.[4]

The system was created in response to fatal domestic fires.

Across the network, connected sensors and building panels feed an IoT platform where AI helps separate emergency, low-risk, and maintenance reports. Human operators verify alarms, while Civil Defence teams and fire-safety specialists supervise emergency response.[5]

HOW THE TECHNOLOGY WORKS

In commercial buildings, Alarm Transmission Equipment connects to the existing fire and life-safety panel and sends alarms to the Hassantuk receiving centre, where they are verified in less than 120 seconds before valid emergencies are forwarded to Civil Defence.[6] Residential installations use a connected panel and wireless smoke, heat, and other detectors to warn occupants and report incidents remotely.[7]

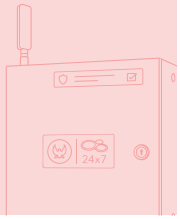
Specifically, the commercial network uses Software AG's Cumulocity IoT platform. In the event of a fire or life-threatening event, the Alarm Transmission Equipment sends the alarm to the Hassantuk IoT platform, which passes it to the Hassantuk command and control centre and then, where required, to the Civil Defence command and control centre.[8] At the receiving centre, the Verification Intelligence Platform uses AI to classify reports, identify their urgency, and provide information about the affected property or system.[9]

Maintenance alerts are routed to building owners or maintenance companies. Residential users can also view device status and receive fire and maintenance notifications through the Hassantuk app.[10,11]

25K+
BUILDINGS
connected to the Hassantuk Alarm

10M+
ALARMS
processed in a single year

62%
FEWER DEATHS
related to fire in H1



IMPACT AND RESULTS

More than 25,000 buildings had been connected to the Hassantuk Alarm Receiving Centre by September 2022, with fire, life-safety, and maintenance alerts monitored continuously through the national platform.[12] Injazat reports that the system processed more than 10 million alarms in a single year.[13]

The residential programme has been directed at households least able to fund protection themselves. From September 2019, the Ministry of Interior, working with the then Ministry of Community Development and Etisalat, sponsored installation in villas of families registered under social support. By 2021 the system had been installed in more than 26,000 homes, including 10,800 belonging to low-income families.[14]

The Ministry of Interior reported that fire-related deaths in buildings and facilities across the UAE fell by 62% between 1 January and 30 June 2021, and that fires in buildings and other facilities fell by 46% over the same period compared with the preceding 3 years. It attributed the decline to greater fire-safety awareness together with the installation of Hassantuk systems in homes and buildings.[15]

From 1 January 2024, installation became mandatory for villa owners, while new villas were required to include the system from construction. The Civil Defence General Command reported that Hassantuk had prevented more than 400 real fire incidents by that date.[16] Mandatory installation and tens of thousands of connected properties now place the system at national scale.

WHAT'S NEXT

Residential deployment is continuing through emirate-level programmes. In May 2025, the Abu Dhabi Civil Defence Authority launched a Hassantuk for Homes campaign that included installing connected early-warning systems in partnership with e&.[17]

Attention is also shifting to maintaining the growing installed base. In July 2026, AED 10 million was allocated to maintain Hassantuk systems for more than 25,000 social-support families across the UAE. The funding covers devices, maintenance, safety equipment, and annual subscription fees, with participating families bearing no cost.[18]

The underlying platform was designed to connect millions of devices. The Ministry of Interior states that it can be extended beyond fire alarms to building-management systems, health alarms, intrusion and personal-attack alerts, and CCTV streams, providing a route for Hassantuk to support a wider range of connected public-safety services.[19]

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SMART CITIES

4IR Technologies:
IoT

Emirate:
Dubai

Maturity:
Operational Deployment

Type:
Public-Private

043

Dubai Smart Parking Availability System

ACTORS

Roads and Transport Authority
Parkin Company PJSC

SNAPSHOT

In May 2019, Dubai's Roads and Transport Authority (RTA) introduced a smart parking-availability system covering 3,035 spaces in Al Rigga and around the Dubai World Trade Centre. The deployment combined 2,030 ground sensors, 70 overhead digital cameras, and a central system that transmitted vacancy information to the RTA app and 13 electronic signs.[1]

Dubai's public-parking operations transferred to Parkin Company on 1 January 2024, while RTA retained responsibility for developing and maintaining public-parking assets.[2] Parkin's mobile application also provides real-time parking availability.[3]

WHY IT MATTERS

Parking spaces cannot be used efficiently when drivers do not know where vacancies are, causing them to circulate through busy streets while searching.

The Dubai system converts changing physical occupancy into information that drivers can access before entering a parking area. Ground sensors and cameras detect vacancies, while the central system distributes the information through a mobile application and roadside signs.[4]

The system also gives the parking operator data on how individual spaces and parking areas are being used. RTA stated that this information would support monitoring and inspection operations and help inform future parking-expansion plans.[5]

HOW THE TECHNOLOGY WORKS

The physical detection layer consists of ground sensors and overhead digital cameras installed across the monitored parking areas. These devices identify vacant spaces and transmit the information immediately to a central system.[6]

The central system consolidates the readings into a current view of parking availability. It then sends the location and number of vacant spaces to the Find Parking function in the RTA app and to 13 variable-message signs serving the covered zones.[7]

Following the transfer of Dubai's parking business, Parkin introduced a dedicated mobile application in early 2025.[8] The application combines real-time parking availability and search functions with cashless payment, AutoPay, and account-management services.[9]

Parkin applies data-security controls to the digital systems through which parking information and services are delivered. These include encrypted backups, access controls, threat detection, and incident-response procedures. The company reported no customer-data security breaches in 2024.[10]

3,035
PARKING SPACES
covered by the original smart parking deployment

20–30%
SEARCH TIME CUT
roughly an 8 minute difference

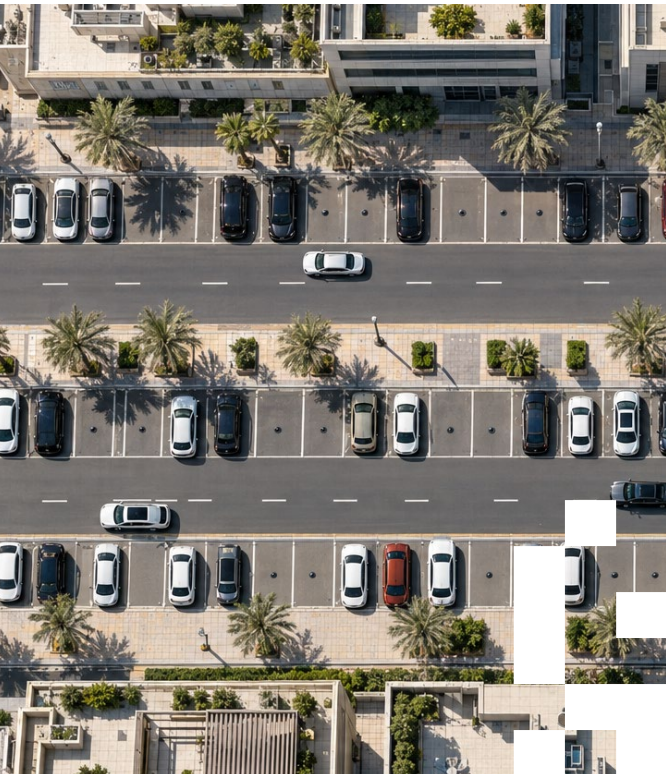
239
TONNES CO_2/YR
emissions avoided annually from reduced search-driving

IMPACT AND RESULTS

The original 2019 deployment provided real-time monitoring for 3,035 parking spaces through 2,030 ground sensors and 70 cameras. RTA estimated that the system could reduce parking-search time by between 20% and 30%, equivalent to approximately 8 minutes.[11]

RTA also estimated that reducing the distance travelled while searching for spaces would prevent approximately 239 tonnes of carbon-dioxide emissions annually.[12]

The system generated occupancy data for RTA's parking-monitoring and inspection activities. RTA also intended to use this information to support future expansion plans.[13]



WHAT'S NEXT

The next phase is already moving into deployment. In February 2026, Parkin announced an initial rollout of approximately 1,000 solar-powered smart cameras for on-street parking. The cameras can be deployed around locations such as the Dubai World Trade Centre during major events, using live video and images to monitor parking availability and inform drivers before they enter congested event areas. The information is also linked to Parkin's smart inspection operations room.[14]

By August 2026, Parkin reported that the initial 1,000 cameras had been deployed and announced plans to add another 5,000 solar-powered smart cameras across key on-street parking locations. The company is also extending automatic payment deductions to on-street parking and integrating its digital services, data connectivity, and physical parking infrastructure.[15]

Beyond expanding camera coverage, Parkin's published technology roadmap calls for AI-driven predictive space availability.[16] It also plans a hands-free feature that will enable drivers to locate available spaces with less manual interaction with the application.[17]

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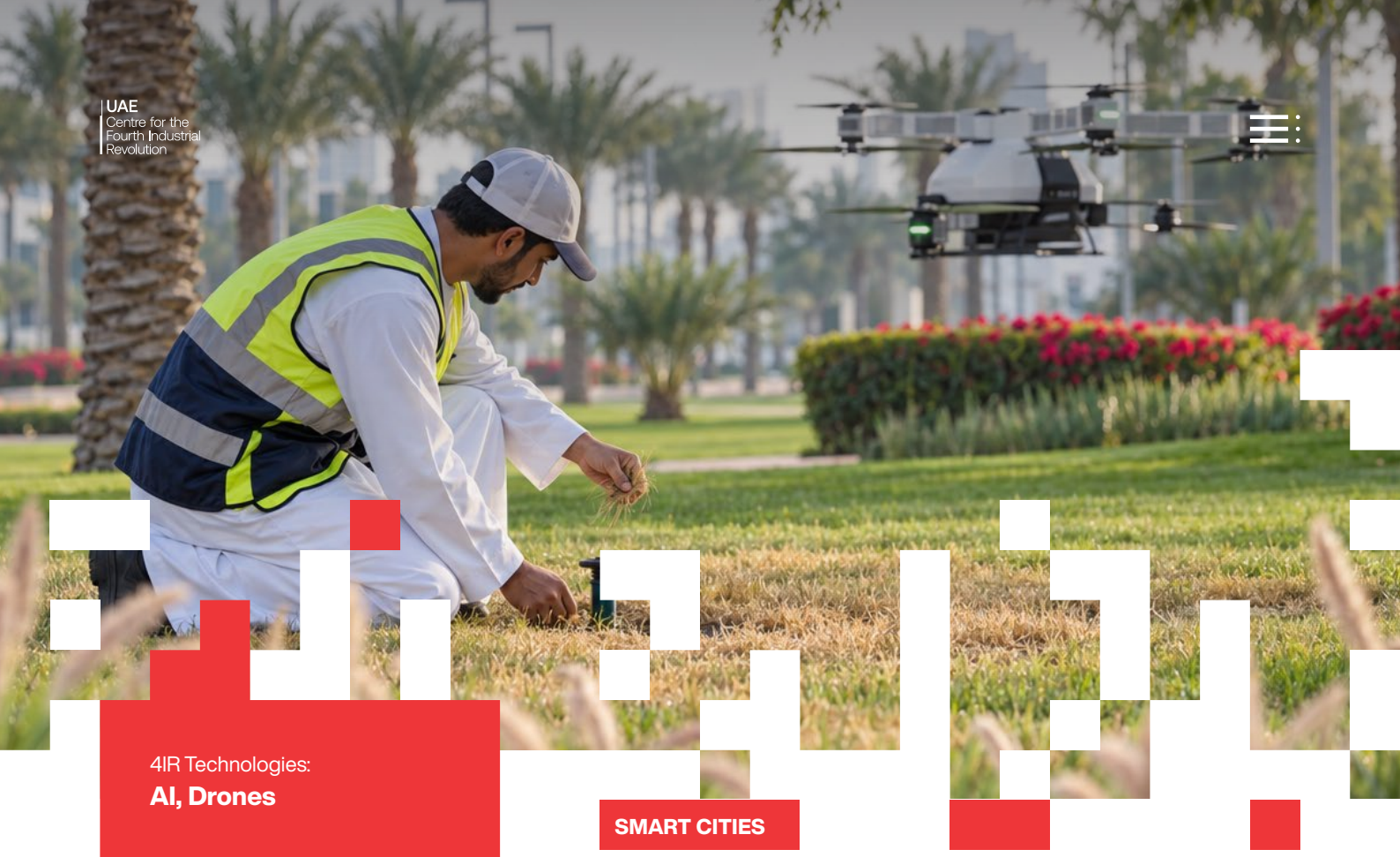


SMART CITIES

4IR Technologies:
AI, Drones

Emirate:
Dubai

Maturity:
Pilot Deployment

Type:
Public-Private

044
Smart Municipality Eye

ACTORS

Dubai Municipality
Eanan Al Samma

SNAPSHOT

Dubai Municipality launched Smart Municipality Eye in November 2025 as an AI-enabled drone initiative for monitoring the city's green spaces. The system is designed to map planted areas, assess vegetation health, and produce reports on potential maintenance problems. Its planned coverage extends across 52 million square metres.[1]

The AI platform analyses data collected through aerial and field mapping for signs of irrigation problems, pest activity, and declining plant health. The launch was accompanied by an agreement with UAE drone manufacturer Eanan Al Samma to develop and deploy drone and AI solutions for municipal, field, and inspection operations.[2]

WHY IT MATTERS

Dubai's green spaces extend across 52 million square metres. Inspecting such a large and dispersed area from the ground requires teams to cover substantial distances and assess plants individually. Irrigation failures, pest activity, and changes in vegetation health also need to be identified early enough for maintenance teams to respond.

Smart Municipality Eye adds an aerial layer to this work. Drones can map large areas and provide a broader view of plant conditions. The resulting data can help municipal teams identify locations that require closer inspection or maintenance.[3]

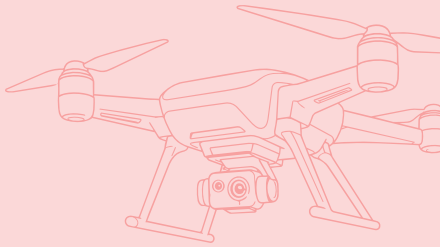
AI processes the collected data for patterns associated with vegetation health, irrigation, and pest concerns. The system then produces real-time reports on potential problems. This shifts part of the inspection process from finding issues during scheduled field visits to directing attention towards areas already identified by the system.[4]

HOW THE TECHNOLOGY WORKS

Each inspection begins with drones mapping a defined green area from the air. This provides a broad view of vegetation across the site, including sections that would otherwise need to be checked separately from the ground. Data collected during the flight is transferred to an AI platform for plant-health assessment.[5]

The AI examines the data for signs of declining vegetation health and patterns associated with irrigation or pest-related concerns. The system is intended to identify sections that may be developing problems and produce real-time reports for follow-up inspection or maintenance. A suspected irrigation problem, for example, can be flagged before its effects spread across a larger planted area.[6]

52M
SQUARE METRES
of Dubai green space under planned drone-based monitoring coverage



IMPACT AND RESULTS

Smart Municipality Eye entered service in November 2025, with coverage set to span Dubai's 52 million square metres of green space. Its contribution at this stage is the workflow itself: aerial mapping, AI-based plant-health assessment, and real-time reporting now operate as a single municipal process.[7]

That process changes where inspection effort goes. Reports generated from each flight direct municipal teams to the green areas showing signs of irrigation, pest or plant-health problems, which gives Dubai Municipality a common information layer for vegetation monitoring across that area.[8]

WHAT'S NEXT

The agreement between Dubai Municipality and Eanan Al Samma provides the development framework for the initiative's next stage. The partners will exchange technical expertise, develop new solutions, and pilot advanced operational models for municipal services and urban planning.[9]

Their cooperation also extends beyond the initial green-space application. The agreement covers additional drone and AI solutions for municipal operations, field services, and inspections, creating a route for the aerial-monitoring system and its analytical platform to support a broader range of municipal work.[10]

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4IR Technologies:
AI, Robotics, Autonomous systems, IoT

Emirate:
Dubai

Maturity:
Operational Deployment

Type:
Public-Private

SMART CITIES

045

One Force, Three Domains: Dubai Police's Multi-Domain Autonomous Policing Ecosystem

ACTORS

Dubai Police

SNAPSHOT

Dubai Police is developing a multi-domain autonomous policing ecosystem that applies artificial intelligence, robotics, autonomous systems and connected technologies to extend operational reach across land, air and sea. On land, DPR-02 provides a fully autonomous ground-patrol capability alongside Ghiath, Dubai Police's officer-operated smart patrol.[1,2] In the air, Drone Box enables autonomous aerial first response through distributed drone stations; by 2025, the network had expanded to 12 active units.[3] At sea, Haddad extends the model toward autonomous maritime monitoring and patrol support.[4]

Co-creation is a defining feature of the ecosystem. Dubai Police has worked with strategic partners to translate frontline operational needs into deployable solutions, combining police domain expertise with external engineering,

mobility and digital capabilities.[5,6,7,8] This approach has allowed the projects to evolve around policing requirements rather than around individual technologies. The significance therefore lies less in any single platform than in the operating model emerging around them. Connected to Dubai Police's wider command-and-control environment, the systems extend sensing, situational awareness and response while officers retain authority over judgement, intervention and enforcement.[9,10]

WHY IT MATTERS

Dubai's scale, density and pace of growth create a public-safety challenge that cannot be addressed simply by adding more conventional patrol resources. Police operations span major road networks, dense public areas, airspace and an extensive coastline, often while responding to incidents in minutes. Dubai Police's digital-transformation agenda therefore focuses on connected operations, real-time data and technology-enabled response across the organisation.[11]

Autonomous systems add a new operational layer to this model. They can maintain persistent presence, reach incidents quickly, gather information before officers arrive and operate where immediate deployment of personnel may be inefficient or carry additional risk. Drone Box illustrates the value of this approach by rapidly deploying an aerial asset to an incident and providing real-time information to the Command and Control Centre.[12,13]

The objective is not autonomy for its own sake. Dubai Police's approach keeps people at the centre of the operating model. DPR-02 includes tele-operation capability for human intervention when required, while Drone Box missions remain integrated with police operational structures.[14,15] Autonomous systems are used for tasks suited to machines, such as sensing, mobility, persistence and rapid deployment, while professional judgement and enforcement remain human responsibilities.

HOW THE TECHNOLOGY WORKS

Land. DPR-02 provides an autonomous patrol capability built around self-driving mobility, onboard sensing and direct connectivity with the Command and Control Centre. The vehicle can operate autonomously while retaining tele-operation capability for human intervention when required.[16] Ghiath provides a complementary form of intelligent mobility: the officer remains in command while advanced smart systems, artificial intelligence and connected technologies strengthen situational awareness and field capability.[17] Together, the two platforms illustrate two levels of 4IR-enabled policing on the road: autonomous presence and technology-augmented frontline operations.

Air. Drone Box transforms the drone from a specialist asset that must be mobilised for each mission into a distributed first-response capability. Aircraft are housed in autonomous stations and can be dispatched to an incident, transmit live operational information to police command centres and return after completing the mission.[18,19] This gives command teams an earlier view of an incident and allows the aerial layer to support ground response as part of the same operational process.

Sea. Haddad extends the same principle into the maritime environment. The self-driving smart police boat combines remote-control functions, onboard monitoring and visual-analysis capabilities to strengthen maritime security and patrol efficiency.[20] Its development has also been advanced through collaborative technology development and knowledge exchange with strategic partners, reflecting the co-creation model used across the ecosystem.[21] The platform broadens the application of autonomous mobility from roads and airspace to the maritime domain.

Integration. The ecosystem's value comes from operational coordination across the three domains. Rather than treating each asset as a standalone technology project, Dubai Police is building a model in which remote sensing, live information and field resources contribute to a common command-and-control process.[22,23] Integration today is primarily operational, covering shared command, dispatch, information flows and human supervision, creating the foundation for progressively deeper technical interoperability between platforms.

IMPACT AND RESULTS

Emergency response time provides the clearest ecosystem-level measure of the direction of travel. In the first quarter of 2021, Dubai Police reported an average patrol response time of 2 minutes 47 seconds to emergency scenes.[24] By the third quarter of 2025, the average response time to critical emergencies had fallen to 2 minutes 7 seconds, an improvement of roughly 24% between those two reported periods.[25] Within the autonomous aerial layer, Drone Box averaged just 57 seconds for very urgent cases.[26] These results reflect the wider evolution of command-and-control, patrol deployment and connected first-response capabilities; they should not be attributed to any single platform.

Public-safety indicators provide wider context for the environment in which the ecosystem operates. For 2025, Dubai Police recorded a 99.9% daytime safety perception score and a 98.7% score for feeling safe while walking at night in the

IMPACT AND RESULTS CONT'D

Security Quality of Life Survey conducted by the Federal Competitiveness and Statistics Centre in cooperation with the Ministry of Interior.[27] Gallup's 2025 Global Safety Report independently placed the UAE among the world's top 10 for perceived nighttime safety, with 90% of respondents reporting that they felt safe walking alone at night; the UAE's Law and Order Index score was 88.[28] These are not direct measures of the autonomous ecosystem, but they provide an independent view of the broader safety outcomes that technology-enabled policing is intended to support.

The ecosystem's maturity is also visible in its progression from experimentation to operational deployment and scale. DPR-02 entered operational deployment in 2025.[29] By the same year, Drone Box had developed into a distributed network of autonomous first-response stations.[30] Ghiath has likewise continued to evolve, with a second generation introduced in 2026.[31] Together, these developments show autonomous and intelligent mobility capabilities moving beyond isolated trials toward repeatable use within policing workflows.

WHAT'S NEXT

The next phase is about interoperability, not simply adding more platforms. The second generation of Ghiath, in service since July 2026, is the newest of the assets that environment will have to coordinate.[32] The wider opportunity is to create a common operating environment in which command centres can identify an incident, select the most appropriate available asset, task it under human oversight, combine information from multiple domains and provide officers with a shared operational picture. This direction is consistent with Dubai Police's 2025 to 2030 Future of Digital Mobility Strategy.[33]

Over time, deeper integration could move the model from connected autonomous assets toward coordinated autonomy across land, air and sea. The central 4IR lesson is that value comes not from robots, drones or AI in isolation, but from co-creating solutions around operational needs and redesigning processes around what the technologies enable: faster sensing, smarter deployment, safer operations and better-informed human decisions.

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4IR Technologies:
AI, Robotics, Autonomous systems

Emirate:
Dubai

Maturity:
Operational Deployment

Type:
Public-Private

SMART CITIES

046

Automated Rail Infrastructure Inspection System (ARIIS)

ACTORS

Roads and Transport Authority
Keolis MHI
Future Maintenance Technologies

SNAPSHOT

In December 2023, Future Maintenance Technologies (FMT) deployed ARIIS on Dubai Metro. The Dubai Roads and Transport Authority (RTA) formally announced its operational rollout with Keolis MHI and FMT in June 2025. The system now inspects track and supporting infrastructure across the Red and Green Lines of the Dubai Metro, a network of 103.8 kilometres of dual track serving 56 stations.[1,2,3]

The platform carries LiDAR, lasers, and 3D cameras, recording asset condition without teams walking the full network or interrupting passenger services.[4,5] RTA reported a 70% reduction in inspection time.[6] FMT reports that a full-network inspection cycle fell from more than 2,400 to approximately 700 staff-hours.[7]

WHY IT MATTERS

Rail infrastructure must be inspected regularly to identify wear, geometry problems, and other defects before they affect safety or operations. Manual inspection requires trained personnel to walk sections of track during restricted engineering hours. FMT reports that a complete manual inspection cycle previously required more than 2,400 staff-hours, limiting how frequently the network could be assessed.[8]

ARIIS automates data collection across large sections of the network, reducing the time personnel spend in the rail corridor. Its repeatable condition records allow engineers to identify changes and schedule interventions according to the condition of an asset rather than relying only on fixed inspection intervals.[9]

The 4IR element combines a robotic inspection platform with precision sensors, computer vision, AI, and machine-learning algorithms. The system automates data collection and initial analysis, while engineers interpret the results and determine the maintenance response.[10]

HOW THE TECHNOLOGY WORKS

The ARIIS unit deployed in Dubai operates as a towed rail vehicle rather than a self-propelled vehicle. It moves from a maintenance depot or siding into the network during engineering and maintenance hours, inspecting track geometry, rail profiles, power infrastructure, and surrounding structures.[11]

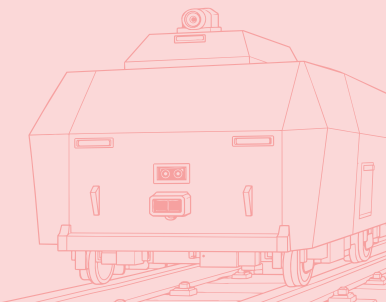
Its sensor suite includes rail-profile and geometry lasers, line cameras, 3D cameras, LiDAR, and inertial measurement units. These instruments measure rail profile and defects, track geometry, third-rail characteristics, overhead-wire geometry, and temperature. The system can also inspect surrounding structures.[12]

ARIIS combines onboard and wayside processing. Safety-critical alerts can be analysed onboard and communicated in near real time. Other inspection data are processed on a dedicated wayside server and transferred to client systems through application programming interfaces.[13]

AI and computer-vision tools analyse the sensor outputs to identify defects and convert each inspection into structured condition data. Engineers review the results, which feed directly into Keolis MHI's maintenance-planning system.[14,15]

70%
TIME CUT
for inspection on the Dubai Metro

103.8
KM OF TRACK
inspected across the Red and Green Lines



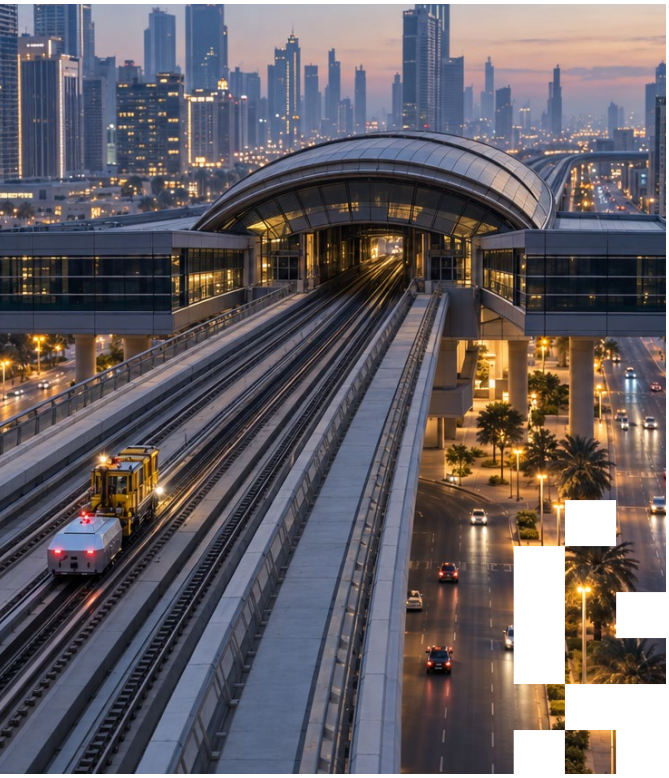
IMPACT AND RESULTS

ARIIS has been deployed across the Red and Green Lines of the Dubai Metro, covering a network of 103.8 kilometres of dual track. FMT states that the deployment operates under a long-term Robotics-as-a-Service contract and that inspection data is integrated directly into Keolis MHI's maintenance-planning systems.[16]

According to FMT, ARIIS reduced manual inspections by up to 70%, cut a full-network inspection cycle from more than 2,400 to approximately 700 staff-hours, and improved infrastructure-condition assessment by 40%.[17]

RTA subsequently reported a 70% reduction in inspection time and described ARIIS as the first system of its kind in the region to use intelligent analytics to deliver data-driven recommendations.[18]

Each inspection also creates a repeatable digital record of infrastructure condition. This allows engineers to track changes, prioritise interventions, and reduce unnecessary maintenance work while limiting the time personnel spend inside the rail corridor.[19]



WHAT'S NEXT

At GITEX Global 2025, RTA showcased ARIIS among 11 AI and predictive-technology initiatives and described it as a step towards proactive asset management, within RTA's Artificial Intelligence Strategy 2030.[20]

The platform itself is built to extend. FMT's technical documentation describes a system that accepts additional sensor modules and analytics, with propulsion and fuller autonomy available as later additions, so inspection capability on the Red and Green Lines can grow without replacing the vehicle.[21]

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4IR Technologies:
AI

Emirate:
Abu Dhabi

Maturity:
Operational Deployment

Type:
Public

SMART CITIES

047
AI-Driven Building Permitting (BINAA)

ACTORS

Department of Municipalities and Transport, Abu Dhabi

SNAPSHOT

Abu Dhabi is using AI to automate technical reviews within the building-permit process. The Department of Municipalities and Transport (DMT) launched the BINAA digital platform across the emirate in June 2025, building on AI-enabled Building Information Modelling and automated plan-review capabilities introduced into the permitting process the previous year.[1,2]

BINAA is being rolled out in phases, beginning with new private villas, a category for which around 20,000 applications are received annually. The platform provides a unified environment through which more than 15 government entities can access blueprints and other project documents.[3] By March 2026, DMT reported that BINAA had reduced the average time required to issue a residential villa building permit by 57% and decreased resubmissions by 53% through the automation of complex technical reviews.[4]

WHY IT MATTERS

Building-permit approval in Abu Dhabi involves technical reviews and coordination across multiple entities. At BINAA's launch, DMT signed a multi-party agreement with organisations including Abu Dhabi Civil Defence Authority, TAQA, and e&, covering the exchange of data, documents, and technical reviews associated with building permits and related approvals.[5]

BINAA introduces AI directly into this regulatory process. DMT's AI-enabled building-permit tools conduct building-code compliance checks on 3D models, while BINAA gives participating entities access to project plans and related documentation through a shared digital environment.[6,7] DMT reports that, since BINAA's introduction, residential villa permit issuance times have fallen by 57% and resubmissions by 53%.[8]

HOW THE TECHNOLOGY WORKS

BINAA incorporates AI and Building Information Modelling capabilities that DMT introduced into its building-permit process in 2024. The associated automated plan-review system uses AI to conduct building-code compliance checks on 3D models, helping identify potential issues against Abu Dhabi's building requirements.[9]

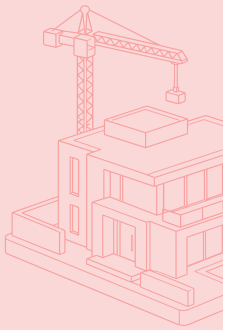
The platform also incorporates virtual and augmented technologies for project review and inspection. Its virtual interface allows users to remotely explore and navigate construction sites and tag areas requiring further attention. On site, augmented technology can overlay 3D design data onto physical structures and spaces, allowing inspectors to identify areas requiring closer examination.[10]

For 2D submissions, automation remains in transition. At BINAA's launch, DMT stated that all new and existing 2D building plans would continue to be reviewed manually, with AI introduced gradually into the process.[11]

57%
FASTER
permit issuance

53%
FEWER
permit resubmissions

20K
APPLICATIONS
recieved annually through the platform



IMPACT AND RESULTS

Since BINAA's introduction in June 2025, DMT reports that the average time required to issue a residential villa building permit has fallen by 57%, while resubmissions have decreased by 53%.[12] DMT explicitly attributes these reductions to the automation of complex technical reviews.

The deployment sits within a permitting system operating at substantial scale. More than 11,000 building permits were issued across Abu Dhabi in 2025, representing a 15% increase from the previous year. DMT also conducted upskilling workshops involving more than 7,000 consultants and contractors to support adaptation to evolving regulatory and market requirements.[13]

WHAT'S NEXT

DMT has stated that it will continue expanding BINAA's capabilities and promoting greater adoption of digital and AI-enabled submissions.[14] The gradual introduction of AI into 2D plan review also indicates that further automation of technical checking remains part of the platform's ongoing development.[15]

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LOGISTICS

4IR Technologies:
Autonomous systems, IoT, AI

Emirate:
Dubai

Maturity:
Operational Deployment

Type:
Public-Private

048

Autonomous and Electric Freight at Jebel Ali Port

ACTORS

DP World
Einride
DGWorld

SNAPSHOT

Jebel Ali Port, among the world's 10 busiest container ports and the largest seaport in the Middle East,[1] is transitioning its internal freight fleet from diesel to AI-managed electric operations. DP World expanded its electric internal terminal vehicle fleet from 14 to 146 units in 10 months.[2] In parallel, a partnership with Swedish firm Einride is deploying connected electric trucks managed through Einride's Saga AI operating system, with the first wave running around the clock and the full fleet targeted to reach two million container movements annually by 2026.[3,4]

WHY IT MATTERS

Internal terminal vehicles shuttle containers between quay cranes, yard stacks, and gates on continuous cycles, around the clock. At a port processing millions of containers per year, a conventional diesel fleet generates significant fuel costs, maintenance burden, and localised emissions. Maritime transport accounts for approximately 3% of global greenhouse gas emissions, and terminal operations are a direct contributor.[5] Replacing those vehicles with electric equivalents is one half of the work. The other is making an electric fleet operationally viable at this intensity: managing charging schedules so vehicles are never idle when needed, optimising routes to conserve battery, balancing fleet deployment across shifts, and sustaining the throughput that a trade-dependent economy relies on.

That is where AI fleet management becomes essential. Electrification without intelligent scheduling would create a slower, less reliable port. Einride's Saga operating system is designed to solve exactly this: coordinating electric fleet operations so that the transition from diesel does not come at the cost of performance. For a port underpinning one of the world's most trade-dependent economies, the value proposition is not electrification or efficiency. It is both, simultaneously, at commercial scale.

HOW THE TECHNOLOGY WORKS

The transition runs on two tracks. The first is the internal terminal vehicle fleet: the trucks that move containers short distances within the port. The expanded fleet includes 35 diesel vehicles converted to electric by DP World's in-house engineering teams, alongside more than 100 new electric vehicles sourced from international manufacturers. Eleven electric empty-container handlers have also been deployed for yard operations. A network of rapid-charging stations across the port supports the fleet.[6]

The second track is Einride's connected electric truck fleet, which adds an AI management layer on top of the electrified infrastructure. Einride's Saga is an AI-driven digital operating system that uses data analysis to optimise electric freight operations for cost and operational efficiency.[7] The first wave of Einride trucks is operational and running 24/7, moving over 204,000 containers annually. The full fleet planned for 2026 is designed to handle two million container movements per year.[8]

146
ELECTRIC VEHICLES
growth of DP World's electric terminal fleet in 10 months

10%+
EMISSIONS CUT
from the fleet expansion

2M
CONTAINER MOVEMENTS
targeted annually by 2026 via the Einride partnership

IMPACT AND RESULTS

DP World expanded its electric internal terminal vehicle fleet from 14 to 146 units in 10 months, with the expansion expected to reduce greenhouse gas emissions by more than 10%.[9] Additionally, the Einride electric freight initiative is expected to reduce emissions by 14,600 tonnes of CO_2 equivalent annually compared with diesel operations.[10]

WHAT'S NEXT

The full Einride fleet was scheduled to reach two million container movements annually by 2026.[11] Reaching that level would demonstrate that a major commercial port can electrify and digitally manage its internal freight at full operational scale. DP World also entered a contractual agreement with UAE-based autonomous-vehicle and robotics specialist DGWorld to equip Jebel Ali Port with Autonomous Internal Terminal Vehicles, with the technology to be integrated into the existing ITV fleet in multiple phases.[12]

For DP World, the strategic value extends beyond Jebel Ali. The company operates a global network of more than 60 ports and terminals across six continents.[13] A proven model for AI-managed electric port logistics in Dubai could therefore provide a blueprint for deployment elsewhere in its global network.

"Electrifying our port operations is a strategic priority that supports the UAE's Net Zero 2050 ambitions. By scaling our electric fleet and transitioning to cleaner energy at Jebel Ali Port, we are building future-ready and more resilient supply chains that benefit our customers and the communities we serve," said Abdulla Bin Damithan, CEO and Managing Director, DP World GCC.[14]

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4IR Technologies:
Quantum technologies, AI

Emirate:
Sharjah

Maturity:
Operational Deployment

Type:
Public-Private

LOGISTICS

049

Real-Time Aircraft Stand Allocation Using Quantum-Ready Optimisation

ACTORS

APEX
Qamia
Sharjah International Airport

SNAPSHOT

Sharjah International Airport handled 19.48 million passengers in 2025, up nearly 14% on the previous year,[1] across 44 usable stands,[2] an average of more than 440,000 passengers per stand. Its footprint cannot expand at the same pace: the terminal expansion now underway is a multi-year build that adds capacity far more slowly than traffic is rising.[3] APEX, developed by Qamia, a UAE-based quantum-computing company, in cooperation with SPARK (Sharjah Research Technology and Innovation Park), is a real-time AI decision engine that optimises how arriving and departing aircraft are assigned to those stands. Validated over 62 days of live operations, it added capacity from the same infrastructure in software rather than concrete.[4]

WHY IT MATTERS

Sharjah is among the region's fastest-growing airports, handling 116,657 aircraft movements in 2025 with an AED 1.24 billion terminal expansion underway aiming to accommodate 25 million passengers by 2027.[5,6] In 2025 it was the third-busiest airport in the UAE, after Dubai and Abu Dhabi, which handled 95.2 million and more than 33 million passengers respectively.[7] Stand allocation, deciding which aircraft occupies which stand and when, has traditionally relied on manual or rule-based planning. Duty managers build the day's plan one flight at a time on a Gantt chart, checking each constraint as they go. With roughly 320 movements a day across 44 stands, the number of feasible combinations is astronomically large, and rebuilding the plan by hand after a schedule change takes 30 to 60 minutes.[8]

The shift is from static human heuristics to real-time, constraint-aware optimisation that resolves automatically as schedules change, extracting more throughput from a fixed number of stands without pouring more concrete. For an airport growing faster than its infrastructure can expand, this is not an efficiency upgrade. It is the difference between capacity constrained and capacity unlocked.

HOW THE TECHNOLOGY WORKS

APEX runs on FENNEQ, Qamia's reasoning and optimisation platform. FENNEQ reads the day's flight schedule together with Sharjah's full operational rulebook: aircraft-to-stand size compatibility, adjacency constraints, airline priorities for boarding-bridge usage, and all time-buffer rules between consecutive flights on the same stand. It compiles everything into a single mathematical model in which every safety rule is a hard constraint, not an after-the-fact check.[9]

A portfolio of solver agents, classical, hybrid, and quantum, with quantum applied where it outperforms, then searches all feasible whole-day allocations simultaneously rather than flight by flight, returning the best plan in approximately 3 seconds. When a delay hits, the system re-optimises in seconds, adjusting other allocations only where necessary and minimising changes for flights arriving soon. APEX supports decisions; it does not replace human judgement. Duty managers review each proposed allocation and can confirm or override it. The system never refuses a manual change unless it creates a rule conflict.[10]

198
SAFETY VIOLATIONS
eliminated by construction

USD 45–75M
VALUE ESTIMATED
in annual operational savings and new revenue

IMPACT AND RESULTS

Validated against 62 days of actual Sharjah operations (July to August 2025, 9,654 flights), head to head against experienced human planners and then on live real-time data, APEX eliminated all hard safety violations (from 198 to zero), guaranteed by construction because rule-breaking plans cannot be generated. It placed 738 additional flights on passenger boarding bridges over the period, an average of 11.9 additional bridge allocations per day and a 20.2% increase in jet-bridge utilisation.[11]

All operational KPIs improved alongside these results: priority flights (full loads, critical connections, quick turnarounds) moved onto bridges, short-sector flights onto dedicated short-sector stands, and long ground-time and night-stop aircraft onto remote aprons, freeing contact stands for high-value traffic. Qamia estimates the resulting operational savings, capital avoidance, and new revenue at approximately USD 45 to USD 75 million per year for the operator.[12] That is capacity unlocked in software, complementing rather than competing with the physical terminal expansion.

WHAT'S NEXT

Scaling to full airport-wide, all-carrier coverage depends on deeper integration with Sharjah's operational systems and controller workflows, including data access from every carrier. The FENNEQ platform extends beyond aviation, with a telecom deployment already underway and the aviation roadmap targeting further airports across the GCC and beyond. Qamia has also signed a letter of intent with Aramco to apply FENNEQ to energy-sector optimisation and secured an AED 8 million grant with the University of Sharjah for research in post-quantum cryptography and quantum networking.[13]

The opportunity lies in operators coming to treat real-time optimisation as core infrastructure rather than an optional aid. If APEX's results at Sharjah hold across other airports, the implication is that significant capacity gains can be extracted from existing infrastructure globally through software, at a fraction of the cost and time required for physical expansion.

"We map a messy operational problem into one clean mathematical form and route it to the best solver, classical, hybrid, or quantum. At Sharjah that unlocked real capacity from existing stands; the architecture is quantum-ready for when quantum wins," said Raouf Dridi, Founder and CEO, Qamia.[14]

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LOGISTICS

4IR Technologies:
AI, Autonomous systems

Emirate:
Dubai

Maturity:
Operational Deployment

Type:
Public-Private

050

Autonomous Drone Inventory Management

ACTORS

dnata
Gather AI
DXB
DWC

SNAPSHOT

In March 2024, dnata announced the successful integration of autonomous inventory drones into its cargo operations at Dubai International (DXB) and Dubai World Central, Al Maktoum International (DWC).[1] The company first introduced the technology in 2021, becoming the first cargo services provider to deploy drones in cargo operations in the UAE. By 2024, the drones were embedded in daily warehouse inventory processes at both airports.[2]

WHY IT MATTERS

Dubai International handled 2.2 million tonnes of cargo in 2024, an increase of 20.5% from the previous year.[3] Across DXB and DWC, dnata processed more than one million tonnes between April 2024 and March 2025. This was its highest volume in a 12-month period, representing annual growth of 30%, while the company served more than 120 airline customers at the two airports.[4]

Air cargo warehouses must maintain accurate records across a varied inventory that includes perishables, pharmaceuticals, dangerous goods, live animals, aircraft engines, and vehicles.[5] Much of this cargo is stored in high-density racking above floor level. Locating and verifying individual shipments through manual checks can require considerable time, physical effort, and the use of mobile elevating equipment.

dnata introduced autonomous inventory drones to address this bottleneck. Instead of employees and elevating equipment inspecting every rack, the drones conduct frequent warehouse scans and provide a current view of shipment locations. This reduces the time and physical effort required for inventory checks while improving visibility across stored cargo.[6]

HOW THE TECHNOLOGY WORKS

dnata operates the cargo warehouses, while Gather AI provides the software for autonomous navigation, warehouse mapping, and inventory capture. Using onboard cameras, the drones move independently through the storage aisles and scan cargo across multiple rack levels. During each flight, they read barcodes, identify shipment locations, count cases, and record temperature data. The system operates without requiring additional beacons, sensors, or other active infrastructure to be installed throughout the warehouse.[7]

Gather AI's software converts the captured images into structured inventory records. Each drone is connected to a tablet that displays results as the scan progresses, while a web dashboard gives warehouse teams access to the collected information. Staff can use this digital record to locate shipments, verify inventory, and review cargo across the facility without conducting a physical inspection of every rack.[8]

The drones are designed for enclosed environments and can operate at temperatures between 0°C and 50°C. This range enables dnata to use the same inventory technology across ambient storage areas and temperature-controlled facilities handling pharmaceuticals, perishables, and other cool-chain cargo.[9]

99%+
TRACKING ACCURACY
achieved by the drones

3
HOURS
inventory check time cut from 48 hours

20%
PROCESSING TIME
reduction to process rack inventories

IMPACT AND RESULTS

In routine operation, the drones monitor approximately 1,800 shipments each day across 2,400 rack locations. dnata reported shipment-tracking accuracy of more than 99%, giving warehouse teams a reliable and frequently updated view of cargo across both facilities.[10]

dnata also reported a 20% reduction in the time required to process rack inventories.[11] The improvement was particularly significant at its 33,000-square-metre DWC facility, where a complete inventory check that previously took approximately 48 hours could be completed by drones in 3 hours. This shorter cycle enabled dnata to repeat the scan every 24 hours and maintain a more current record of stored cargo.[12]

The deployment has also changed how people and equipment are used inside the warehouse. Autonomous scanning reduces the need for cherry pickers and lifts, types of mobile platforms used to raise employees to high storage racks during routine inventory checks. This limits repetitive work at height and allows employees to focus on more complex operational responsibilities. dnata also reported a reduction in the carbon footprint associated with the inventory process.[13]

WHAT'S NEXT

dnata's planned next step is to extend the programme beyond Dubai to additional stations across its international cargo network. Replicating the model would allow more facilities to replace periodic manual inspections with faster and more frequent inventory scans.[14]

Specialised cargo facilities offer another area for expansion. Because the drones can operate across a wide temperature range, they can support regular inventory monitoring in cool-chain environments handling pharmaceuticals, perishables, and other temperature-sensitive shipments.[15]

The programme also complements dnata's wider cargo digitalisation strategy. Its cloud-based OneCargo platform automates functions including safety and quality monitoring, operational reporting, and unit-load-device management across multiple countries.[16] As these systems develop, autonomous drones can provide current information from inside the warehouse, while digital cargo platforms coordinate the wider operational workflow. Together, they can support faster inventory verification, greater visibility, and more consistent cargo management across dnata's network.

Guillaume Crozier, dnata's Senior Vice President for UAE Cargo and Global Cargo Strategy, described the operational effect: "The precision and reliability of these drones have surpassed our expectations, leading to a transformative impact on our efficiency levels."[17]

In August 2026 dnata opened a cargo integrated command centre in Dubai, combining OneCargo, dock management and Calogi data in a single view refreshed every 10 seconds. Drone scanning supplies the warehouse inventory data such a view depends on, and that dependency is the argument for extending the model to other stations.[18]

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4IR Technologies:
AI, Autonomous systems

Emirate:
Dubai

Maturity:
Operational Deployment

Type:
Public-Private

LOGISTICS

051

Automated Express Sorting and Air–Ground Logistics Hub

ACTORS

FedEx Express
Dubai South
DWC

SNAPSHOT

In February 2024, FedEx Express inaugurated its new air and ground regional hub at Dubai World Central Airport in Dubai South. The facility represents a long-term investment of more than USD 350 million, approximately AED 1.3 billion, in UAE logistics infrastructure and technology.[1]

The 57,000-square-metre hub combines automated package sorting with two AI-equipped high-speed X-ray machines and a 170-square-metre cold-storage area for temperature-sensitive shipments.[2] By integrating air and ground operations in one facility, the hub processes and redistributes shipments moving between the UAE and international markets. It serves the Middle East, Indian subcontinent, and Africa while connecting Dubai to FedEx's global network of 220 countries and territories.[3]

WHY IT MATTERS

The UAE's non-oil foreign trade reached a record AED 2.997 trillion in 2024, an increase of 14.6% from the previous year.[4] Growth continued into 2026, with non-oil foreign trade reaching AED 1.937 trillion in the first half of the year, 13.1% more than in the same period of 2025.[5]

Transport and storage are central to sustaining this expansion. The sector was the UAE's fastest-growing contributor to GDP in 2024, recording year-on-year growth of 9.6%.[6] Under We the UAE 2031, the country aims to rank among the world's top three in the Logistics Performance Index by developing advanced infrastructure, smart services, and integrated systems. In 2025, the UAE Cabinet reinforced this objective by establishing the UAE Logistics Integration Council to coordinate policies and programmes across ports, roads, transport, customs, railways, and border crossings. The government aims to increase the logistics sector's contribution to the national economy to more than AED 200 billion within 7 years.[7]

As trade volumes increase, the country needs logistics infrastructure capable of moving goods through arrival, security screening, sorting, and onward distribution without creating delays between transport modes.

The FedEx facility adds an automated express-logistics layer to this infrastructure. It brings air and ground handling, automated package sorting, AI-equipped security screening, and temperature-controlled storage into one regional hub. This allows the UAE to process time-sensitive and specialised shipments at greater speed while strengthening its capacity to connect businesses across regional and global markets.[8]

HOW THE TECHNOLOGY WORKS

Packages arriving at the hub by air or road enter an automated sorting process that separates shipment flows and directs packages towards their onward distribution routes. By March 2025, the system was capable of processing up to 9,000 packages per hour, increasing the speed and consistency with which shipments move through the facility.[9]

Security screening is incorporated into the same operating environment. Two automated, high-speed X-ray machines are equipped with artificial intelligence to scan goods efficiently and strengthen cargo security. The screening systems allow security checks to operate at the pace required by an automated express-sorting facility.[10]

Shipments requiring controlled temperatures are transferred to a dedicated 170-square-metre cold-storage area. Integrating this capability into the regional hub enables FedEx to process a wide range of temperature-sensitive shipments within the same air and ground logistics operation.[11]

Automation also extends to the management of the facility and its ground operations. A building-management system supports efficient energy use, while a solar-power project contributes to the hub's electricity requirements. FedEx also uses an electric ground-service fleet and provides charging stations for operational, delivery, and employee vehicles.[12]

IMPACT AND RESULTS

When the hub opened in February 2024, it was managing 58 FedEx flights arriving at and departing from Dubai each week.[13] By March 2025, it had become the company's main regional hub and was supporting 69 weekly flights connecting the UAE directly with markets including the United States, Belgium, France, India, Hong Kong, Italy, South Africa, Kenya, China, and Singapore.[14]

FedEx subsequently identified DWC as a critical gateway linking Asia, Europe, and Africa. This places the UAE at the centre of package flows moving between three major economic regions rather than limiting the facility to domestic or Gulf distribution.[15]

The hub is also supporting new international routes. In December 2024, FedEx introduced a service operating five times each week from Guangzhou through Bangalore and the UAE to Liège and Paris. The route strengthened trade connections between China, India, the UAE, and Europe and reduced transit times for some shipments to South India by 1 day.[16]

These results demonstrate the hub's contribution to the UAE's 4IR logistics capacity. Automated package processing is combined with a growing flight network, AI-enabled screening, and specialised cold storage within a single operational facility. The result is greater capacity for the UAE to handle, secure, and redistribute time-sensitive international shipments.

WHAT'S NEXT

DWC's planned expansion to an annual cargo capacity of 12 million tonnes will give FedEx scope to add connections and route more international shipments through the UAE.[17] This infrastructure supports the Forward Economy pillar of the "We the UAE 2031" national vision, which targets AED 4 trillion in annual foreign trade by 2031.[18]

FedEx is also extending its technology-enabled logistics model beyond physical handling. Its Import Tool streamlines customs documentation, while FedEx Surround supports shipment monitoring and intervention.[19] Connecting these services with the DWC hub can create a more integrated process spanning customs clearance, sorting, distribution, and exception management.

Kami Viswanathan, President of FedEx Middle East, Indian Subcontinent and Africa, described the hub's role: "Harnessing cutting-edge technology, our hub at DWC in Dubai South exemplifies our commitment to transforming our operations through automation."[20]

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LOGISTICS

4IR Technologies:
AI, Robotics, Autonomous systems

Emirate:
Dubai

Maturity:
Operational Deployment

Type:
Private

052
Robotic E-Commerce Fulfilment Centre

ACTORS

RoboStores
AutoStore
Swisslog

SNAPSHOT

RoboStores is a Dubai-based third-party logistics company providing warehousing and fulfilment for e-commerce businesses and retail brands. To automate its Al Quoz facility, it selected AutoStore's cube-storage robotics, with Swisslog implementing the system. The installation entered production in February 2018 after 8 months of work, followed by commercial use of the integrated solution from January 2020.[1,2]

The facility uses five R5 robots, four ConveyorPort workstations, and 10,000 storage bins coordinated through Swisslog's SynQ software. It supports import management, warehousing, order fulfilment, and last-mile delivery for businesses serving the UAE and wider Gulf market.[3]

WHY IT MATTERS

Digital trade is becoming an increasingly important part of the UAE economy. Research issued jointly by the Ministry of Economy and the Abu Dhabi Chamber of Commerce and Industry projected annual growth of 12.3% between 2023 and 2028. It also found that approximately 49% of UAE consumers shop online frequently.[4] The UAE Digital Economy Strategy aims to double the digital economy's contribution to GDP from 9.7% to 19.4% within 10 years.[5]

This growth creates a physical logistics challenge. E-commerce fulfilment centres must manage large numbers of products across multiple merchants while processing small, time-sensitive orders accurately. The Dubai Chamber of Digital Economy has identified infrastructure as one of the sector's central business issues as Dubai works to establish itself as a leading e-commerce marketplace.[6] The challenge becomes more demanding during sales campaigns and seasonal peaks, when thousands of orders must be prioritised without creating picking delays or increasing errors.[7]

RoboStores addresses this challenge by giving e-commerce companies access to shared robotic fulfilment infrastructure in Dubai. Merchants can connect their online stores to RoboStores, place inventory inside its automated facility, and track orders through the fulfilment process. The model allows businesses to use advanced warehousing technology without constructing and operating their own automated distribution centre.[8]

75%
SPACE SAVED
for the same volume

99.9%
ORDER ACCURACY
achieved by the automated system

HOW THE TECHNOLOGY WORKS

RoboStores focuses on fast and accurate order processing for digital startups and international brands entering the Gulf market. Serving several clients from one facility means storing thousands of stock-keeping units, managing different order profiles, and absorbing sudden changes in demand. RoboStores selected AutoStore to provide the high-density robotic storage system, while Swisslog integrated the technology with the company's warehouse and e-commerce operations. RoboStores continues to manage the inventory, client relationships, fulfilment, and delivery services.[9]

The process begins when a customer places an order through a merchant's Shopify or WooCommerce store. The order passes into RoboStores' in-house enterprise-resource-planning system and is transferred through an application programming interface to Swisslog's SynQ platform. SynQ converts the order into retrieval instructions, manages robot traffic, and coordinates the automated and manual stages of fulfilment.[10]

Products are stored in 10,000 bins stacked vertically inside a high-density aluminium grid. Five AutoStore R5 robots travel across rails on top of the structure. When an item is required, a robot positions itself above the relevant stack, lowers a hoist, and retrieves the appropriate bin. If the bin is stored beneath others, several robots can work together to move the upper bins temporarily. The selected bin is then delivered to one of four ConveyorPort workstations, bringing the goods directly to the employee responsible for picking.[11]

The system continually reorganises inventory according to demand. Frequently ordered products remain closer to the top of the grid, while slower-moving goods are placed deeper inside the cube. Machine learning supports this placement process, helping the robots retrieve products in approximately 29 to 40 seconds depending on the depth of the bin.[12]

At the workstation, Put-to-Light instructions show the employee which product and order container to use. Radio-frequency identification provides an additional verification layer during picking and packing. Once the order is confirmed, the robot returns the bin to the grid and RoboStores moves the completed package into its delivery network.[13]

IMPACT AND RESULTS

The deployment significantly increased the capacity of RoboStores' Dubai facility. By 2021, it was processing more than 1,500 orders per day and routinely supporting 4-hour delivery turnaround in urban areas. RoboStores reported that AutoStore reduced the warehouse space required for this volume by as much as 75%. Four employees were able to operate the fulfilment process at a capacity the company estimated would otherwise have required at least 20 people.[14]

The system has also delivered measurable gains in speed and accuracy. AutoStore's 2026 case material reports order accuracy of 99.9%, with robots retrieving and delivering bins to picking stations in approximately 29 to 40 seconds. Because the robots can operate continuously, the system can reposition inventory and prepare work outside normal picking hours, helping RoboStores respond to changing order volumes without interrupting fulfilment.[15]

IMPACT AND RESULTS CONT'D

RoboStores was named Warehouse Facility or Firm of the Year at the 2021 Logistics and Transport Awards, providing external recognition of the Dubai facility's approach to automated fulfilment.[16] More broadly, the deployment demonstrates how robotics, machine learning, and integrated warehouse software can operate as shared logistics infrastructure in the UAE. Digital businesses can access automated fulfilment without building their own facilities, while international brands gain a Dubai-based platform for serving customers across the UAE and wider Gulf market.

WHAT'S NEXT

AutoStore's modular architecture provides a direct route for expansion. RoboStores can increase capacity by adding robots to the existing grid without installing additional workstations. The storage structure can also be extended as inventory grows, allowing the facility to scale without replacing its core technology.[17]

This flexibility could enable more digital startups and international brands to operate from the UAE without building their own automated warehouses. As delivery expectations move from next-day service towards 2-hour fulfilment, express-order prioritisation, machine-learning-based inventory placement, and continuous robotic operation will become increasingly valuable.[18]

Elias Ma'ayah, General Manager of RoboStores, framed the scaling requirement: "If you receive ten orders it's easy, but when you start talking about thousands of orders per day, that's when you need the robotics."[19]

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4IR Technologies:
AI, Cloud computing

Emirate:
Abu Dhabi

Maturity:
Operational Deployment

Type:
Public-Private

LOGISTICS

053
AI-Powered Contrail Management

ACTORS

Etihad Airways
SATAVIA

SNAPSHOT

On 23 October 2021, Etihad Airways used SATAVIA's DECISIONX technology on flight EY20 from London Heathrow to Abu Dhabi. The platform identified atmospheric conditions associated with persistent contrails and recommended changes to the flight plan to avoid them. Etihad described the journey as the first commercial flight to test contrail avoidance as part of a wider package of emissions-reduction measures.[1]

Following further trials in 2022, Etihad and SATAVIA signed a multi-year commercial agreement at Abu Dhabi Sustainability Week in January 2023. Described by the companies as the world's first production contract for contrail management, the agreement moved the technology beyond individual demonstrations towards integration into Etihad's routine flight-planning operations.[2]

WHY IT MATTERS

Aviation's climate impact extends beyond the carbon dioxide produced by burning fuel. Persistent contrails form in cold, humid air, and some spread into cirrus clouds that retain heat in the atmosphere. A major scientific assessment estimated that contrail cirrus accounted for approximately 57% of aviation's net effective radiative forcing in 2018, compared with approximately 34% from accumulated aviation carbon dioxide emissions.[3]

Much of this warming is concentrated among a small proportion of flights. Targeted route adjustments can therefore reduce contrail formation without significantly increasing overall fuel consumption. A simulation using Japanese airspace found that changing the altitude of 1.7% of flights could reduce contrail energy forcing by as much as 59.3%, while increasing total fleet fuel consumption and carbon dioxide emissions by only 0.014%.[4]

Etihad tested DECISIONX through its Greenliner programme, which used commercial Boeing 787 flights as test beds for sustainability technologies. The platform gave the airline an immediate way to address contrail warming using aircraft already in service. Etihad treated it as a complement to fuel-efficiency measures and sustainable aviation fuel, which reduce direct emissions but do not eliminate aviation's non-carbon-dioxide effects.[5,6]

Avoiding contrails can require additional fuel, so Etihad also explored how to cover the associated operating cost. For its November 2022 transatlantic demonstration, the airline identified subsidies, its Corporate Conscious Choices programme, and future environmental credits from contrail avoidance as possible funding sources.[7]

The case is relevant to the UAE because Etihad is based in Abu Dhabi and can apply the technology across its international network. The climate benefit is not confined to UAE airspace; it occurs wherever Etihad's flights encounter conditions likely to produce persistent warming contrails. The programme also aligns with the UAE aviation sector's Net Zero resolution, which identifies operational efficiencies as a complement to sustainable and low-carbon aviation fuels.[8]

HOW THE TECHNOLOGY WORKS

DECISIONX combines numerical weather prediction, atmospheric modelling, artificial intelligence, and cloud computing to forecast where persistent warming contrails are likely to form. SATAVIA reported dividing the atmosphere into approximately six billion cells and running algorithmic calculations at 30-second intervals to update these forecasts.[9,10]

The platform screens scheduled routes against predicted ice-supersaturated regions: cold and humid areas in which persistent contrails are most likely to develop. It then models the probable climate effect of each planned trajectory and identifies flights for which a limited change in altitude or routing could meaningfully reduce warming.[11,12]

For a selected flight, SATAVIA provides recommended changes to the conventional flight plan. Etihad's dispatchers assess them against fuel requirements, aircraft performance, weather, restricted airspace, journey time, and air-traffic-control constraints. If the modification is operationally viable, it can be incorporated into the approved flight plan. The pilot retains authority to respond to conditions and air-traffic-control instructions during the flight.[13]

After landing, the trajectory flown is analysed using updated atmospheric and aircraft-position data. SATAVIA compares its estimated contrail impact with that of the original flight plan and calculates the difference in carbon dioxide equivalent. This post-flight assessment allows Etihad to quantify the estimated climate benefit associated with each modified trajectory.[14,15]

60+
flights re-routed to avoid contrail formation

6,000+
tonnes CO_2e of climate impact mitigated across the programme

IMPACT AND RESULTS

Between February and November 2022, Etihad operated 55 flights using plans modified with SATAVIA's contrail-avoidance software, including more than 30 during a concentrated programme around Earth Day.[16] Etihad's Environmental Report 2023 later reported a cumulative total of more than 60 modified flights, based on the analysis of more than 120,000 possible trajectories. The airline estimated that these activities mitigated more than 6,000 tonnes of carbon dioxide equivalent climate impact.[17]

The first London-to-Abu Dhabi flight illustrates the relationship between the estimated climate benefit and the additional fuel consumed. Etihad reported that the modified plan avoided approximately 64 tonnes of carbon dioxide equivalent warming while requiring around 100 kilograms of additional fuel.[18] ICAO's standard conversion factor for conventional jet fuel is 3.16 kilograms of carbon dioxide per kilogram of fuel. The fuel penalty therefore corresponded to approximately 316 kilograms, or 0.32 tonnes, of direct carbon dioxide emissions.[19]

IMPACT AND RESULTS CONT'D

Using Etihad's reported estimate and ICAO's fuel-conversion factor, the avoided contrail impact was approximately 200 times the additional direct carbon dioxide produced by the route adjustment.[20,21]

In its Environmental Report 2023, published in November 2024, Etihad reported that SATAVIA was working with the airline to scale contrail management across its operations and integrate climate-optimised flight planning into day-to-day flying.[22] Achieving this scale requires coordination among SATAVIA, flight-planning software providers, airline dispatchers, pilots, air-traffic-control authorities, and air-navigation service providers.[23]

WHAT'S NEXT

The next phase is deeper integration into Etihad's routine flight-planning systems. Screening a larger share of the airline's schedule will require automated data exchange between SATAVIA's atmospheric models and Etihad's operational systems. Recommended changes must then be incorporated while accounting for safety, aircraft performance, network reliability, airspace capacity, and changing weather conditions.[24]

Scaling contrail management will also require common methods for measuring and reporting its climate effects. European Union monitoring and reporting requirements for aviation's non-carbon-dioxide effects took effect in 2025. During 2025 and 2026, mandatory coverage applies principally to flights within the European Economic Area (EEA) and routes from the EEA to the United Kingdom and Switzerland. Coverage is scheduled to expand to all EU-related flights from 2027.[25]

To support these requirements, the European Commission and EUROCONTROL developed the Non-CO_2 Aviation Effects Tracking System, a regulatory measurement platform. DECISIONX helps Etihad forecast contrail-forming conditions and modify flight plans. The EU system calculates and reports the non-carbon-dioxide effects of completed flights using a common methodology. Its third version, released in April 2026, supports the full monitoring, reporting, and verification process. For an international airline such as Etihad, this provides a consistent basis for reporting and verifying the climate effects of flight-path changes as regulatory coverage expands.[26]

At Etihad's November 2022 transatlantic demonstration, Mariam Alqubaisi, the airline's Head of Sustainability and Business Excellence, described its intended direction: "We look forward to our continued collaboration with SATAVIA, expanding the art of the possible and accelerating progress towards climate-neutral aviation."[27]

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4IR Technologies:
Blockchain

Emirate:
Abu Dhabi

Maturity:
Pilot Deployment

Type:
Public-Private

LOGISTICS

054

Blockchain-Based Trade Documentation Pilot (Silsal)

ACTORS

Maqta Gateway
AD Ports Group

SNAPSHOT

In June 2018, Maqta Gateway, then a subsidiary of Abu Dhabi Ports (AD Ports), launched Silsal, a blockchain platform developed in its Digital Innovation Lab for maritime trade documentation. Built internally without an external technology partner, it was field-tested with selected AD Ports customers. AD Ports described Silsal as Abu Dhabi's first home-grown blockchain technology.[1]

The platform combines a blockchain transaction record with digital user identities. It is designed to encrypt and exchange bills of lading, delivery orders, bookings, and transport orders while giving authorised trade participants access to transaction updates.[2]

Later in 2018, Maqta Gateway announced separate pilot collaborations with the Port of Antwerp and Mediterranean Shipping Company (MSC). The Antwerp proof of concept focused on exchanging documents between ports, while MSC provided carrier information and operational feedback.[3,4] Maqta Gateway continued to describe Silsal as a proof of concept in 2019.[5]

WHY IT MATTERS

Abu Dhabi's ports support a large network of shipping lines, freight forwarders, importers, exporters, and public authorities. By 2019, Maqta Gateway's wider Port Community System was operating across five ports and 54 private jetties, connected to 20 shipping lines and providing more than 100 services.[6] At this scale, delays in confirming documents or shipment information can affect numerous organisations involved in moving goods through the emirate.

Maqta Gateway identified a specific weakness in this process. Exporters and importers needed easier access to transaction updates and a way to reduce their reliance on paperwork, telephone calls, and physical visits. Information also needed to move more quickly between the organisations responsible for a shipment.[7]

Silsal was developed as the UAE pursued its Emirates Blockchain Strategy 2021, which aimed to transfer 50% of applicable government transactions onto blockchain platforms.[8] For the UAE, the project tested whether locally developed blockchain and digital identity technology could make cross-border trade documents easier to verify and exchange. This supports Abu Dhabi's wider ambition to operate as a digitally connected trade and logistics hub.

HOW THE TECHNOLOGY WORKS

Silsal combines a blockchain ledger with a digital identity for each user. The identity determines what information the user can access and supports the encryption of transport documents, including bills of lading, delivery orders, bookings, and transport orders.[9]

When transaction information is recorded, authorised participants can retrieve the relevant details and follow status updates through the shared ledger. This gives the parties involved in a shipment access to a consistent transaction record. Silsal complements Maqta Gateway's Port Community System, which manages the wider exchange of port services and information.[10]

The Port of Antwerp pilot was designed to apply this process to trade between the UAE and Belgium. It examined whether the two ports could exchange, identify, and acknowledge cargo documents and certificates through Silsal, improving visibility across the shipment process.[11]

MSC brought the perspective of an international shipping line. The company supplied operational information and feedback to help test how cargo documents and certificates could be exchanged between AD Ports and overseas ports.[12]

5 MONTHS
to secure international pilot deals with Antwerp and MSC after launch

1ST HOME-GROWN
blockchain technology in Abu Dhabi

IMPACT AND RESULTS

Silsal established a locally developed blockchain capability within Abu Dhabi's maritime sector and progressed into field testing with strategic customers.[13] Within 5 months of its launch, Maqta Gateway had secured pilot agreements with the Port of Antwerp and MSC, extending the testing programme to an international port and a global shipping line.[14,15]

The Antwerp collaboration introduced a cross-border port-to-port use case centred on cargo documents and certificates. MSC added carrier-level input, allowing the platform to be assessed against the documentation requirements of an international shipping operator.

By 2019, Silsal was available to export and import companies and their customers, with wider participation planned as the project developed. Maqta Gateway continued to identify it as a proof-of-concept technology.[16]

For the UAE, the programme demonstrated that an Emirati port technology team could design a blockchain system, test it with trade users, and attract an international port and global carrier as partners. It also established a practical foundation for exploring trusted digital-document exchange between Abu Dhabi and overseas trade networks.

WHAT'S NEXT

When Silsal was launched, Maqta Gateway planned to expand it beyond freight forwarders and their customers to the wider trade community.[17] The aim was to allow ports, shipping lines, importers, exporters, and public authorities to verify identities and exchange trade documents through the same blockchain network.

The Port of Antwerp pilot provided the first model for extending Silsal beyond Abu Dhabi by testing document exchange between two port community systems.[18] Abu Dhabi subsequently expanded its digital trade infrastructure through the Advanced Trade and Logistics Platform (ATLP), which became operational in 2022 and facilitates trade across sea, land, air, industrial, and free-zone activities.[19]

Silsal's significance now lies in what followed it. ATLP describes Silsal as the point at which Maqta Gateway became the first in the region to achieve integration between two port community systems, and the document-verification capability it proved has since been carried into Abu Dhabi's single-window trade infrastructure rather than run as a separate service. The opportunity is to extend that verification beyond national borders, to overseas ports and shipping lines, so that bills of lading, delivery orders and port certificates can be authenticated across organisations.[20]

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4IR Technologies:
AI, Autonomous systems, IoT

Emirate:
Abu Dhabi

Maturity:
Operational Deployment

Type:
Public-Private

LOGISTICS

055

Autonomous Electric Container-Transport Fleet (Q-Truck)

ACTORS

COSCO SHIPPING Ports Abu Dhabi Terminal
AD Ports Group
Westwell

SNAPSHOT

In July 2021, COSCO SHIPPING Ports (CSP) Abu Dhabi Terminal deployed six electric Qomolo Q-Trucks at Khalifa Port following a 2-month trial. The autonomous vehicles transport general and refrigerated containers between vessels and the terminal yard during loading and unloading operations.[1]

The Q-Trucks were developed by Westwell, a Chinese artificial intelligence and logistics-technology company founded in Shanghai.[2] By October 2021, the fleet was participating in live vessel-handling operations at the terminal.[3] In May 2025, CSP reported that the vehicles were supporting round-the-clock operations and had remained stable during extreme heat and sandstorms. The terminal also received a second batch of Q-Trucks, which it described as a further expansion of the fleet.[4]

WHY IT MATTERS

Horizontal transport connects a container terminal's quayside with its storage yard, moving containers between quay cranes and yard blocks. Its efficiency directly affects terminal performance: insufficient vehicle availability can leave quay cranes waiting, slow down vessel loading and unloading, and delay ship departures.[5,6]

This matters at Khalifa Port, where total container-handling capacity reached 9.6 million twenty-foot equivalent units in 2025.[7] The Q-Trucks operate within CSP Abu Dhabi Terminal, where automating repetitive transfers can provide a more consistent flow of containers between the quay and yard.[8]

The vehicles combine two changes to conventional terminal transport. Autonomous operation removes the need for a dedicated driver in each truck, while battery-electric propulsion replaces diesel-powered movements. AD Ports expected the deployment to reduce operating costs and carbon dioxide emissions while allowing the terminal to sustain operations during workforce disruptions.[9]

The deployment also shows how autonomous transport can be introduced without rebuilding an existing terminal around automation. Westwell reported that the Q-Trucks were integrated into CSP Abu Dhabi Terminal without extensive changes to its infrastructure, reducing the disruption and upfront investment associated with automating horizontal transport.[10]

40+
DEGREES CELSIUS
daily temperatures the fleet operated through reliably

6
ELECTRIC TRUCKS
Deployed at Khalifa Port following a 2-month trial

HOW THE TECHNOLOGY WORKS

AD Ports described the Q-Trucks as Level 5 autonomous freight vehicles.[11] Under the standard classification of driving automation, Level 5 denotes full automation: the system performs the entire driving task and does not require a human driver to steer, brake, accelerate, or monitor the route. At Khalifa Port, this driverless operation takes place within the controlled environment of the container terminal.[12]

Each truck is equipped with a 360-degree sensor system, traffic monitoring, and driving-guidance technology. These systems allow the vehicle to detect its surroundings, navigate through the terminal yard, and transport general and refrigerated containers without an onboard driver.[13]

Movement instructions are coordinated through a Fleet Management System integrated with the terminal's operational control tower. The platform monitors the vehicles in real time, manages workflows, and exchanges information with other terminal systems, connecting each truck movement with the wider sequence of vessel and yard operations.[14]

Westwell uses an order-based operating model. The system receives a container-movement request, assigns an available Q-Truck, and selects a route through the yard. The vehicle then completes the movement while the Fleet Management System monitors its location and progress.[15]

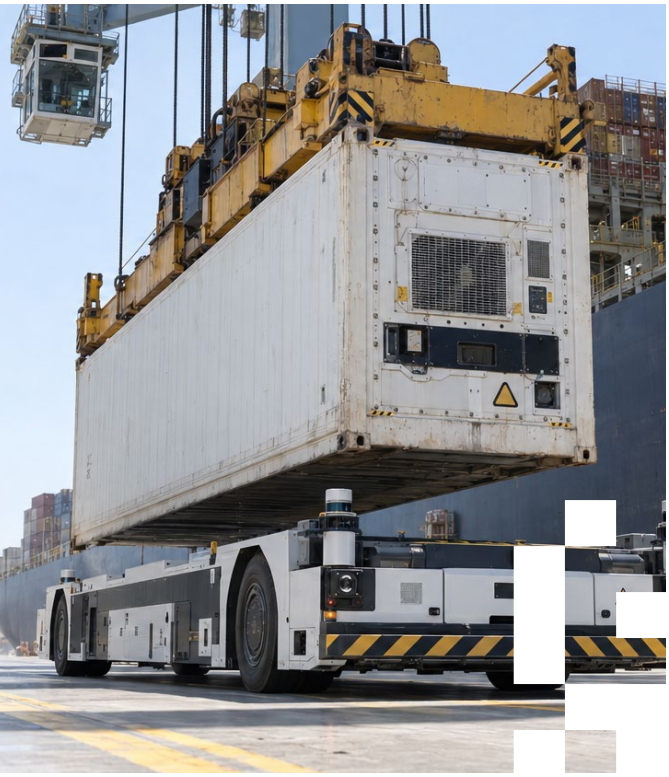
Each truck has a 281-kilowatt-hour battery, a maximum load capacity of 80 tonnes, and a stated operating range of 200 kilometres. AD Ports reported that the vehicles could operate for up to 44 hours continuously. A battery temperature-control system helps protect battery life in extreme weather conditions.[16]

IMPACT AND RESULTS

The first operational result was the transition from a 2-month trial to a six-vehicle fleet participating in vessel operations during 2021. Westwell reported that the vehicles continued operating despite daily high temperatures exceeding 40°C.[17]

In June 2022, AD Ports Group continued to identify the Q-Trucks as deployed at CSP Abu Dhabi Terminal. It listed the vehicles alongside Khalifa Port's automatic stacking cranes, aerial drones, automated terminal operating system, and digital services, placing autonomous transport within the port's wider operating technology.[18]

In May 2025, CSP received a second batch of Q-Trucks and described the order as an expansion of the fleet intended to improve the quality and efficiency of horizontal transport at the terminal.[19,20] CSP also reported that the vehicles had supported round-the-clock operations and precise positioning, remained stable during extreme heat and sandstorms, and reduced energy consumption per container movement. The repeat procurement came 4 years after the original deployment.[21]



WHAT'S NEXT

Following the 2025 fleet expansion, CSP Abu Dhabi Terminal said it would explore developing an "intelligent port brain" driven by large artificial intelligence models. The terminal intends to use these models to coordinate port operations more effectively and strengthen its regional competitiveness.[22]

This direction aligns with wider electrification at Khalifa Port. AD Ports Group's 2024 Sustainability Report records the introduction of electric rubber-tyred gantry cranes at Khalifa Port and electric-vehicle charging stations at Zayed Port and Khalifa Port. Together with the Q-Trucks, these investments extend electrification across additional parts of port and container-yard operations.[23]

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4IR Technologies:
AI, Autonomous systems, IoT

Emirate:
Abu Dhabi

Maturity:
Operational Deployment

Type:
Public-Private

LOGISTICS

056

Renewable-Powered Unmanned Offshore Survey Vessel (SAFEEN Green)

ACTORS

SAFEEN Subsea | **AD Ports Group**
NMDC Group

SNAPSHOT

In October 2024, SAFEEN Subsea launched SAFEEN Green, a remotely operated unmanned surface vessel developed to survey seabed conditions and support inspections of subsea infrastructure used in offshore energy and construction projects. The vessel collects geophysical and hydrographic data and can operate up to 200 nautical miles offshore while being controlled from an onshore Remote Operation Centre. SAFEEN Subsea is a joint venture between AD Ports Group and NMDC Group.[1]

Before entering the UAE offshore market, SAFEEN Green underwent extensive trials in the North Sea. These trials prepared the vessel for deployment in UAE waters.[2]

By the end of 2025, NMDC Group reported that SAFEEN Green had completed more than 20,000 kilometres of marine survey operations.[3]

WHY IT MATTERS

Offshore energy and infrastructure projects depend on accurate knowledge of the seabed. Geophysical surveys support site selection, navigation, pipeline and cable-route planning, and subsea construction. They also help identify geohazards that could endanger personnel, infrastructure, or the integrity of an engineering, procurement, and construction project.[4]

Conventional offshore surveys place vessel personnel at sea for the duration of the mission. SAFEEN Green changes this operating model by moving vessel control ashore and deploying the unmanned platform and its survey equipment offshore. This reduces personnel exposure while allowing survey operations to proceed without an onboard crew.[5]

The capability is particularly relevant to Abu Dhabi because offshore production represents a large and infrastructure-intensive part of the emirate's energy sector. ADNOC Offshore accounts for about half of Abu Dhabi's oil production capacity and operates nine fields, six artificial islands, three natural islands, eight offshore super complexes, and more than 400 offshore structures.[6]

Supporting this network requires seabed surveys for site selection, pipeline and cable routes, and foundations and subsea construction, as well as inspections of pipelines, risers, jackets, and other underwater assets.[7] SAFEEN Green can also support offshore wind farms and deep-sea mineral exploration, allowing the unmanned operating model to serve both established offshore industries and emerging marine-energy applications.[8]

HOW THE TECHNOLOGY WORKS

SAFEEN Green is remotely operated from an onshore control centre rather than navigated by a crew onboard. Dual autopilots support navigation, while high-definition cameras and comprehensive monitoring systems allow the shore-based team to supervise the vessel and its operating environment. These systems support continuous and secure offshore operations.[9]

The vessel carries modular payloads that can be adapted to different survey and inspection requirements. Its primary role is to collect geophysical and hydrographic data, with the modular design allowing different equipment configurations to be used without restricting the platform to one survey function.[10]

The collected data supports engineering design, site selection, navigation, route planning, and subsea construction. SAFEEN Subsea's geophysical survey capability uses acoustic equipment including side-scan sonar, sub-bottom profilers, single and multibeam echo sounders, and magnetometers to produce accurate data for offshore planning and execution.[11]

AD Ports Group states that SAFEEN Green can operate using renewable electric power or biofuel and produces approximately 10% of the emissions of a conventional vessel. The company also identifies improved fuel economy, modular payloads, and unmanned operation as contributors to lower operating costs.[12]

40%+

Cost savings vs conventional survey methods

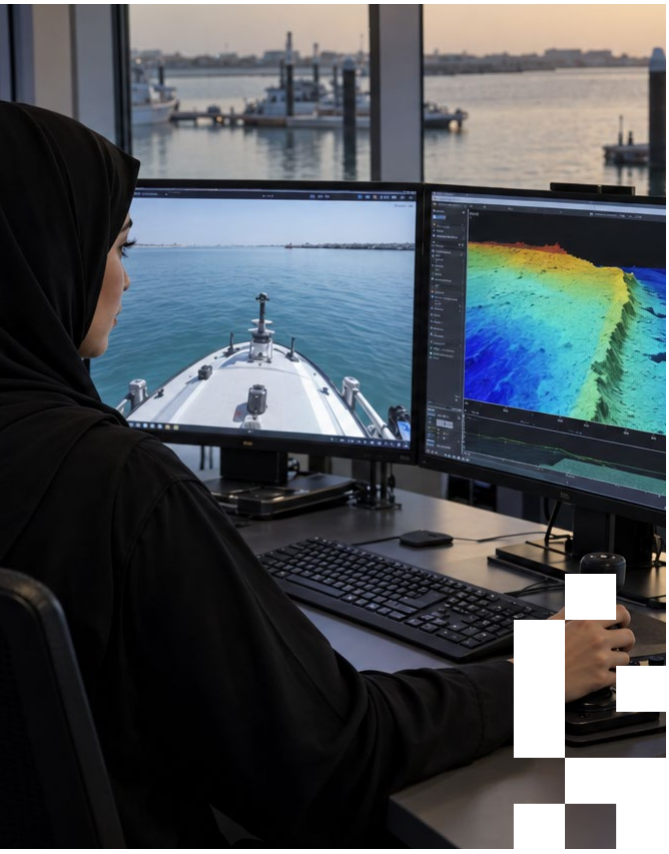
200

Nautical miles maximum offshore range from onshore control

IMPACT AND RESULTS

By the end of 2025, SAFEEN Green had completed more than 20,000 kilometres of marine survey operations. NMDC Group identified this as one of SAFEEN Subsea's principal operational milestones for the year, reflecting the vessel's use across offshore survey work.[13]

In July 2025, AD Ports Group reported that SAFEEN Green had achieved cost savings of more than 40%, operated with no personnel offshore, and established a track record across high-impact survey projects. The same announcement recorded SAFEEN Subsea as the Gold winner of an Innovative Idea Award for developing the vessel.[14]



WHAT'S NEXT

NMDC Group plans to conduct all SAFEEN Subsea geophysical survey projects using fully unmanned systems. The company also intends to extend its unmanned operating model from hydrographic and geophysical surveys into the visual inspection of offshore facilities using remotely operated underwater vehicles.[15]

In a November 2025 interview with Emirates News Agency, SAFEEN Subsea's chief executive said the company was pursuing international expansion through planned projects in Saudi Arabia, Taiwan, and Brunei. He referred to investments in SAFEEN Green 1 and SAFEEN Green 2 and confirmed that SAFEEN Green's operations were being managed remotely from the company's control centre at Zayed Port.[16]

Combining an unmanned surface vessel with remotely operated underwater vehicles would extend this model beyond seabed mapping. SAFEEN Green could transport and support the underwater equipment, while specialists in Abu Dhabi supervise inspections of pipelines and offshore structures and analyse the resulting data. This would create an integrated platform for recurring survey, inspection, maintenance, and asset-integrity work.

Tareq Abdulla Al Marzooqi, CEO of SAFEEN Subsea, described the platform's significance: "SAFEEN Green is not just another unmanned vessel; it is a testament to our dedication to excellence and environmental stewardship."[17]

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4IR Technologies:
AI, Blockchain

Emirate:
Dubai

Maturity:
Operational Deployment

Type:
Public-Private

LOGISTICS

057

Blockchain-Enabled Cross-Border E-Commerce Customs Platform

ACTORS

Dubai Customs
JAFZA
Dubai South
Avanza Innovations
DAFZA
Dubai CommerCity

SNAPSHOT

Dubai Customs launched its Cross-Border E-Commerce Platform in January 2020 following a pilot in September 2019. Built on Hyperledger Fabric and incorporating Avanza Innovations' CIPHER technology, the platform connects customs, e-commerce, logistics, courier, and free-zone systems through a shared transaction history.[1,2,3]

By October 2025, the operational platform combined automated customs declarations and digital returns with AI-powered audits, routing, risk profiling, and compliance checks.[4] A May 2026 integration involving Dubai CommerCity, Dubai Customs, Dubai Municipality, and NAQEL Express extended the connected workflow to regulatory approvals and final delivery.[5]

WHY IT MATTERS

Cross-border e-commerce generates large volumes of individual orders that must be cleared quickly. Customs authorities must process these shipments while managing safety and security risks, collecting revenue, and maintaining accurate trade statistics. Dubai Customs also identified limited supply-chain visibility and inefficient returns and inventory reconciliation as important operational problems.[6]

The platform connects information held separately by retailers, logistics providers, couriers, free zones, and government authorities. Each participant submits data at the relevant stage of the transaction, creating a shared record that follows the shipment from purchase and customs clearance through delivery and any subsequent return.[7]

This shared record gives Dubai Customs access to order-level product descriptions, shipment information, and delivery records. Data supplied by different participants can be cross-referenced to identify risks such as undervaluation and incorrect product classification. Connecting the original purchase with customs clearance, delivery, and returns also gives Dubai Customs a more complete view of each transaction.[8]

Dubai Customs describes the platform as a cornerstone of the Dubai government's broader e-commerce strategy and links it to the Dubai Economic Agenda D33.[9] Agreements with Jebel Ali Free Zone, Dubai Airport Free Zone, Dubai South, and Dubai CommerCity have extended its services to businesses operating through major logistics, fulfilment, and e-commerce locations across the emirate.[10]

17M+
B2C DECLARATIONS
processed since 2023

72K+
B2B DECLARATIONS
processed since 2023

HOW THE TECHNOLOGY WORKS

Hyperledger Fabric provides the platform's blockchain layer. It maintains immutable transaction records, while digital signatures authenticate information submitted through participating systems. The platform also validates whether registered companies hold the approvals required for particular goods. Dubai Customs owns the platform and manages it through its internal technology team.[11]

When a registered e-commerce company receives an online order, the order information is transmitted directly to the platform. The retailer or its third-party logistics provider then submits the corresponding shipment and transportation details. The platform uses this information to generate an e-commerce customs declaration automatically.[12]

The declaration passes through Dubai Customs' internal processes, including risk assessment and approval. Once cleared, the result is distributed to the relevant e-commerce company, logistics provider, customs broker, and last-mile delivery company. A free-zone gate pass can then be generated. Delivery confirmation completes the transaction after the parcel reaches the customer.[13]

Returned goods remain connected to the original transaction history. This allows the platform to process returns digitally and make immediate duty adjustments without separate manual paperwork.[14]

Artificial intelligence operates alongside the blockchain layer. Dubai Customs has integrated AI-powered systems for automated customs audits, predictive shipment routing, real-time risk profiling of parcels and traders, and immediate compliance checks. Blockchain preserves the transaction history, while AI analyses the connected order and shipment data to support customs processing and risk management.[15]

IMPACT AND RESULTS

In May 2025, the Hamdan bin Mohammed Programme for Government Services recognised the cross-border e-commerce project with its Best Pioneering Initiative Award. The programme highlighted the project's use of real-time customs clearance and proactive services to improve the e-commerce customer journey.[16]

In October 2025, Dubai Customs reported that more than 17 million business-to-consumer declarations and over 72,000 business-to-business e-commerce declarations had been processed under its e-commerce framework since 2023.[17]

By that point, DHL, FirstCry, DB Schenker, Reliance Freight Systems, and Al Tayer Insignia were processing thousands of declarations each day through the platform. Participating businesses also benefited from waived service charges on e-commerce declarations and claims.[18]

The rollout subsequently expanded through shared access for smaller businesses and closer integration among participating organisations. As of October 2025, Dubai CommerCity and EZDubai were piloting shared blockchain nodes through which small and medium-sized e-commerce companies could connect by application programming interface and submit order and transportation data without maintaining separate blockchain infrastructure.[19] In May 2026, Dubai CommerCity strengthened its integration with Dubai Customs, Dubai Municipality, and NAQEL Express. Dubai Municipality incorporated the approvals required to transfer controlled goods from free zones to the local market. NAQEL reported reduced processing time, automated clearance and delivery workflows, and improved end-to-end shipment visibility.[20]

WHAT'S NEXT

Dubai Customs aims to increase the share of low-value courier shipments carrying e-commerce goods processed through the platform. Its target is 20% to 30% of these shipments, equivalent to approximately five to ten million declarations annually.[21]

Beyond increasing transaction volumes, the next phase would broaden the platform's functional coverage. Dubai Customs' October 2025 plans called for connections with permit-issuing authorities, an expanded business-to-business module, and trade-finance connectivity.[22] Following the integration of Dubai Municipality approvals in May 2026, further rollout would extend regulatory connections to additional authorities and implement the planned business-to-business and trade-finance functions.[23]

Matar Al Muhairi, Director of the Client Happiness Department at Dubai Customs, said: "This platform reflects our ongoing commitment to advancing smart customs solutions that directly enhance trade facilitation, improve operational efficiency, and reduce costs for stakeholders."[24]

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4IR Technologies:
Robotics

Emirate:
Dubai

Maturity:
Pilot Deployment

Type:
Public-Private

LOGISTICS

058

Automated High-Bay Container Storage and Robotic Handling System (BOXBAY)

ACTORS

DP World
SMS group
BOXBAY FZCO
Jebel Ali Port

SNAPSHOT

BOXBAY brings automated high-bay storage to container-terminal operations. Fully electrified cranes provide the robotic handling layer, moving containers into individual slots within an 11-level steel structure. Direct access to every slot eliminates the need to relocate other containers before retrieving a target box.[1]

The 792-slot installation entered trial operation at Jebel Ali's Terminal 4 in January 2021 after an 18-month build. Designed as a full-size test facility, it had completed more than 63,000 container movements by August 2021. DP World reported handling rates of 19.3 moves per hour at each waterside transfer table and 31.8 moves per hour at each landside truck crane.[2,3]

WHY IT MATTERS

Jebel Ali Port handled 15.5 million twenty-foot equivalent units in 2024 against a declared annual capacity of 19.4 million. At approximately 80% utilisation, yard productivity becomes as important as quay capacity: vessels can only be turned efficiently if discharged containers can be stored, located, and released without congestion spreading through the terminal.[4]

Conventional yards stack containers directly on top of one another. When the required container sits lower in the stack, the boxes above it must be moved first. These reshuffling movements occupy cranes, consume energy, and make retrieval performance dependent on stack order.[5]

BOXBAY separates storage density from that constraint. Each container occupies its own rack position, allowing the handling system to retrieve it directly. DP World reported that the tested configuration offered three times the capacity of a conventional yard and could reduce the required terminal footprint by 70%.[6]

The innovation lies in changing the operating logic of the container yard. Storage locations, inventory data, and equipment movements are coordinated as one automated system, while electrified cranes execute the physical work. This extends digitalisation beyond planning and visibility into the movement of the containers themselves.[7]

HOW THE TECHNOLOGY WORKS

The high-bay concept originated in technology developed by SMS group for the automated storage of metal coils weighing up to 50 tonnes. DP World and SMS group adapted the approach for full-size shipping containers through the BOXBAY joint venture.[8]

At the landside interface, an automated truck crane lifts containers on or off external vehicles. Underground conveyors carry incoming containers towards the storage structure, where stacker cranes raise them into assigned rack positions. The same equipment sequence operates in reverse when a container is retrieved. These automated cranes provide the system's robotics layer, using computer-directed machinery to lift, transfer, and position heavy physical loads.[9]

A warehouse-management system maintains the container inventory and coordinates storage and retrieval. During testing, BOXBAY analysed large volumes of data from this system to identify performance issues and adjust the installation. The resulting loop between operational data, control decisions, and automated equipment is the core of the system's 4IR architecture.[10]

Because each slot is independently accessible, retrieval does not depend on where a container sits within a stack. The stacker cranes travel between rows of container bays, select the required slot, and remove the container without disturbing those stored above or below it.[11]

All principal handling equipment is electrically driven. Power-regeneration and energy-recuperation systems recover electricity during container handling, while advanced controls reduce unnecessary consumption. The roof can accommodate photovoltaic panels capable of supplying electricity to the storage system and, depending on configuration and location, other terminal operations.[12]

IMPACT AND RESULTS

The Jebel Ali proof of concept established that BOXBAY could operate at full scale under realistic terminal conditions. By the end of June 2022, the facility had completed 190,000 container movements, which DP World said verified the system's market maturity.[13]

The trial also produced measurable operating results. DP World reported handling rates of 19.3 moves per hour at each waterside transfer table and 31.8 moves per hour at each landside truck crane. Energy costs were 29% better than anticipated, while maintenance requirements were lower than expected. Modifications introduced during testing further improved performance and reduced the investment required for future installations.[14]

The project subsequently moved into commercial development. In March 2023, Pusan Newport Corporation in South Korea signed a contract with BOXBAY FZCO to begin design and engineering work for the first announced commercial application. The system was designed as a retrofit integrated with the terminal's existing automated rail-mounted gantry crane and truck operations. DP World projected that it would eliminate 350,000 unproductive movements annually and improve truck-servicing times by 20%.[15]

A larger implementation commitment followed in October 2025, when BOXBAY signed a EUR 91.7 million contract to install an Empty Superstack at DP World's London Gateway terminal. The 10-aisle facility will contain 15 automated storage-and-retrieval machines and provide capacity for 27,000 twenty-foot equivalent units of empty containers stacked up to 16 levels high.[16]

WHAT'S NEXT

The London Gateway installation is the next major stage in BOXBAY's development. The fully enclosed and automated facility will be installed at the terminal's new all-electric Berth 4, with construction expected to take just over 2 years. It is designed to handle more than 200 container movements per hour on the waterside.[17]

The project will apply the high-bay concept at a much larger scale than the 792-slot Jebel Ali facility. It will also test a specialised application: removing empty containers from the conventional yard and storing them in a dedicated automated structure. This is intended to reduce rehandling, release yard capacity, and improve the performance of other terminal equipment.[18]

Successful delivery would demonstrate whether the operating principles validated in Dubai – direct container access, automated handling, and high-density storage – can be integrated into a high-volume commercial terminal. It would also establish a model that could be adapted by other ports facing limited land availability and growing container volumes.

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4IR Technologies:
IoT

Emirate:
Abu Dhabi

Maturity:
Scaled Deployment

Type:
Public-Private

LOGISTICS

059

Integrated Multi-Port Vessel Traffic Management System (VTMIS)

ACTORS

AD Ports Group
Elcome International
Saab

SNAPSHOT

AD Ports Group has deployed an integrated Vessel Traffic Management Information System across Khalifa Port, Zayed Port, Free Port, Musaffah Port, and ports in the Al Dhafra region. The system connects radar, Automatic Identification System data, CCTV, VHF communications, and weather sensors to Saab's MaritimeControl platform, which combines them into a single, real-time picture of vessel traffic.[1]

Elcome International supplied and integrated the platform, sensors, and control-room infrastructure. Its distributed design allows maritime traffic to be monitored across AD Ports Group's geographically dispersed port network, while redundant communications and control infrastructure support operational continuity.[2]

WHY IT MATTERS

Port capacity delivers economic value when vessels can move safely and predictably between open sea and berth. AD Ports Group's UAE terminals handled 4.6 million twenty-foot equivalent units in 2023. One year later, the UAE ranked third globally in facilitating seaborne trade, fifth in port rankings, and ninth in port efficiency.[3,4]

Maintaining that performance requires coordinated oversight across Abu Dhabi's container, cruise, industrial, and community ports. The national importance of maritime visibility is reflected in the planned mandate of the UAE's National Maritime Navigation Centre, which is intended to combine vessel-traffic monitoring with navigational safety, emergency coordination, and trade facilitation.[5]

VTMIS puts that priority into operation across AD Ports Group's network. Its IoT architecture combines radar, vessel-identification signals, cameras, radio communications, and weather data into one live traffic picture. Automated alerts direct controllers to movements requiring attention, while harbour masters, pilots, and emergency teams work from consistent information across port boundaries.[6]

HOW THE TECHNOLOGY WORKS

VTMIS begins with a network of connected sensors monitoring the waters around each port. Radar establishes the position and movement of vessels, including those not transmitting identification data. Automatic Identification System signals add information such as vessel identity, course, and speed. Saab's MaritimeControl platform reconciles these inputs with camera footage, weather readings, and radio communications to create a consolidated track for each vessel.[7]

Controllers view this common operating picture through dedicated consoles and video walls. They can use it to sequence arrivals and departures, provide navigational guidance, and coordinate responses to traffic conflicts or incidents. Portable Pilot Units give pilots access to current traffic information while aboard vessels, maintaining a consistent view between the control room, pilot, and bridge during port approaches and manoeuvres.[8]

The network incorporates redundant communications, distributed control infrastructure, and backup capability. If part of the system becomes unavailable, traffic-management responsibilities can be transferred without losing the wider operational picture.[9]

5
Port areas integrated into one vessel-traffic operating picture

4.6M
TEU of container volume handled by AD Ports Group terminals in 2023

3RD
UAE's global ranking in facilitating seaborne trade

IMPACT AND RESULTS

VTMIS has established integrated vessel monitoring across five AD Ports Group port areas. The multi-port deployment gives controllers a consistent view of vessel movements across locations that previously operated through separate traffic-management environments.[10]

The World Ports Sustainability Program reports improved access to real-time information and stronger coordination across the network. Combining information from multiple sensors helps controllers verify vessel positions and movements more reliably than separate operational feeds, supporting earlier intervention when traffic conflicts or navigational hazards emerge.[11]

AD Ports Group has also established a certified training programme for personnel operating and maintaining VTMIS. This supports consistent traffic-management procedures across the network and develops the technical capacity required to operate the integrated system.[12]

In January 2025, AD Ports Group reported that VTMIS had received Project Diamond and Professional Diamond awards at the Harvard Business Council International Awards. The project was recognised for its operational contribution to maritime safety, vessel management, and efficiency within UAE waters.[13]

VTMIS therefore moves vessel monitoring beyond individual ports. It gives AD Ports Group a network-wide operating picture through which controllers, pilots, and emergency teams can coordinate vessel movements and manage maritime traffic across its Abu Dhabi port network.

WHAT'S NEXT

The development path identified by AD Ports Group is to connect VTMIS with an enhanced Port Community System. This would link live vessel information with port-call coordination and maritime-service workflows, allowing operational teams and port users to work from connected traffic and service data.[14]

At national level, the UAE is developing the National Maritime Navigation Centre and Unified National Maritime Single Window. These initiatives are intended to connect vessel monitoring, navigational safety, emergency coordination, and maritime trade procedures within a common national framework.[15]

Linking port-level traffic management with these wider digital systems would allow vessel arrival information to inform berth planning, service coordination, and regulatory processes. This would extend VTMIS from traffic monitoring into the broader management of port calls and maritime trade.

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LOGISTICS

4IR Technologies:
AI

Emirate:
Abu Dhabi

Maturity:
Scaled Deployment

Type:
Public-Private

060

Agentic AI Across Port and Logistics Operations

ACTORS

AD Ports Group

SNAPSHOT

AD Ports Group runs 205 AI agents across its global operations, working across functions from cargo handling to warehouse automation. In November 2025 the group received a Guinness World Records title for the most AI agents deployed in a logistics facility.[1]

Three AI agents show what that means in practice. The Vessel Speed Optimiser cut fuel consumption by approximately 3%, the Container Balancer boosted utilisation by 90%, and the Intelligent Workforce Scheduler reduced human resources processing times by more than 90%.[2] The group states that the Vessel Speed Optimiser is designed to deliver that saving while maintaining a 98% on-time arrival rate.[3]

WHY IT MATTERS

Logistics software has traditionally informed decisions. It gathers the data, presents the options, and leaves the choice to a person at a screen. Agentic AI closes that last step, giving the system responsibility for an area of operations and the ability to act within it. AD Ports Group describes its deployment as a fundamental shift in how logistics systems operate, enabling real-time decision-making, predictive planning, and autonomous coordination at a scale previously unattainable.[4]

For the UAE this sits at the intersection of trade and digital-economy priorities. AD Ports Group is among the country's principal trade enablers and reported record revenue of AED 20.77 billion for 2025.[5] Its chairman placed the programme in national terms, describing innovation as one of the most powerful drivers of national strength and economic resilience, and the agents as redefining how trade, logistics, and infrastructure are orchestrated at scale.[6]

The breadth of the group determines how far a capability of this kind can travel. Its business spans ports, logistics, maritime services, economic cities, and digital operations,[7] and the group-wide platform it has since built on this foundation is aligned with the UAE's National Strategy for Artificial Intelligence and its aim of global AI leadership by 2031.[8]

HOW THE TECHNOLOGY WORKS

The group set out its approach in a blueprint unveiled on 11 November 2025.[9] Its central idea is what the document calls the agentic organisation, in which AI agents are integrated into daily workflows as digital colleagues and form part of the operating model.[10] Work is divided between machine and human by competency. Agents take continuous monitoring and anomaly detection, pattern analysis across large datasets, predictive modelling and forecasting, process optimisation, and round-the-clock consistency, leaving strategic leadership, ethical reasoning, empathy, and complex negotiation to people.[11]

Of the 205 agents, the group has disclosed three, and they show how that division works in practice. The Vessel Speed Optimiser works on vessel operations, targeting a fuel saving while maintaining a 98% on-time arrival rate, so speed and schedule adherence are managed together. The Container Balancer works on the commercial side, allocating containers to raise utilisation, cut costs, and increase revenue. The Intelligent Workforce Scheduler applies the same approach to workforce management, compressing scheduling and administrative processing.[12]

These agents sit across core operations, finance, human resources, and logistics.[13] Mohamed Jamal-Eddine, Group Chief Digital and Information Officer at AD Ports Group, describes them as digital co-workers designed around real operational needs and measurable outcomes, the equivalent of a full-time employee, and integrated directly into decision-making workflows.[14] The blueprint is explicit that technology alone is insufficient: secure infrastructure and responsible AI governance must align with talent development, and job descriptions and required skills will evolve toward human-AI collaboration.[15]

205
AI agents deployed across AD Ports Group's global operations

90%
Utilisation boost from the Container Balancer agent

98%
On-time arrival rate maintained by the Vessel Speed Optimiser agent

IMPACT AND RESULTS

Guinness World Records awarded the title on 11 November 2025 for the most AI agents deployed in a logistics facility, presenting the certificate to the group's chairman, H.E. Mohamed Hassan Alsuwaidi, and its managing director and group chief executive, Captain Mohamed Juma Al Shamisi.[16]

Across the deployment, the group reports efficiency gains, cost reductions, and operational resilience at scale.[17] Its 2025 annual report records the Guinness recognition alongside an 18% reduction in the carbon intensity of its global operations per unit of revenue against 2024.[18]

The three named agents were presented in the blueprint as tools already running in production, which distinguishes them from pilots or demonstrations.[19]

WHAT'S NEXT

The programme has since moved from individual agents to a group-wide capability. In June 2026, the group launched IHQ, a platform employing thousands of digital workers and embedding AI across 20 global workstreams. At launch it demonstrated transformed workflows including port and berth optimisation, vessel arrival orchestration, software development and talent acquisition, and the group intends to extend AI systematically across all 20 workstreams.[20]

Mohamed Jamal-Eddine, Group Chief Digital and Information Officer at AD Ports Group, set out the selection principle behind that expansion: "Every workstream selected for AI-powered transformation sits at a critical juncture, where artificial intelligence can measurably improve speed, accuracy and decision quality."[21]

Captain Mohamed Juma Al Shamisi described the wider objective in similar terms: "we are building a future-proof workforce environment where human expertise and artificial intelligence work side by side to deliver safer, smarter, and more efficient operations."[22]

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4IR Technologies:
Robotics, Autonomous systems

Emirate:
Dubai

Maturity:
Scaled Deployment

Type:
Public-Private

LOGISTICS

061

Automated Mega Distribution Centre (Omega DC)

ACTORS

Landmark Group
Dematic
Omega Logistics
JAFZA

SNAPSHOT

Omega DC is the AED 1 billion automated distribution centre of Landmark Group, a Dubai-headquartered retail and hospitality group operating across the Middle East, Africa, and India, located in Dubai's Jebel Ali Free Zone (JAFZA).[1] Its 43-metre-high storage system uses 1,254 robotic shuttles and 94 lifts to move up to 15,000 totes an hour, equivalent to 250 every minute. A separate automated system can hold two million hanging garments.[2]

Landmark Group opened Omega DC in November 2019,[3] following a development partnership with JAFZA.[4] Dematic completed the integrated automation system in January 2021.[5] The 265,000-square-metre site can hold 2.2 million cartons.[6] It was designed to handle up to 300 million items annually.[7]

From Jebel Ali, Omega DC supplies Landmark's regional warehouses.[8] It also serves nearly 1,400 retail stores and fulfils orders for individual customers.[9]

WHY IT MATTERS

Logistics is one of the pillars of the UAE economy, contributing around AED 136.7 billion in 2024, with the UAE Logistics Integration Council targeting more than AED 200 billion by 2032 and a top-three place on the World Bank's Logistics Performance Index under the We the UAE 2031 vision. Landmark's logistics challenge comes from the combination of scale and variety. Omega DC is designed to receive up to 74,000 cartons, dispatch up to 90,000 cartons, and sort up to 250,000 hanging garments per day.[10] Within those flows are garments, footwear, furniture, toys, and smaller consumer products destined for regional warehouses, retail stores, and individual online customers. Hanging garments, cartons, and pallets each require different systems for storage, preparation, and dispatch.[11]

Before Omega DC, part of this activity was managed across five manual distribution sites.[12] The new centre brought those flows into one automated operation while creating enough capacity for Landmark to establish Omega Logistics and offer warehousing and fulfilment services to external customers.[13]

HOW THE TECHNOLOGY WORKS

Every incoming carton passes through a laser-controlled check that measures its dimensions to within one millimetre. Stock needed within the next few days enters the first Multishuttle system, where 726 robotic shuttles buffer, sort, and sequence it. A second bank of 528 shuttles retrieves the products required for daily orders. Slower-moving inventory goes to the 36,000-position high-bay store, where four 41-metre cranes store and retrieve it automatically.[14]

The software constantly repositions goods according to current and forecast demand, balances work across the different systems, and sends up to 15,000 totes per hour to picking stations. Hanging garments stay on a separate rail-based system that can store two million items and sort up to 250,000 garments daily.[15]

1,254
ROBOTIC SHUTTLES
moving inventory inside Omega DC

15,000
TOTES/HOUR
moving capacity,
equivalent to 250 every minute

300M
ITEMS/YR
handling capacity
the centre was designed for

IMPACT AND RESULTS

Omega DC combines high-volume distribution with detailed order preparation. More than 200 workstations support activities such as picking, packing, tagging, branding, and adding retailer-specific promotional material. An 11-kilometre conveyor network then moves cartons, containers, and pallets between storage, preparation, and dispatch. Large orders can replenish regional warehouses and stores, while smaller orders can be prepared for direct delivery to online customers.[16]

Omega DC also created a commercial logistics business beyond Landmark's own brands. Omega Logistics was established to use the facility's capacity for third-party customers requiring storage, fulfilment, and distribution services across product categories including apparel and electronics.[17]

WHAT'S NEXT

Omega DC now anchors a wider expansion of Landmark's supply-chain network. In November 2024, the group committed USD 1 billion over 3 years to physical expansion and upgrades to its e-commerce, technology, and supply-chain capabilities. Landmark reported that its online business was growing by more than 20% annually and identified the Jebel Ali Mega Distribution Centre as the flagship of its 12-million-square-foot warehousing and distribution network.[18]

Landmark is also extending its logistics services beyond retail fulfilment. Its third-party logistics company, Logistiq, reported handling more than 20,000 daily shipments for over 50 customers in the UAE and Saudi Arabia after its first 18 months. The group plans to expand this business across the GCC through freight, warehousing, and cross-border delivery services.[19]

By November 2025 the group had set the programme's endpoint at 400 new stores by 2027. E-commerce then accounted for close to a fifth of regional sales. The economics of a facility like Omega DC follow order density, so the fulfilment centre and the online business grow together.[20]

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4IR Technologies:
AI, IoT

Emirate:
Dubai, Abu Dhabi

Maturity:
Scaled Deployment

Type:
Public-Private

AGRITECH

062

Controlled-Environment Agriculture at Commercial Scale

ACTORS

Emirates Flight Catering (Bustanica)
Pure Harvest Smart Farms | **Armela Farms**
Emirates Hydroponics Farms | **ReFarm (GigaFarm)**

SNAPSHOT

Across the UAE, commercial produce is grown year-round inside environments where the growing conditions are set by machines and sensors rather than by the weather. Multiple operators span the technology's range, from a greenhouse pioneer running since 2005 to the world's largest indoor vertical farm and, newest of all, a farm built to run on a city's own waste.[1]

Emirates Hydroponics Farms has grown produce under glass in Abu Dhabi since 2005. Armela Farms supplies most of the lettuce grown in the country from a high-tech greenhouse near Abu Dhabi.[2] Pure Harvest runs climate-controlled greenhouses across the UAE and Saudi Arabia; Emirates Flight Catering's Bustanica, opened in 2022 at Dubai World Central, is the world's largest indoor vertical farm; and ReFarm's GigaFarm, now coming into service in Dubai's Food Tech Valley, wraps a vertical farm inside a closed loop that turns food waste into the farm's own inputs.[3]

WHY IT MATTERS

The UAE imports an estimated 90% of its food, a dependence that leaves the country exposed to disruptions in global supply chains it does not control.[4] The obstacle to growing more at home is the climate itself: extreme summer heat, almost no rainfall, and scarce freshwater make conventional field farming impractical across much of the year, and the little arable land there is competes directly with people for water.

The National Food Security Strategy 2051 therefore emphasises reliable, year-round local production.[5] Controlled-environment agriculture supports that goal by moving cultivation into spaces where temperature, humidity, light, water, and nutrients can be managed precisely. Crops can be grown without soil and with far less dependence on outdoor conditions, making the approach particularly well suited to the UAE. It is now operating commercially across the country, from automated greenhouses to fully indoor vertical farms.

95%

Less water used vs conventional agriculture at Bustanica

75–85%

Of the UAE's locally produced lettuce supplied by Armela Farms

HOW THE TECHNOLOGY WORKS

All five operators use hydroponics, in which plant roots receive water containing dissolved nutrients instead of drawing them from soil. Sensors monitor factors such as pH and conductivity, allowing nutrients to be adjusted precisely and the water to be recirculated through a closed system.[6] Controlled-environment agriculture adds a managed growing space around that root system, using sensors and climate equipment to regulate temperature, humidity, airflow, and carbon dioxide. The main difference between the five models is how completely they separate crops from outdoor conditions.

Emirates Hydroponics Farms represents the sealed-greenhouse model. Its Abu Dhabi facility uses computerised climate control to maintain stable conditions throughout the day and replace the internal air several times an hour.[7] Armela Farms applies the same principle at larger scale, bringing propagation, hydroponic growing, climate control, and packing together on one site. Its cooling system is designed to reduce the share of water used for temperature control from around 80% to approximately 30%.[8]

Pure Harvest continues to use natural sunlight while controlling the greenhouse climate around it. At its UAE facilities, an electrified cooling and heating system developed with Trane Technologies maintains suitable growing conditions and is expected to avoid 8,293 tonnes of carbon dioxide equivalent each year.[9]

Bustanica removes outdoor conditions almost entirely. Crops are grown in vertically stacked layers under artificial light, with machine learning supporting the control of lighting, water, and nutrients. More than one million plants can be grown at the facility at one time, while water released through plant transpiration is recovered and reused, reducing consumption by 95% compared with conventional agriculture.[10]

GigaFarm combines vertical hydroponics with a wider circular system. Alongside crop production, black soldier fly larvae process food waste into animal feed, compost, and reusable water. Six complementary technologies are brought together on the site to reduce waste and return useful materials to production rather than sending them to landfill.[11]

IMPACT AND RESULTS

The sector rests on 2 decades of commercial proof. Emirates Hydroponics Farms has operated since 2005 on hydroponic technology it states is patented and unique in the Middle East, demonstrating that soilless farming works as a business in the UAE, not just in trials.[12]

On that foundation the operators have reached real scale. Armela Farms now grows around 4.5 tonnes of lettuce a day and holds an estimated 75% to 85% of the UAE's locally produced lettuce, supplying retailers including Carrefour, Spinneys, and LuLu.[13] Domestic lettuce is still a small share of what the UAE consumes, which is the measure of how much room there is to grow.[14]

Bustanica supplies leafy greens, herbs, and microgreens into meals on Emirates and other airlines and to major retailers including Spinneys, Waitrose, Carrefour, and Choithrams, from a facility built to grow more than one million kilograms a year,

IMPACT AND RESULTS CONT'D

3 tonnes every day. It supplied COP28 and became wholly UAE-owned in February 2024 when Emirates Flight Catering acquired full control from its joint-venture partner, and its range now extends to its own strawberries.[15]

Pure Harvest has raised USD 287 million since 2017 and describes its farms as profitable and growing, operating across the UAE and Saudi Arabia. It reports its greenhouses are around seven times more efficient than a typical UAE greenhouse and 30 times more efficient than field farming, with 85% of the water it uses leaving the farm inside the produce itself, a direct measure of how little is wasted.[16]

GigaFarm is the newest and is still coming into service rather than delivering results. Construction at the Food Tech Valley site is well advanced, the first phase of its 200 growing towers is being completed, and its first crops are due to be harvested later in 2026.[17] When fully operational it is designed to recycle around 50,000 tonnes of food waste a year and to grow produce at a scale its backers say could replace roughly 1% of the country's fresh-produce imports.[18]

WHAT'S NEXT

The next opportunity is to export the capability, not only the produce. Two decades of operating controlled-environment agriculture in one of the world's harshest growing climates has created expertise that other hot, water-scarce markets also need. Pure Harvest is turning that expertise into farming-as-a-service, building and operating farms for landowners while marketing the produce under its own brand, with further projects planned in Kuwait, Singapore, and Morocco.[19]

Emirates Flight Catering is moving further into food production and retail. At Gulfood 2026 it presented ready-to-eat salads, sandwiches, soups, and juices built from its own produce, and Bustanica signed an agreement with Spinneys and Waitrose to develop a private-label retail brand that Spinneys intends to carry into other GCC markets.[20] GigaFarm points to a third route by demonstrating a circular model that could be replicated in cities with both large food-waste streams and strong demand for local produce. Together, these approaches show the UAE moving from adopting controlled-environment agriculture to exporting its technology, operating models, and food brands.[21]

"Long-term food security and self-sufficiency are vital to the economic growth of any country, and the UAE is no exception. We've specific challenges in our region, given the limitations around arable land and climate. Bustanica ushers in a new era of innovation and investments, which are important steps for sustainable growth and align with our country's well-defined food and water security strategies," said HH Sheikh Ahmed bin Saeed Al Maktoum, Chairman and Chief Executive, Emirates Airline and Group.[22]

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4IR Technologies:
AI, IoT, Precision agriculture

Emirate:
Abu Dhabi

Maturity:
Operational Deployment

Type:
Public

AGRITECH

063

An Agri-Food Research and Trial Centre for Desert Conditions (Innovation Oasis)

ACTORS

Silal Food and Technology

SNAPSHOT

Silal, the agri-food and technology company established by Abu Dhabi Development Holding Company (ADQ) in 2020 to diversify the emirate's food sources, opened the Innovation Oasis in Al Ain in April 2025. The 300,000-square-metre centre tests agricultural technologies under the region's heat, salinity, and water scarcity before they reach commercial farms, bringing researchers, companies, startups, and academics onto a single site.[1] It was inaugurated alongside the Advance AgriTech Academy, which trains the specialists to operate these technologies.[2]

WHY IT MATTERS

Around 80% of the UAE is desert, leaving the country with limited agricultural land and constraints on water and soil quality.[3] Yet many agricultural technologies are developed for temperate climates, fresh irrigation water, and fertile soils. A greenhouse system, crop variety, or irrigation technology that performs well elsewhere may prove ineffective under the UAE's extreme heat, salinity, and arid growing conditions. For farmers, discovering those limitations after deployment can mean losing both a growing season and the capital invested in it.

The Innovation Oasis provides a shared environment in which technologies can be tested, adapted, and validated under UAE conditions before they are deployed at scale. By absorbing the cost and risk of experimentation, it allows commercial farms to adopt solutions with stronger evidence of performance. More broadly, it gives the UAE the infrastructure to develop agricultural technologies suited to its own environment rather than relying solely on systems designed abroad.

HOW THE TECHNOLOGY WORKS

The site is organised as an end-to-end testing chain, following crops from variety development through to cultivation and post-harvest handling. Diagnostic laboratories analyse soil and water conditions, identify pests and diseases, and support crop-variety improvement, providing the evidence needed to design and test appropriate interventions.[4] Growth chambers and phenotyping facilities provide the next stage of testing. Plants are grown under controlled, instrumented conditions and measured across individual traits, allowing researchers to separate genetic performance from the effects of weather and other environmental variation. This provides a more reliable basis for selecting varieties with traits such as heat and salt tolerance.[5]

Promising crops and technologies are then tested under increasingly realistic conditions, moving from greenhouses and net-houses to open-field plots before reaching post-harvest evaluation.[6] Alongside this testing infrastructure, the research programme covers IoT-enabled precision agriculture, water-efficient production, renewable-powered desalination, salt-tolerant crops, robotics, machine learning, and data analytics. Field sensors track conditions such as soil moisture, nutrients, and microclimate, helping farmers apply water and other inputs more precisely.[7]

The Advance AgriTech Academy addresses the constraint that follows. Sensor networks and predictive models are only as useful as the people who can run and interpret them, and the Academy develops those specialists through career guidance and practical training delivered with global research institutions.[8]

300,000
SQUARE METRES
size of the Innovation Oasis centre

14
STRATEGIC PARTNERSHIPS
signed to expand the food-security ecosystem

IMPACT AND RESULTS

The centre is beginning to serve as a hub for research, technology deployment, and skills development. Its cooperation agreement with United Arab Emirates University includes five scholarships for students in the College of Agriculture, linking the Oasis to the national research and talent pipeline.[9] A partnership with iyris is deploying new agricultural technologies in Al Ain, including greenhouses cooled using salt water,[10] and an agreement with Square Roots was signed through the Oasis in December 2025.[11] In May 2026 the first cohort graduated from its Future Innovators Program,[12] and at the Emirates Agriculture Conference 2026 Silal signed 14 strategic partnerships to expand collaboration across the UAE food security ecosystem.[13]

WHAT'S NEXT

The opportunity ahead is to move successful technologies from testing into commercial use. Silal's Farm Innovation Fund supports Emirati farmers in adopting new agricultural solutions, while its June 2026 partnership with Dutch consultancy Delphy focuses on developing local expertise across the UAE's food and agriculture sector.[14,15] Together, these initiatives extend the Innovation Oasis beyond research by supporting adoption on farms and building the capabilities needed to sustain it.

A larger opportunity is regional. The conditions the Oasis tests for, extreme heat, saline water, and poor soil, are shared across the Gulf, North Africa, and much of South Asia, and a facility that has already characterised which technologies survive them holds knowledge those markets need. The same infrastructure that de-risks adoption for Emirati farmers can serve as the reference point for the wider arid belt.

"Innovation Oasis (iO) is redefining the future of agri-food in the UAE. By harnessing advanced technologies and fostering strategic partnerships, we are strengthening the resilience and sustainability of our food system. With a strong focus on research, innovation, and knowledge transfer, we are not only driving progress but also positioning the UAE at the forefront of global agritech solutions," said Salmeen Obaid Alameri, CEO, Silal.[16]

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4IR Technologies:
Biotechnology

Emirate:
Sharjah

Maturity:
Pilot Deployment

Type:
Private

AGRITECH

064

Nano-Biotechnology for Restoring Desert Soil (Tierris)

ACTORS

Tierris

SNAPSHOT

Tierris, an agricultural technology company launched by New Enterprise East Innovations, has developed a nano-biotechnology platform that seeds barren desert sand with beneficial microbes, wrapping them in a nanoscale shell that shields them from the heat and salinity that would otherwise kill them off. It reports that the treatment turned previously uncultivable land into productive agricultural soil within 90 days during a pilot in Al Madam, Sharjah, where the treated site grew barley, millet, oats, and panicum.[1]

WHY IT MATTERS

The UAE is about 80% desert, with limited agricultural resources.[2] Desert sand lacks many of the properties that make soil productive: it retains little water or nutrients, contains minimal organic matter, and supports limited microbial activity. Irrigation alone cannot overcome these constraints, because water drains rapidly through the sand and carries nutrients beyond the reach of plant roots.

Several successful UAE companies bypass the limitations of desert land by creating controlled growing environments above it. Soil restoration takes the opposite approach: it seeks to make the land itself productive. The potential significance is substantial. Desert is the UAE's most abundant physical resource, yet one of its least agriculturally useful. A treatment that could convert it into arable soil reliably and at viable cost would fundamentally expand the country's agricultural base.

HOW THE TECHNOLOGY WORKS

The technique is nano-encapsulation, and it exists to solve a delivery problem. Beneficial soil microbes and the nutrients sustaining them do not survive being spread across hot, saline, alkaline sand: they dry out, leach away, or die before establishing a population. Encapsulation wraps each active agent in a nanoscale shell that shields it from those conditions and then degrades gradually, releasing its contents over weeks rather than at once. A single application therefore seeds a biological community that establishes and multiplies instead of one that disappears within days.

Tierris builds four products on that platform, formulated for arid climates with sandy and calcareous soils: Genesis for regenerating degraded land, Thrive for yield enhancement, Anchor for sand stabilisation, and Guardian for biological pest control, each designed to deliver lasting results from one application.[3]

90
DAYS
for uncultivable desert land to become productive agricultural soil

25,000x
BACTERIAL INCREASE
from 400,000 to 10 billionCFU per gram

40%
LESS IRRIGATION
requirements after treatment

IMPACT AND RESULTS

In the Al Madam pilot, Tierris reports that treated soil was ready for sowing within 24 hours, showed measurable structural improvement within 45 days, and produced four cereal and forage crops in under 90 days, with irrigation requirements down by up to 40% and the transformation durable beyond 12 months from the single application. Native bacterial counts rose from 400,000 to 10 billion colony-forming units per gram, which is the measure that matters: it is the difference between inert sand and living soil, and it is what allows plants to extract minerals from what is there. A parallel shade-house trial using Thrive improved yields by 25% to 35% while using up to 40% less water and 30% to 45% less fertiliser.[4]

WHAT'S NEXT

The opportunity is measured in hectares that do not currently exist as farmland. If the treatment holds across seasons and remains economic at field scale, it converts desert from the boundary of UAE agriculture into its expansion room, and does so without the capital intensity of building controlled environments over every hectare. That is a different economic proposition from any other approach to desert farming: not a facility per unit of production, but a one-time treatment of the ground.

Tierris is positioning the platform for deployment across the GCC through government partnerships, and the company states that its process can take sludge, wastewater, and manure as feedstock, which would tie soil restoration to waste streams already being managed.[5] What stands between the pilot and that opportunity is verification: independent, multi-season field data at hectare scale is the evidence a government would need before committing land or budget, and producing it is the next milestone that matters.

"Tierris technology represents a paradigm shift in how to approach land rehabilitation for improved agricultural productivity in water-scarce environments. Tierris doesn't just treat symptoms, it fundamentally transforms soil biology, chemistry and physics to create sustainable, productive ecosystems," said Dr Manu Behzadi, Chief Technology Officer, Tierris.[6]

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AGRITECH

4IR Technologies:
Biotechnology

Emirate:
Abu Dhabi

Maturity:
Pilot Deployment

Type:
Public

065

A National Agricultural Gene Bank and Genome Programme (ADAFSA)

ACTORS

Abu Dhabi Agriculture and Food Safety Authority

SNAPSHOT

In June 2022 the Abu Dhabi Agriculture and Food Safety Authority launched the Abu Dhabi Agricultural Genome Program, which it describes as the first of its kind in the region. It studies the genetics of local plants, animals, and fish to develop breeds suited to the emirate's conditions and establishes a gene bank to conserve those genetic resources.[1]

WHY IT MATTERS

The UAE is predominantly desert and has limited potential for conventional agriculture because of its arid climate, scarce freshwater resources, and constrained agricultural land.[2,3] High temperatures, water scarcity, and salinity place crops and livestock under conditions for which many commercially used varieties and breeds may not be well adapted. Salinity alone can reduce crop yields by limiting the ability of roots to absorb water, even where irrigation is available.[4]

Controlled environments, irrigation, and other farm technologies can reduce exposure to these pressures, but they do not change the inherited characteristics of the organism itself. Breeding programmes address that underlying biological constraint by drawing on genetic diversity to develop crops and livestock better adapted to heat, salinity, disease, and limited water availability. The resulting traits can be reproduced through subsequent generations and incorporated into varieties and breeds used across the agricultural sector.[5]

Conservation is therefore as important as improvement. Locally adapted varieties and breeds may already contain traits that are valuable for resilience under difficult environmental conditions. The UN Food and Agriculture Organization identifies the replacement of local varieties by modern commercial varieties as a principal cause of genetic erosion, through which potentially useful genes and combinations of genes can be lost.[6] A national gene bank preserves this material and keeps it available for future research and breeding.

AED 13.3B

Value of the food-production sector the programme feeds into, 2023

36%

Share of the UAE's total food manufacturing

HOW THE TECHNOLOGY WORKS

An organism's genome is the full set of instructions determining what it is and what it can tolerate, written in DNA. Sequencing is the process of reading that code and setting it down as data, so it can be compared, searched, and stored rather than inferred from how the organism behaves. Read enough individuals and patterns emerge: particular stretches of code turn out to be present in the date palms that survive high salinity, or the goats that hold condition through summer, and absent in those that do not. Those stretches are genetic markers, and they are useful because they can be detected long before the trait itself appears.

That is what changes breeding. Conventionally, a breeder crosses two parents, raises the offspring to maturity, observes which inherited the desired trait, and repeats, a cycle measured in seasons for crops and years for livestock. With markers identified, a breeder can test a seedling or a young animal directly for the genetic signature and discard the rest immediately, compressing a process that would take decades into one that can deliver locally adapted varieties within a working programme.

The programme develops local breeds of plants, animals, and fish, supporting genetic sequencing and the study of traits to identify desired characteristics, with a gene bank and database established to conserve local genetic resources.[7] The gene bank is the physical counterpart to that data: seeds and genetic samples held in controlled storage where they remain viable for decades, so material stays available to breeding programmes long after the population it came from may have gone. The programme is implemented with the Khalifa Center for Genetic Engineering and Biotechnology,[8] the UAE University centre established in 2014 to apply plant genetics to agriculture in the UAE.[9]

IMPACT AND RESULTS

The programme, launched in June 2022, remains active 4 years on. ADAFSA lists the Agricultural Genome Program among the R&D initiatives of its Farm to Factory strategy, presented in May 2026, which set out to expand a food-production sector whose output had reached AED 13.3 billion (USD 3.6 billion) in 2023, some 36% of the UAE's total food manufacturing.[10] Its outputs are deliberately foundational: sequenced genomes, characterised traits, and preserved material are inputs to breeding programmes whose results appear in the field over years, not quarters. Judged as infrastructure, the measure of progress is how much of the emirate's genetic base has been read and secured.

WHAT'S NEXT

The opportunity compounds with the size of the collection. Every additional genome sequenced and every accession to the bank widens the pool of traits breeders can draw on, and the varieties that emerge are assets the emirate owns rather than licenses, deployable on any farm without a recurring payment to a seed company abroad. In a region where climate pressure on agriculture is intensifying, locally bred heat- and salt-tolerant varieties are also an exportable product, since the conditions they are built for extend well beyond the UAE.

ADAFSA has set that work inside a broader technological push, stating under Farm to Factory that it is accelerating adoption of Agriculture 4.0 technologies capable of increasing production thirtyfold while reducing water consumption by 60%.[11] Genetics is the layer beneath those gains: controlled environments and precision irrigation raise what a given plant can achieve, but the ceiling is set by the plant.

"The Agricultural Genome Program embodies the vision and commitment of the leadership that oversees the UAE Genome Program Council to strengthen the UAE's position as a centre for research and innovation in genomics," said Saeed Al Bahri Al Ameri, Director General, Abu Dhabi Agriculture and Food Safety Authority.[12]

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4IR Technologies:
AI, IoT

Emirate:
Abu Dhabi

Maturity:
Pilot Deployment

Type:
Public-Private

AGRITECH

066

AI-Enabled Marine Cage Aquaculture (Dalma Fish Project)

ACTORS

Environment Agency – Abu Dhabi
BMT

SNAPSHOT

In August 2024, the Environment Agency – Abu Dhabi (EAD) launched the emirate's first sea-cage aquaculture project southeast of Dalma Island. The pilot comprises six floating cages with capacity to produce 100 tonnes of local fish annually using AI-enabled monitoring.[1]

Production began in 2025, bringing farmed fish such as Safi, Shaari, Qabit, and Hamour to the local market. Sensors measure water conditions, cameras monitor the fish, and a solar-powered gateway transmits the data for remote analysis.[2]

WHY IT MATTERS

The project addresses a linked food-security and conservation problem. Safi, Shaari, Qabit, and Hamour are commercially important local species, several of which face pressure from overfishing. Cultivating them in marine cages can increase local supply without requiring an equivalent increase in catches from wild stocks.[3]

Offshore aquaculture must itself be controlled. Excess biomass, feed, or waste can reduce oxygen, alter water quality, and affect seabed habitats. The safe scale of a farm therefore depends on currents, water exchange, and continued environmental monitoring.[4]

The 4IR element is the end-to-end data system governing where and how the fish are farmed. Environmental models determine site capacity before deployment; connected sensors and cameras monitor water conditions and fish during production; and AI analyses this data to support decisions about health, growth, and feeding.

HOW THE TECHNOLOGY WORKS

Before installation, three locations west and southeast of Dalma Island were assessed. BMT developed a 3D environmental model that simulated currents, particle and nutrient movement, water quality, seabed effects, and the biomass each location could support. Side-scan sonar was also used to map deep-water habitats.[5]

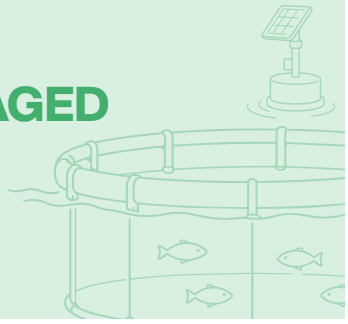
At the selected site, sensors measure temperature, pH, salinity, dissolved oxygen, turbidity, and ammonia. Underwater and surface cameras monitor behaviour and feeding efficiency and help estimate fish weight. A solar-powered gateway sends the information to a central platform.[6]

AI and advanced analytics process the combined sensor and camera data to identify changes in fish health, growth, and conditions inside the cages. The system provides real-time information and predictive insights to EAD operators, who retain responsibility for feeding, stocking, and environmental management.[7]

100
TONNES/YR
fish production capacity across the pilot's six floating cages

6
FLOATING CAGES
comprising the offshore aquaculture pilot

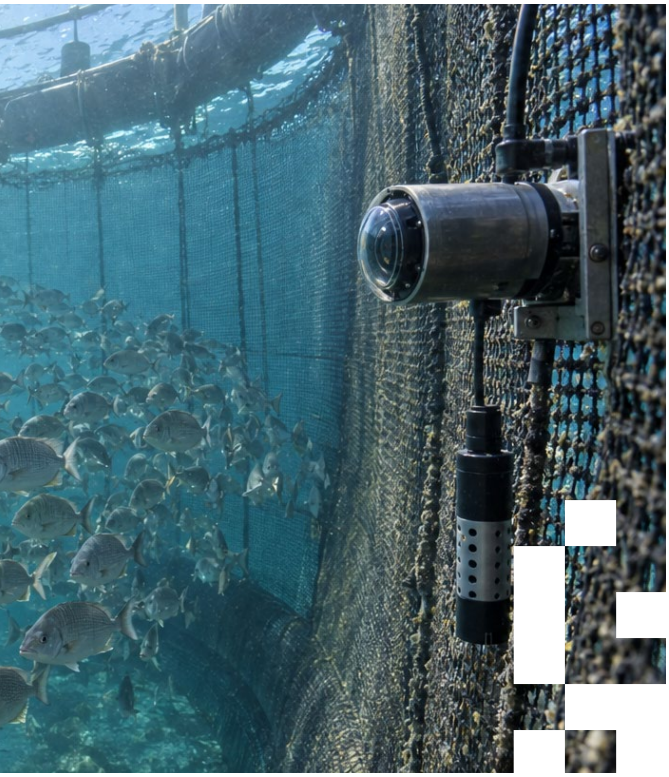
1ST
AI-MANAGED FARM
operating in the Middle East



IMPACT AND RESULTS

By August 2025, the Dalma project had moved from construction and stocking into production, with locally cultivated fish reaching the market. Its six cages have a combined design capacity of 100 tonnes of fish a year.[8]

The complete monitoring system has also been deployed. Environmental sensors, underwater cameras, solar-powered communications, and the AI platform are operating together at the offshore site. EAD describes Dalma as the first marine fish-farming project in the Middle East to use AI in its management and operation.[9]



WHAT'S NEXT

Dalma is also a research site. EAD is using the farm to study how environmental conditions affect the growth and survival of cultivated fish, and to build the operating protocols that will govern sustainable marine cage farming in the emirate.[10]

Those protocols have somewhere to go. EAD has completed data collection, stakeholder engagement, and environmental and technical screening to identify suitable aquaculture locations around Sila in the Al Dhafra Region, laying the groundwork for the next sites.[11]

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4IR Technologies:
AI, IoT

Emirate:
Abu Dhabi

Maturity:
Operational Deployment

Type:
Public

AGRITECH

067

AI-Powered Smart Water Metering for Farms

ACTORS

Abu Dhabi Department of Energy
Abu Dhabi Agriculture and Food Safety Authority

SNAPSHOT

Abu Dhabi is connecting AI-powered smart water meters on farms to its wider digital energy and water infrastructure. In December 2025, the Department of Energy (DoE) and Abu Dhabi Agriculture and Food Safety Authority (ADAFSA) launched the Smart Meter Project in Al Wathba following an earlier limited pilot. The deployment now covers 80 farms, providing farmers with accurate, real-time information and analytics on their water consumption.[1]

The meters are connected to AD.WE, DoE's AI-powered energy and water management platform. The integration is intended to improve the accuracy of farm-level water measurement and monitoring and give both farmers and government authorities better information for managing consumption.[2] DoE has announced plans to extend the programme to 130 farms in Al Nahda and 2,500 farms in Al Rahba.[3]

WHY IT MATTERS

Groundwater makes up around 60% of the water Abu Dhabi consumes, and it goes mainly to irrigating crops.[4] In December 2024, ADAFSA reported that agricultural water consumption had fallen to 1.89 billion cubic metres, from 2 billion in 2019.[5]

The Smart Meter Project introduces farm-level digital measurement into this resource-management challenge. Farmers receive real-time information on their own water consumption, while integration with AD.WE enables more systematic monitoring and analysis. DoE and ADAFSA say the project is intended to support more efficient distribution, consumption management, and data-driven decision-making.[6]

HOW THE TECHNOLOGY WORKS

AI-powered smart meters measure water consumption at participating farms and transmit the data into DoE's AD.WE platform. Farmers can access real-time consumption information and analytics, while the integration gives authorities more accurate data for monitoring agricultural water use.[7]

AD.WE provides the wider digital layer behind the system. Developed by DoE with Presight, the platform combines billions of live and historical grid records in a secure UAE-hosted cloud and uses real-time AI to identify efficiency opportunities. Irrigation optimisation is one of the early AI applications developed through the platform.[8]

The result is a connected monitoring system in which farm-level meters generate consumption data, the digital platform aggregates and analyses that information, and farmers and government authorities can use the resulting insights to inform water-management decisions.

80
FARMS COVERED
under the current operational Smart Meter deployment

2,500
FARMS PLANNED
for the Al Rahba expansion phase

IMPACT AND RESULTS

The project has progressed beyond its initial limited pilot to an operational deployment covering 80 farms in Al Wathba. DoE describes the earlier pilot as successful and says the current rollout provides participating farmers with accurate, real-time information on their water consumption.[9]

The reported achievement to date is the move from a limited pilot to deployment across 80 farms, together with the introduction of real-time farm-level consumption information.[10]

The initiative also forms part of a broader agricultural water-efficiency effort. In December 2024, ADAFSA reported that programmes to optimise water resources and improve irrigation-network efficiency had helped reduce agricultural water consumption from 2 billion cubic metres in 2019 to 1.89 billion cubic metres.[11] This wider reduction predates the Al Wathba deployment and should not be attributed to the Smart Meter Project itself.

WHAT'S NEXT

DoE and ADAFSA plan to extend the Smart Meter Project beyond Al Wathba. The announced next phases cover 130 farms in Al Nahda and 2,500 farms in Al Rahba, potentially taking the programme from tens to thousands of farms if the rollout is completed.[12]

DoE continued to feature the Al Wathba Smart Meters as an active AI-enabled water-efficiency initiative at Abu Dhabi Sustainability Week in January 2026, alongside its wider programme of smart water-management and agricultural technologies.[13]

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HEALTHCARE

4IR Technologies:
Robotics

Emirate:
Dubai

Maturity:
Scaled Deployment

Type:
Public-Private

068
Robot-Assisted Surgery

ACTORS

The da Vinci Surgical Platform
UAE Health System

SNAPSHOT

The da Vinci is a robotic surgical platform that enables surgeons to perform complex minimally invasive procedures from a console, using robotic arms with 3D high-definition visualisation and articulated instruments.[1] Da Vinci systems are in use at hospitals across Dubai,[2] Abu Dhabi,[3] and Sharjah.[4] Reported robotic-surgery volumes at American Hospital Dubai and Sheikh Shakhbout Medical City alone exceed 4,000 procedures,[5,6] while robotic-assisted cases account for up to 20% of all surgeries at American Hospital Dubai.[7] American Hospital Dubai also operates the region's first private robotic surgery centre of excellence accredited by the US-based Surgical Review Corporation and launched a structured robotic-surgery programme in 2024 to train 20 Emirati surgeons.[8]

WHY IT MATTERS

Minimally invasive surgery in anatomically constrained spaces demands a level of dexterity and visualisation that conventional instruments cannot reliably deliver. Laparoscopic surgery, the standard approach for minimally invasive procedures, operates through small incisions using a camera and long instruments rather than open access. While this reduces patient trauma and recovery time, it imposes well-documented constraints on the surgeon: two-dimensional depth perception, poor hand-eye coordination, limited range of motion, steep learning curves, and reduced haptic feedback that leaves hand tremors and involuntary movements uncorrected.[9]

Robotic surgery is designed to address some of these technical limitations, particularly in procedures requiring precise manipulation in confined anatomical spaces. In urology, systematic evidence shows that robot-assisted procedures can offer benefits including reduced blood loss and shorter hospital stays for selected operations.[10] In gynaecology, evidence indicates more procedure-specific benefits; for example, robotic hysterectomy has been associated with modestly shorter hospital stays, although differences in blood loss and complications are not consistently demonstrated.[11]

HOW THE TECHNOLOGY WORKS

The da Vinci platform, manufactured by Intuitive Surgical, a US-based company, is a robotic surgical system designed to address the core limitations of conventional laparoscopy. The surgeon operates from a console with every movement translated directly into instrument motion inside the patient. The system is not autonomous, and the surgeon retains full clinical control throughout.[12] Three generations of the platform are now in clinical use across the UAE. The da Vinci Xi, the most widely deployed, combines wristed instruments, 3D high-definition visualisation, and intuitive motion control through an overhead arm architecture that enables anatomical access from virtually any position.[13]

The American Hospital Dubai introduced the da Vinci SP (Single Port) system in September 2025, becoming the first hospital in the Middle East, Africa and Eastern Europe to employ the platform. The system enables procedures through a single incision or natural orifice.[14] American Hospital Dubai added the da Vinci 5 system in early 2026.[15] Its Force Feedback technology enables surgeons to sense pushing and pulling forces at the instrument tip and has demonstrated up to 43% less force applied to tissue in preclinical studies.[16]

IMPACT AND RESULTS

American Hospital Dubai has performed around 3,000 multi-specialty robotic surgeries and operates the da Vinci Xi, SP and da Vinci 5 platforms. Its Centre of Excellence in Robotic Surgery is the first private healthcare facility in the region accredited by the US-based Surgical Review Corporation.[17] In 2024, the hospital launched a structured programme to train 20 Emirati surgeons in robotic surgery.[18]

Cleveland Clinic Abu Dhabi has used robotic surgery for complex procedures since 2015.[19] In 2024, the programme performed more than 400 robotic surgical cases, including the first robotic mastectomy in the UAE and the region.[20]

Dubai Health launched its robotic surgery programme at Dubai Hospital in the second half of 2022 and, by October 2025, had completed more than 145 surgeries. It reported reductions in blood loss exceeding 90% and hospital stays falling from 2 weeks to less than 3 days.[21] Burjeel Medical City grew from one da Vinci-certified robotic surgeon when its programme launched in August 2023 to more than 15 certified surgeons and more than 470 robotic surgeries by January 2025.[22] Mediclinic City Hospital has been recognised as the first regional reference centre for case observation in the UAE for da Vinci robotic surgery, supporting surgeon training through case observation.[23]

Sheikh Shakhbout Medical City also operates da Vinci technology as part of a robotic surgery programme that has completed more than 1,000 robotic-assisted procedures,[24] while Al Qassimi Hospital in Sharjah has performed da Vinci robotic surgeries through the federal robotic surgery programme.[25] Taken together, these deployments demonstrate the use of robotic surgery across multiple public and private healthcare institutions in the UAE.

WHAT'S NEXT

The UAE's robotic surgery ecosystem now includes multiple institutional training pathways. American Hospital Dubai runs a structured robotic-surgery training programme for Emirati surgeons,[26] while Mediclinic City Hospital serves as a regional reference centre for da Vinci case observation.[27] Each institution is building capability within its own system; a next step would be to connect these efforts through more consistent credentialing across public and private systems, shared outcomes data, and training pipelines capable of sustaining quality as surgical volumes grow.

This direction is consistent with existing health-sector policy. The Dubai Health Strategy 2021 identifies smart healthcare and governance as two of its four core approaches,[28] while the Emirates Health Services Innovation Strategy 2023–2026 emphasises digital health practices, pilot projects, strategic partnerships and capability development.[29]

Looking further ahead, Mohamed bin Zayed University of Artificial Intelligence (MBZUAI) and Cleveland Clinic Abu Dhabi are researching AI-powered intrabody navigation, in which robotic systems autonomously guide instruments through the body, and autonomous ultrasound scanning, pointing to a next generation of surgical robotics developed from UAE-based R&D.[30]

"Robotic surgeries at Dubai Health represent a significant step forward in the use of smart technologies in the operating room. This approach has increased surgical precision, strengthened patient safety, and led to improved outcomes," said Dr Yaser AlSaeedi, Head of Urology and Director of the Robotic Surgery Programme at Dubai Health.[31]

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HEALTHCARE

4IR Technologies:
AI, Advanced materials, IoT

Emirate:
Dubai

Maturity:
Proof of Concept

Type:
Private

069
Smart Contact Lenses

ACTORS

XPANCEO

SNAPSHOT

XPANCEO is developing an ultra-thin smart contact lens that compresses AI, nanophotonics, biosensing, and extended reality into a single device worn directly on the eye. Based in Dubai, the company raised USD 250 million in a Series A round in July 2025 at a USD 1.35 billion valuation,[1] the largest Series A ever raised in the UAE and the largest globally in AR/VR and wearables.[2] At GITEX Global 2025, XPANCEO presented six working prototypes spanning glucose sensing, intraocular pressure monitoring, AR vision, night vision, colour correction, and holographic display.[3]

WHY IT MATTERS

Smart contact lenses push health monitoring beyond phones, watches, and external wearables into a device that sits directly on the eye. The eye provides continuous access to physiological signals that conventional consumer devices cannot reliably capture: tear fluid contains biomarkers correlated with blood glucose, lactate, cortisol, hormones, and even cancer indicators,[4] while intraocular pressure is the only modifiable risk factor for glaucoma, a condition affecting over 70 million people worldwide and the leading cause of irreversible blindness.[5]

Current intraocular pressure (IOP) measurement relies on episodic readings in a physician's office, typically only a few times per year, missing the nocturnal pressure peaks and daily fluctuations now recognised as critical to disease progression.[6] If clinically validated, a smart lens capable of continuous IOP or glucose monitoring would shift diagnosis from episodic clinic visits to always-on physiological tracking in a device the patient already knows how to wear. That compression of AI, biosensing, microelectronics, and wireless power into a near-invisible form factor is what makes this a frontier 4IR case rather than an incremental improvement in wearable technology.

HOW THE TECHNOLOGY WORKS

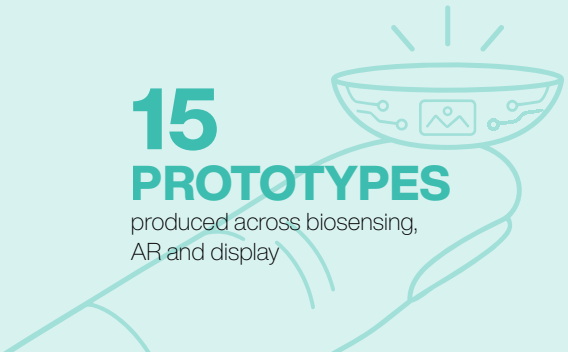
XPANCEO's prototypes combine optical, electronic, and biosensing components inside contact lens formats. The health readings prototype integrates a miniature sensor designed to detect glucose in tear fluid and transmit readings wirelessly to a smartphone, using electrochemical technology similar to compact glucometers.[7] The IOP lens embeds an optical pattern that reacts to intraocular pressure changes without blocking vision. Users scan the pattern through an AI-powered app trained on more than 10,000 IOP measurements to estimate eye pressure,[8] with a reported 50% improvement in measurement effectiveness over existing non-invasive methods.[9]

Other prototypes explore AR microdisplays consuming as little as 1 to 3 microwatts (100 to 300 times less than conventional AR glasses), wireless power transfer with twice the range of previous industry solutions, night vision through nanoparticle-enhanced lenses, colour correction for colour blindness, and holographic display.[10,11] Together, the prototypes indicate XPANCEO's intended pathway: first validating individual sensing, display, power, and data-transfer functions, then integrating them into a single clinically safe smart lens, with an integrated prototype target of 2027.

USD 250M RAISED
in the largest Series A round ever in the UAE

USD 1.35B VALUATION
following the raise

15 PROTOTYPES
produced across biosensing, AR and display



IMPACT AND RESULTS

The company has raised USD 290 million in total funding (USD 40 million seed, USD 250 million Series A), produced 15 working prototypes across biosensing, AR, power, and display systems, and expanded its Dubai R&D laboratory with a dedicated biosensing facility opened during GITEX 2025.[12,13]

XPANCEO is ranked the number one corporate research institution in Western Asia and one of the top three research institutions in the UAE by the Nature Index,[14] with 110 scientific publications.[15] For Dubai, XPANCEO positions the city not only as a market for imported medtech but as a base for frontier R&D at the intersection of AI, nanotechnology, biosensing, and human–computer interaction. The Series A was among the top three hardware funding rounds in history globally.[16]

WHAT'S NEXT

The next milestone is integration. XPANCEO must move from individual working prototypes toward a single smart lens that combines sensing, display, power, wireless data transfer, and user-facing functionality in a safe and comfortable form. The company has indicated its Series A funding will support product development, team expansion, and its path to market, with an integrated prototype target of 2027.

For healthcare, the decisive steps will be calibration, safety testing, clinical validation, and regulatory approval. If smart lenses can reliably monitor eye pressure or tear-fluid biomarkers in a clinically validated format, they could create a new class of continuous health interfaces. The 15 working prototypes, supported by XPANCEO's R&D capabilities, funding and publication record, demonstrate that the programme has moved beyond the conceptual stage and established a strong foundation for progression towards a regulated medical device.

"In just 24 months, we've developed 15 working prototypes, each unlocking a new layer of possibility. Our vision remains the same: to merge all your devices into a single, invisible interface," said Roman Axelrod, Founder and Managing Partner of XPANCEO.[17]

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4IR Technologies:
AI

Emirate:
Abu Dhabi

Maturity:
Pilot Deployment

Type:
Private

HEALTHCARE

070

A Clinical Large Language Model (LLM) for Medicine

ACTORS

M42
Cerebras

SNAPSHOT

Med42 is a medical LLM developed by Abu Dhabi health-technology group M42. Like general-purpose conversational AI, it responds in natural language, but it is designed for clinical use and trained on medical knowledge. Potential applications include summarising patient histories, supporting diagnostic reasoning, answering medical questions, and helping retrieve relevant medical knowledge.[1]

M42 released the first version as an open model in October 2023, followed by a more capable second generation in 2024. Both were made available for researchers and developers to download, test, and adapt.[2] On standard medical benchmarks, Med42 performs competitively with leading systems in its class, demonstrating strong potential as M42 continues the testing and validation needed to prepare the model for real-world clinical use.[3]

WHY IT MATTERS

Keeping pace with the full volume of medical knowledge is becoming increasingly challenging for clinicians. Patient histories may be long and fragmented, while relevant evidence is spread across a rapidly expanding body of research. As a result, the information needed for a decision may exist but remain difficult to retrieve and apply at the point of care.[4]

General-purpose AI models are not designed for that task. Because they are trained broadly rather than specifically for medicine, they can produce answers that sound authoritative without being clinically reliable. In healthcare, that gap between fluency and accuracy creates a serious risk.[5]

Med42 addresses this by combining medical specialisation with an open model. Hospitals, researchers, and health systems can inspect, adapt, and deploy it on their own infrastructure, giving them greater control over how the model is used and how sensitive data is handled.[6]

72%
USMLE SCORE
on US medical licensing exam sample questions

79%
MEDQA SCORE
on the MedQA benchmark, 2024 generation

HOW THE TECHNOLOGY WORKS

Med42 is an LLM built to interpret and generate clinical text, primarily in English. Like other language models, it generates text one token at a time based on the context that comes before it. Trained across a large body of text, it learns statistical relationships between language, concepts, and knowledge. This allows it to interpret free-text patient histories, respond to clinical questions in ordinary language, and generate reasoned answers rather than follow only pre-written rules.[7]

What makes Med42 specialised is its medical training. M42 started with Meta's Llama model and continued training it on a large, curated collection of medical material, strengthening its ability to understand clinical language and reasoning.[8] The model is available in 8-billion and 70-billion-parameter versions, balancing computing requirements against performance. Parameters are the internal values through which the model stores what it has learned.[9]

Two additional training stages improve its usefulness in clinical settings. Instruction tuning teaches the model to follow a user's request, while preference alignment exposes it to examples of stronger and weaker responses so that its outputs become more accurate, safer, and better suited to clinical workflows.[10]

The model was developed in Abu Dhabi by M42 with Cerebras and Core42, while researchers from Mohamed bin Zayed University of Artificial Intelligence independently evaluated its performance.[11] Because Med42 is openly available, hospitals and public authorities can deploy it within their own secure infrastructure, allowing sensitive patient data to remain under local control.[12]

IMPACT AND RESULTS

Med42 ranks among the strongest open medical language models. The first version scored 72% on sample questions from the United States Medical Licensing Examination, outperforming earlier openly available medical models.[13] The 2024 generation improved across all reported clinical benchmarks, surpassed GPT-4 on most medical question-answering tests, and reached approximately 79% on MedQA, placing it among the leading open models in the field.[14]

Its use has also extended beyond M42. The first model was downloaded more than 8,200 times from Hugging Face,[15] and independent researchers have used it in published studies, including work applying Med42 to pathology reports for cancer staging.[16]

M42 is also explicit about the model's limitations. Its documentation states that Med42 is not yet ready for unsupervised clinical use and requires further testing and human evaluation because it can still generate incorrect information.[17] Its significance at this stage lies in combining strong benchmark performance with open access, allowing researchers and healthcare organisations to examine, test, and improve the model before it is used in patient care.

WHAT'S NEXT

In releasing v2, the research team set out a more detailed evaluation against real-world clinical use cases as the next step, assessing clinical-data understanding, safety and reasoning in practical settings before the model is integrated into healthcare workflows.[18]

Its broader significance lies in where it was developed and how it can be deployed. An open clinical model built in Abu Dhabi positions the UAE as a developer of advanced medical AI, while giving local healthcare organisations a system they can run on sovereign infrastructure and adapt to their own needs.[19]

M42 presents Med42 as a platform for widening access to medical knowledge. By releasing it openly, the company has made the model available for healthcare professionals and researchers to examine, use, and improve.[20]

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4IR Technologies:
Biotechnology, AI

Emirate:
UAE-wide

Maturity:
Scaled Deployment

Type:
Public-Private

HEALTHCARE

071

Sequencing a Nation's Genome

ACTORS

Emirati Genome Programme
Department of Health – Abu Dhabi
M42

SNAPSHOT

The Emirati Genome Programme is sequencing the complete genetic code of the UAE's Emirati population, with the aim of building a genomic reference covering more than one million citizens. By early 2025, it had sequenced more than 700,000 people, making it one of the world's largest population-scale genome initiatives.[1]

The programme is designed so that a person's genome can inform healthcare throughout their life. In Abu Dhabi, physicians can already request pharmacogenomic reports showing how a patient's genetic profile may affect their response to particular medicines.[2]

WHY IT MATTERS

Most genomic research still draws heavily on people of European ancestry. As a result, many of the genetic markers used to assess disease risk and guide treatment may be less accurate for underrepresented populations.[3] For Emiratis, whose ancestry is not well represented in global datasets, a variant considered significant elsewhere may have a different meaning locally, while variants important to the UAE population may be overlooked.

The consequences are practical. The UAE has a high prevalence of inherited conditions, and genetic differences can also affect how patients respond to medicines.[4] Without local genomic data, clinicians have less reliable evidence for identifying disease risk, interpreting variants, and selecting the most appropriate drug or dose.

The Emirati Genome Programme addresses this by building a large reference dataset from the population itself and linking that knowledge to clinical care.[5] Together, those two elements create the basis for more accurate diagnosis, prevention, and treatment for Emirati patients.

700K+
PEOPLE SEQUENCED
by early 2025, one of the world's largest population-scale genome efforts

HOW THE TECHNOLOGY WORKS

The process begins with a blood sample. The programme uses whole-genome sequencing to read all three billion base pairs of a person's DNA, rather than the small fraction examined by targeted tests. Each position is read at roughly 30-fold depth, improving the accuracy of the final sequence.[6] Sequencing is carried out across platforms from Illumina, MGI, and Oxford Nanopore, combining highly accurate short reads with longer reads that help resolve more complex regions of the genome.[7]

At this scale, the challenge is not only generating data but interpreting it. AI and large-scale computational analysis compare hundreds of thousands of genomes to identify variants that are common or distinctive in the Emirati population and to build a national reference genome for interpreting individual results.[8]

The link to healthcare comes through phenoEGP, which connects genomic data with up to 10 years of clinical records drawn from Abu Dhabi's Malaffi health-information exchange. This allows researchers to compare genetic variants with real health outcomes across the population.[9] The same infrastructure supports a national pharmacogenomics service, delivering drug-gene reports through Malaffi so clinicians can assess how a patient may respond to selected medicines.[10]

Because genomic information can identify individuals and reveal sensitive health risks, its use is subject to specific privacy and consent safeguards. UAE law requires informed consent before genetic testing and establishes confidentiality requirements for the collection, analysis, and storage of genomic data.[11] The Emirati Genome Programme also states that participant data are encrypted and protected under UAE privacy and security requirements.[12]

IMPACT AND RESULTS

The programme is already influencing frontline care. Physicians can order pharmacogenomic reports through Malaffi to assess how a patient's genetic profile may affect their response to selected medicines.[13] Genomic screening has also entered national public-health policy: since January 2025, genetic carrier screening has been mandatory for Emirati couples as part of premarital testing, helping identify shared risks of passing on inherited conditions.[14]

The programme is also generating findings that depend on population-scale data. Using genomic and health records from more than 500,000 participants, researchers conducted the largest study of its kind into inherited retinal disease. The work reassessed which variants are clinically significant in the Emirati population and identified new ones, improving the evidence available for diagnosis.[15]

Its clinical reach is set to expand further. In November 2025, M42 and Oracle announced plans to integrate genomic insights from the programme directly into electronic health records, allowing relevant information to appear at the point of care rather than being requested through a separate process.[16]

WHAT'S NEXT

The programme is now moving from large-scale sequencing towards deeper clinical integration. Its next phase will connect genomic information with real-time clinical, environmental, and lifestyle data to create a more complete view of population health and support more predictive and preventive care.[17]

Its longer-term significance is as national infrastructure. A population-scale genomic resource held on sovereign systems and linked to health records can support services ranging from expanded carrier screening to precision oncology. It also gives the UAE a greater role in addressing the long-standing underrepresentation of non-European populations in genomic research.[18]

Programme leaders describe the ambition as bringing these different layers of health data together so they can generate insights that lead to more accurate, personalised, and timely care.[19]

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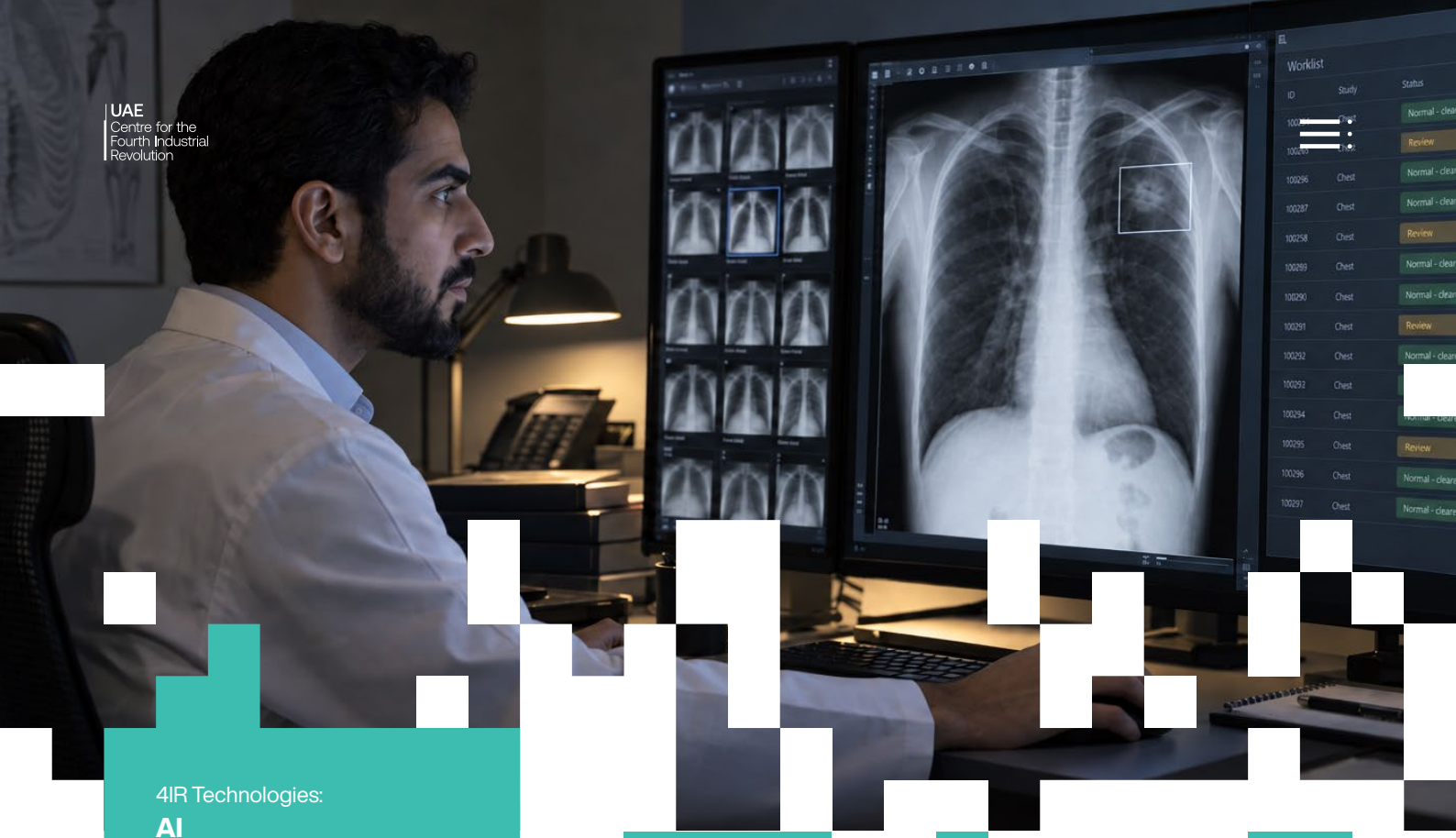


4IR Technologies:
AI

Emirate:
Abu Dhabi

Maturity:
Operational Deployment

Type:
Public-Private

HEALTHCARE

072

AI Triage for Tuberculosis Screening

ACTORS

M42
Capital Health Screening Centre

SNAPSHOT

AIRIS-TB is an AI system developed by M42 to screen chest X-rays for signs of tuberculosis. It automatically clears images assessed as normal and refers potentially abnormal scans to a radiologist for review.[1]

Over 2 years at Abu Dhabi's Capital Health Screening Centre, AIRIS-TB analysed more than one million chest X-rays, making it one of the largest real-world evaluations of a medical AI system to date.[2]

WHY IT MATTERS

The UAE requires expatriates applying for or renewing residence permits to undergo medical-fitness screening for communicable diseases, including tuberculosis (TB). In Abu Dhabi, chest X-rays are used to screen for pulmonary TB, creating particularly large imaging volumes: around one million people undergo screening in the emirate each year.[3] Because the vast majority of scans are normal, radiologists spend much of their time confirming the absence of disease.

That creates a capacity constraint. Screening throughput, the rate at which scanning is performed, depends on how many images radiologists can review accurately each day, while sustained exposure to large volumes of similar scans increases workload and the risk of fatigue.[4] At Abu Dhabi's scale, even small delays or error rates can affect the speed and reliability of the wider public-health process.

AIRIS-TB is designed to relieve that pressure by automatically clearing scans assessed as normal and directing potentially abnormal cases to radiologists. This concentrates specialist attention on the images most likely to require review and allows the screening system to process larger volumes more efficiently.[5]

HOW THE TECHNOLOGY WORKS

AIRIS-TB is a deep-learning model trained on large collections of chest X-rays to recognise patterns associated with tuberculosis and other abnormalities. Rather than following rules written in advance, it learns from labelled examples how normal and abnormal scans differ.[6]

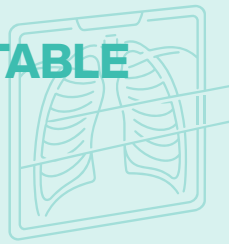
Its role is triage rather than final diagnosis. The system classifies each X-ray as normal or abnormal, automatically clears scans assessed as normal, and sends potentially abnormal cases to a radiologist, highlighting areas that may require closer review.[7] It is tuned to minimise false negatives, reducing the risk that a scan showing disease is incorrectly cleared.[8]

M42 has also released AIRIS-TB openly on GitHub, together with model outputs on widely used public datasets, allowing independent researchers to test its performance beyond the original deployment setting.[9]

1M+
X-RAYS ANALYSED
the largest real-world evaluation of its kind

98.5%
ACCURACY (AUC)
area-under-curve accuracy achieved, with 99.7% sensitivity

80%
AUTOMATABLE
routine chest X-ray assessments



IMPACT AND RESULTS

The headline results come from a peer-reviewed study of more than one million chest X-rays published in *npj Digital Medicine*. AIRIS-TB achieved an area under the curve of 98.5% and sensitivity of 99.7%, while missing no confirmed tuberculosis cases in the dataset.[10]

On that basis, the study concluded that the system could automate up to 80% of routine chest-X-ray assessments, removing most normal scans from radiologists' workloads and concentrating specialist review on potentially abnormal cases.[11]

At Capital Health Screening Centre, AIRIS-TB supports up to 2,000 AI-assisted chest X-rays a day, around 10 times the throughput of conventional manual screening.[12] This increase in capacity allows large-scale screening programmes to process more people without a corresponding increase in radiologist workload.

WHAT'S NEXT

The same underlying technology could be extended to other conditions visible on chest X-rays, including lung cancer, pneumonia, and emphysema. This would allow a single screening image to support checks for several diseases at once.[13]

Its greatest potential may be in regions where tuberculosis is common and radiologist capacity is limited. M42 presents AIRIS-TB as a scalable way to expand screening in those settings, while its open release allows independent researchers and health systems to validate and adapt the model.[14]

Dimitris Moulavasilis, Group Chief Executive of M42, placed the work in that global context: "In regions with a high prevalence of TB, we now have a scalable technological solution that can bridge the divide, expand radiologist capacity and help save lives."[15]

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4IR Technologies:
Biotechnology, Digital twins, AI

Emirate:
Abu Dhabi, Dubai

Maturity:
Pilot Deployment

Type:
Private

HEALTHCARE

073

A Digital Twin of the Human Body

ACTORS

Prepaire Labs
American Hospital Dubai
Aram Group

SNAPSHOT

Prepaire Labs, an Abu Dhabi company, is developing a biological digital twin: a continuously updated model of an individual's health built from genomic, proteomic, metabolic, microbiome, imaging and wearable-device data. Its GenetiQ platform uses that model to forecast how a person's health may change and which treatments may be most suitable.[1]

What sets the platform apart is its link to living biology. Prepaire grows a patient's own cells in the laboratory and uses them to test the model's predictions, connecting digital analysis with physical validation.[2] American Hospital Dubai became the first hospital in the region to offer the platform to patients, and in 2026 Prepaire entered an alliance to develop biological-data infrastructure across the UAE.[3]

WHY IT MATTERS

The UAE is investing in personalised and preventive healthcare as part of a broader effort to strengthen its position in advanced healthcare and life sciences. National initiatives in genomics and precision medicine are intended to move healthcare towards earlier risk detection and treatments tailored more closely to an individual's biology.[4]

Delivering that kind of care requires information from many parts of a person's biology, including their genome, immune system, metabolism, microbiome and clinical history. Healthcare systems typically capture these signals separately, making it difficult to combine them into a single, continuously updated view of health.[5] Bringing these sources together could support earlier detection and more individualised treatment.[6]

HOW THE TECHNOLOGY WORKS

GenetiQ builds the digital twin by combining multiple layers of an individual's biological and clinical data, including their genome, proteins, metabolites, microbiome, medical records and real-time readings from wearable devices. The model is updated as new information becomes available, allowing it to reflect changes in the person's health over time.[7] Machine-learning models then compare that information with patterns found across large genetic, clinical and phenotypic datasets to estimate disease risk and likely treatment response.[8]

The distinctive step is biological validation. From a patient's blood sample, Prepaire can generate induced pluripotent stem cells, which can be developed into different tissue types and used to model the person's biology in the laboratory. Because these cells retain the patient's genetic profile, researchers can test how their tissue responds to a drug rather than relying only on a generic model.[9]

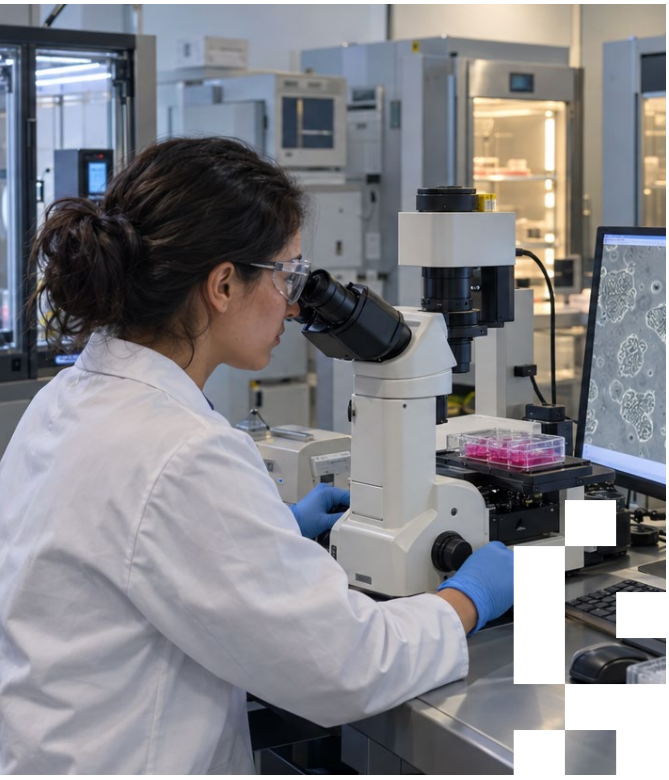
The digital and laboratory models are designed to work together. A prediction generated by the twin can be tested on the patient-derived cells, and the result can then be used to refine the model. This process is supported by Prepaire's automated laboratory in Masdar City, developed with MGI and equipped with high-throughput genome-sequencing systems.[10]

1,700+
BIOMARKERS ANALYSED
through the platform's expanded capabilities

1ST
REGIONAL HOSPITAL
to offer the platform

IMPACT AND RESULTS

The platform has moved into early clinical deployment. In 2025, American Hospital Dubai adopted GenetiQ, becoming, according to the hospital, the first healthcare provider in the region to offer this form of predictive and personalised care.[11] Prepaire has also expanded the platform's supporting capabilities, including a partnership that adds analysis of more than 1,700 biomarkers with local data processing.[12]



WHAT'S NEXT

The immediate priority is to build clinical evidence at scale. Prepaire plans to develop a 50,000-person UAE cohort, publish clinical validation and demonstrate that the twin's predictions lead to better health outcomes.[13]

Through its alliance with Aram Group, Prepaire also plans to develop a network of biological-data centres and diagnostic hubs across the UAE, beginning with a new facility at Masdar City.[14]

Adam Freer, Managing Director at Prepaire, put the aim in concrete terms: "It's about detecting cancer before it shows up on a scan, knowing which drug will work for you, not just for the average patient, and giving every clinician a model of the person in front of them that updates as new information arrives."[15]

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4IR Technologies:
AI

Emirate:
Dubai

Maturity:
Operational Deployment

Type:
Public

HEALTHCARE

074

Predicting Chronic Diseases from a City's Health Data

ACTORS

Dubai Health Authority

SNAPSHOT

EJADA Ai is a predictive-health platform used by the Dubai Health Authority to identify people at elevated risk of developing chronic diseases or costly complications. It analyses health-insurance claims covering around four million insured residents and applies artificial intelligence to detect risk patterns before illness progresses.[1]

The system is designed for prevention and planning rather than diagnosis. By identifying people at elevated risk before diagnosis, and diagnosed patients before serious complications develop, it can support targeted intervention, while population-level forecasts help the authority direct resources towards the diseases and groups likely to generate the greatest health burden and cost. The wider EJADA programme was launched in 2022. Its AI component now analyses chronic-disease data including diabetes, chronic obstructive pulmonary disease, and asthma, while 30 major disease areas have been identified as priorities across the programme.[2]

WHY IT MATTERS

Chronic disease is one of the Gulf's largest health-system challenges, with diabetes carrying a particularly heavy burden. In Dubai, treatment for insured patients with diabetes costs more than AED 2 billion a year, excluding people whose risk has not yet been identified.[3]

A treatment-led system may identify people only after disease or complications have progressed. In diabetes, those complications can include kidney disease, damage to blood vessels in the eyes, and nerve damage or poor circulation in the feet, which can lead to ulcers and, in severe cases, amputation.[4] At population scale, identifying who is at risk of disease or complications requires analysing patterns across millions of health records.

EJADA Ai is designed to close that gap. By analysing population-scale claims data, it can identify people at elevated risk of chronic diseases including diabetes, chronic obstructive pulmonary disease (COPD) and asthma, as well as diagnosed patients at risk of complications.[5] This helps the authority target prevention earlier and direct resources towards the patients and conditions likely to need them most.

25–30%
BURDEN REDUCTION
targeted in the financial burden of diabetes

HOW THE TECHNOLOGY WORKS

EJADA Ai works with electronic claims data already generated across Dubai's insured healthcare system. Its dataset covers around four million insured people and more than 360 million patient activities, diagnoses, and patient notes recorded since the system launched in mid-2022.[6]

Because EJADA analyses sensitive health-insurance data at population scale, privacy and access controls are an important part of the operating environment. DHA's broader health-data governance framework includes policies and standards covering data protection and confidentiality, consent and access control, authentication and authorisation, and artificial intelligence.[7]

Machine-learning models analyse this history to identify patterns that tend to precede disease. From the sequence of a person's claims, diagnoses, tests, and treatments, the system generates a risk score estimating their likelihood of developing a chronic condition or, if already diagnosed, progressing to serious complications. Individuals can then be ranked by risk so that those most likely to benefit from early intervention are identified first.[8]

The same data also supports population-level forecasting. EJADA Ai estimates how disease burden and healthcare costs may develop across the insured population, including spending on medicines, consultations, and hospital care. This helps the authority plan budgets and target prevention programmes using predicted need rather than broad assumptions.[9] Unlike tools focused on a single disease, EJADA is designed to assess multiple chronic conditions across both diagnosed and undiagnosed populations.[10]

IMPACT AND RESULTS

Diabetes is the best-documented use case in public reporting. The Dubai Health Authority reports that EJADA Ai can identify both people at elevated risk of developing diabetes and diagnosed patients most likely to experience serious complications.[11] These are the groups for whom earlier intervention could have the greatest effect.

The programme is designed to reduce the financial burden of diabetes by 25% to 30%, covering both the cost of treating existing patients and the future cost associated with those currently at risk.[12] This target indicates the scale of savings the authority expects preventive analytics to support against an annual diabetes bill of more than AED 2 billion.

EJADA Ai has also expanded beyond its original focus. DHA describes the system as supporting chronic-disease analysis across conditions including diabetes, COPD, and asthma, while the wider programme identified 30 priority disease areas based on factors including patient numbers, claims activity, and cost burden.[13] This moves EJADA from a diabetes-focused application towards a broader platform for predicting and managing chronic illness across Dubai.

WHAT'S NEXT

The next step is to connect prediction with value-based care. EJADA Ai's risk scores and cost forecasts can support not only earlier intervention but also the assessment of whether care is improving outcomes efficiently, shifting incentives from the volume of treatment delivered towards the value it creates.[14]

Its wider significance lies in the operating model. Because the platform uses claims data already generated across the insurance system, the same approach could be extended to other diseases and populations.[15] This positions Dubai as an early example of a health authority using predictive analytics to shape prevention, spending, and care delivery at population scale.

Wedad Binbraik, Director of the Health Economics and Insurance Policies Department at the Dubai Health Authority, explained the value of combining different health indicators: "AI helps in linking diverse factors that may manifest in different tests and provides a comprehensive narrative that extends beyond lifestyle influences".[16]

Dubai's insurers processed 49.6 million claims in 2025, 13.5% more than the year before, so the dataset the model learns from continues to grow.[17]

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4IR Technologies:
Robotics, Autonomous systems

Emirate:
UAE-wide

Maturity:
Scaled Deployment

Type:
Public

HEALTHCARE

075

Robots in the Hospital Pharmacy

ACTORS

Emirates Health Services
Dubai Health Authority
SEHA
Ministry of Health and Prevention

SNAPSHOT

Across the UAE's public hospitals, robotic dispensing systems are taking over much of the routine work involved in preparing outpatient medicines. Once an electronic prescription is issued, the system locates and retrieves the required packs from an automated store containing tens of thousands of items, then delivers them to the pharmacy counter within seconds.[1]

The model has expanded well beyond a single trial. Robotic dispensing has been adopted by the Ministry of Health and Prevention, Emirates Health Services, the Dubai Health Authority, and Abu Dhabi's SEHA, with private providers introducing similar systems. What began as a site-level innovation is now becoming an established part of pharmacy operations across the UAE.[2]

WHY IT MATTERS

Hospital pharmacies process large numbers of prescriptions each day, and retrieving, counting, and checking medicines can take significant staff time. Before automation, patients at Dubai's public hospitals could wait more than 20 minutes to receive their medicines.[3]

Robotic dispensing is intended to complement pharmacists by automating repetitive physical tasks such as storage, retrieval, and stock handling, while pharmacists retain responsibility for prescription review, clinical judgement, and patient counselling.[4] This division of work can make the dispensing process more efficient while keeping professional oversight at the centre of pharmacy care.

By handling routine retrieval and inventory tasks at high speed, automated systems can shorten waiting times, support dispensing accuracy, and free pharmacists to spend more time explaining medicines, checking prescriptions, and advising patients on their safe use.[5]

HOW THE TECHNOLOGY WORKS

At the centre of a robotic pharmacy is an automated storage and retrieval system. Medicines are held in a compact store containing tens of thousands of packs, while a robotic arm moves along tracks to select the required items.[6] When a doctor issues an electronic prescription, the order is sent directly to the system, which retrieves the medicines and delivers them to the pharmacy counter without a paper-based handover.[7]

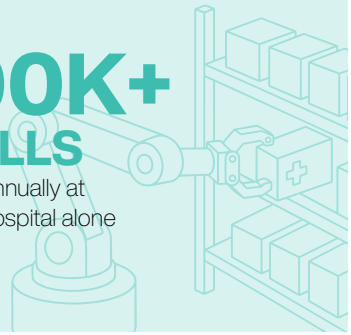
The systems operate at high speed. At Fujairah Hospital, where the Ministry of Health introduced the UAE's first robotic pharmacy, the machine can prepare a refill in 8 to 12 seconds and process up to 2,000 pharmaceutical packs an hour.[8] It also manages inventory continuously by tracking every pack, reorganising stock between orders and maintaining a live count, helping use space more efficiently and reduce expired or wasted medicines.[9]

Emirates Health Services has extended the model to collection. Its smart self-dispensing system allows patients to order medicines through an application and collect them from an automated outlet without waiting at a pharmacy counter.[10]

<3
MINUTES
average medicine wait time cut from 20 minutes across Dubai's public hospitals

AED 3.48M
SAVINGS
reported over 2 years

400K+
REFILLS
handled annually at Fujairah Hospital alone



IMPACT AND RESULTS

The clearest impact is the reduction in waiting time. Across Dubai's public hospitals, automated dispensing cut the average time required to receive medicines from more than 20 minutes to under three. The authority also reported savings of approximately AED 3.48 million over 2 years, while pharmacists were able to spend more time counselling patients.[11]

Deployment has expanded across the country. Emirates Health Services introduced four robotic pharmacies in hospitals in Sharjah and Ras Al Khaimah.[12] In Abu Dhabi, SEHA contracted seven systems for hospitals including Tawam Hospital and Sheikh Khalifa Medical City, integrated with its clinical information systems.[13] The federal Ministry of Health and Prevention launched the UAE's first robotic pharmacy at Fujairah Hospital in 2017, where four robots now support more than 100,000 patients and over 400,000 refill transactions each year.[14]

Across these deployments, the main operational shift is the reallocation of pharmacists' time. By automating storage, retrieval, and counting, the systems allow pharmacists to focus more on prescription review, patient counselling, and the safe use of medicines.[15]

WHAT'S NEXT

The immediate direction is wider coverage. Dubai Health Authority has said it plans to extend smart pharmacies across all hospitals and primary-care centres, moving from selected deployments towards network-wide adoption.[16]

The longer-term model is an end-to-end automated medicine journey, from electronic prescription and robotic preparation to self-service collection. Combined with connected health records, this could make dispensing a largely automated part of care rather than a source of delay for patients.[17]

Dr Yousif Al Serkal, Assistant Undersecretary for the Hospitals Sector at the Ministry of Health and Prevention, pointed to the next stage of automation: "In the near future, a dispensing (ATM) pharmacy will be available to boost both the robotic pharmacy performance and pharmacist role in providing relevant consultations."[18]

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4IR Technologies:
Biotechnology, AI

Emirate:
Abu Dhabi

Maturity:
Operational Deployment

Type:
Public-Private

HEALTHCARE

076

Precision Oncology for Breast Cancer

ACTORS

Department of Health – Abu Dhabi
Cleveland Clinic Abu Dhabi
M42
Mubadala Health

SNAPSHOT

Abu Dhabi's precision-oncology programme uses genetic information from both the patient and the tumour to guide cancer care. This allows clinicians to select treatments that are better matched to the individual biology of the disease and to identify relatives who may share an inherited cancer risk.[1]

Launched by the Department of Health in October 2022, and described by the authority as the region's first Personalised Precision Medicine Programme for Oncology, the programme initially focused on breast cancer. By December 2024, it had delivered tailored treatment and prevention plans to a selected group of 256 Emirati cancer patients in Abu Dhabi.[2]

WHY IT MATTERS

Cancer represents a substantial health burden in the UAE. In 2023, the UAE National Cancer Registry recorded 7,487 new cancer cases nationwide, including 1,736 among Emirati citizens. Breast cancer was the most commonly diagnosed cancer, with 1,456 new cases recorded that year.[3]

Patients with the same type and stage of breast cancer can still have tumours driven by different genetic changes. Those differences can affect how well they respond to treatment, meaning that a therapy effective for one patient may offer limited benefit to another. Inherited mutations create a second challenge because close relatives may carry the same elevated risk without knowing it.[4]

Genomic testing addresses both problems. It can help clinicians match treatment more closely to the biology of an individual tumour and identify relatives who may benefit from earlier screening or preventive care. The programme was designed to bring those two applications together, using genetic information to support both personalised treatment and family-level prevention.[5]

HOW THE TECHNOLOGY WORKS

The programme combines genomic testing with specialist clinical interpretation. Eligible patients are screened across a panel of 47 cancer-associated genes, covering both germline mutations inherited at birth and genetic changes found within the tumour itself.[6]

Sequencing is carried out through M42's Biogenix Labs, described as the region's largest omics facility, which produces a clinical genetics report within 2 weeks of receiving the patient's data. Genetic counsellors and oncologists then interpret the findings and use them to shape an individual treatment or prevention plan.[7] Artificial intelligence supports this process by helping analyse genomic data, identify relevant biomarkers, and clarify the molecular pathways and potential treatment targets that distinguish one case from another.[8]

The programme is supported by a wider national research and clinical network. It was developed by the Department of Health with Mubadala Health and Cleveland Clinic Abu Dhabi, with NYU Abu Dhabi and Mohamed bin Zayed University of Artificial Intelligence contributing research and AI expertise. It also draws on genomic data generated through the Emirati Genome Programme.[9] Clinical guidelines for germline testing in breast and ovarian cancer have been issued across the emirate, helping standardise how the approach is applied in practice.[10]

256
TOTAL PATIENTS
given tailored treatment and prevention plans

207
RELATIVES PROTECTED
through personalised prevention plans

47-GENE
PANEL TOOL
used to assess every patient

IMPACT AND RESULTS

The 256 patients supported by the programme were assessed using a 47-gene panel, with genetic counsellors and specialists using the results to inform personalised treatment or prevention plans.[11]

Its impact also extends beyond individual patients. Where inherited cancer-linked mutations were identified, the programme developed personalised prevention plans for 207 relatives who carried the same risk but had not developed disease.[12] A further 200 Emiratis aged 25 to 50 were selected through the Emirati Genome Programme and screened for variants associated with breast, ovarian, colorectal, and lung cancer, extending the preventive approach to a wider population.[13]

The programme has also established the clinical and regulatory framework needed for broader use. The Department of Health and its partners developed testing policies and clinical guidelines, including emirate-wide guidance for germline testing in breast and ovarian cancer.[14]

WHAT'S NEXT

The programme is already expanding beyond breast cancer. The Department of Health and M42 have partnered with AbbVie to apply precision medicine to multiple myeloma and non-small-cell lung cancer, drawing again on data from the Emirati Genome Programme.[15] Over time, the same model extends beyond oncology to other chronic diseases.[16]

Its broader significance lies in the system being established: genomic data is linked to common clinical standards, coordinated delivery, and the UAE's own population-level evidence. This creates a pathway for precision medicine to become part of routine care in Abu Dhabi rather than remain confined to research programmes.[17]

Dr Asma Ibrahim Al Mannaei, Executive Director of the Research and Innovation Centre at the Department of Health – Abu Dhabi, set the programme in a wider frame: "Our ambitions for the Abu Dhabi Precision Medicine Programme extend beyond oncology – over the next period, we aim to consolidate learnings, unify efforts and address other chronic diseases hindering the health and well-being of community members."[18]

In June 2026 the model reached beyond oncology altogether: M42 and the Department of Health began an Alzheimer's prevention trial that draws on the Emirati Genome Programme to identify people at risk before symptoms appear.[19]

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4IR Technologies:
Digital twins, AI, Cloud computing

Emirate:
Abu Dhabi

Maturity:
Pilot Deployment

Type:
Public-Private

HEALTHCARE

077

Population Health Intelligence: Modelling an Emirate's Health to Prevent Disease

ACTORS

Department of Health – Abu Dhabi
Microsoft

SNAPSHOT

Abu Dhabi is developing a digital twin of population health: a continuously updated model that brings together clinical, lifestyle, environmental, and demographic data from across the emirate. Developed by the Department of Health with Microsoft, the Population Health Intelligence platform is designed to identify emerging risks and simulate the likely effects of public-health interventions before they are introduced.[1]

Unveiled at the Gulf Information Technology Exhibition (GITEX) Global in October 2025, the platform was described by the Department of Health as a global first in AI-powered population health at emirate scale.[2]

WHY IT MATTERS

Preventive care depends in part on identifying health risks before disease becomes advanced. Chronic conditions such as heart disease, diabetes, obesity, and cancer can develop over many years, making earlier detection of changing risk patterns valuable for both individual care and health-system planning.[3]

Abu Dhabi is well placed to take a more predictive approach because much of the required data infrastructure already exists. Malaffi connects public and private healthcare providers and insurers across the emirate, while the Emirati Genome Programme adds population-scale genomic information.[4] Together, these systems provide a detailed record of population health, but records alone describe the past rather than forecast what may happen next.

The Population Health Intelligence platform is designed to make that shift. By combining a digital twin of the emirate's population with AI-driven analysis, it aims to identify emerging risks, model how disease may spread or intensify, and test the likely effect of public-health interventions before they are introduced.[5]

HOW THE TECHNOLOGY WORKS

At the centre of the platform is a digital twin, a continuously updated software model of Abu Dhabi's health ecosystem. It brings together data that would otherwise sit in separate systems, including clinical records, lifestyle and behavioural information, and environmental and demographic data, to create a unified view of population health.[6]

The platform performs two main functions. First, AI analyses the combined data to identify anomalies, emerging trends, and areas where health risks may be increasing.[7] Second, AI agents, advanced analytics, and geospatial modelling are used to simulate the likely effects of policies or clinical interventions on the virtual population before they are introduced in practice.[8]

As new data enters the system, the model updates its understanding of the population. The Department of Health describes this as a learning health system, one that evolves continuously rather than relying on a fixed historical picture. Microsoft provides the cloud and AI infrastructure supporting the platform.[9]

1ST GLOBALLY
in AI-powered population health at emirate scale

2 FOCUS AREAS
obesity and cancer, the platform's initial priority conditions

IMPACT AND RESULTS

The platform was launched in October 2025 and is in the early stages of deployment.[10] Its first focus areas are obesity and cancer, where earlier population-level intervention could have a substantial effect. Policymakers and clinicians can use the platform's forecasts to target prevention, allocate resources, and design health policy around predicted need.[11]

The platform also brings together infrastructure Abu Dhabi has built over several years. Malaffi provides emirate-wide health-data exchange, while the Emirati Genome Programme contributes population-scale genomic information. The Population Health Intelligence platform adds the analytical layer needed to turn those connected datasets into forecasts and simulated interventions.[12]

WHAT'S NEXT

The next phase is to expand the platform beyond obesity and cancer and incorporate more genomic, environmental, and lifestyle data, allowing the digital twin to develop into a broader model of population health across the emirate.[13]

Abu Dhabi also plans to share the approach internationally. The Department of Health and Microsoft have presented the platform as a potential blueprint for other governments seeking to move from reactive treatment towards predictive and preventive care.[14]

Dr Noura Khamis Al Ghaithi, Undersecretary of the Department of Health – Abu Dhabi, set out the ambition behind the platform: "Our mission goes beyond delivering healthcare. We are shaping a new era of healthy longevity where data, prevention and innovation come together to empower healthier lives."[15]

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4IR Technologies:
AI, Robotics, Biotechnology

Emirate:
Abu Dhabi

Maturity:
Operational Deployment

Type:
Public-Private

HEALTHCARE

078

AI-Powered Diagnostic Laboratory and Digital Pathology Hub (PureLab)

ACTORS

PureHealth
PureLab

SNAPSHOT

In December 2025, PureHealth inaugurated a 70,000-square-foot diagnostic laboratory developed under its PureLab subsidiary. The seven-storey Abu Dhabi facility operates continuously and combines AI, robotics, automated sample transport, and real-time quality control. It has installed capacity to process more than 30 million samples annually and offers over 1,800 test parameters.[1]

The facility also serves as the central hub of PureLab's Digital Pathology Initiative. Whole Slide Imaging converts pathology slides into high-resolution digital images that can be examined remotely and analysed with AI-assisted tools. The platform connects oncology centres across the UAE and supports virtual consultations between pathologists.[2]

WHY IT MATTERS

The Department of Health – Abu Dhabi builds its model on four pillars, with prevention and proactivity first, alongside quality of care, innovation, and preparedness and response; diagnostics underpin all four. Laboratory services operate behind much of the healthcare system. Routine blood tests, molecular diagnostics, cancer pathology, newborn screening, infectious-disease surveillance, and transplant matching all depend on specimens being processed accurately and returned to clinicians quickly.

PureLab already manages a network of more than 140 laboratories with over 50 international accreditations. The new facility gives that network a central, high-capacity platform for routine and specialist testing. Healthcare providers can submit a broad range of tests through one system instead of coordinating with several separate laboratories.[3]

Centralisation is particularly important for complex tests that require specialist equipment or expertise. PureLab's menu includes molecular genetics, haematopathology, anatomical pathology, and histocompatibility testing for organ and bone-marrow transplantation, alongside routine chemistry, immunoassay, serology, coagulation, and microbiology. The laboratory also supports national programmes including newborn screening and infectious-disease monitoring.[4,5]

Digital pathology addresses a different constraint. Conventional pathology requires a specialist to examine a physical glass slide under a microscope. If expertise is located elsewhere, the slide must be transported or another opinion obtained later. Whole Slide Imaging allows the complete slide to be scanned, stored, and shared digitally. Specialists at different hospitals can view the same image, consult remotely, and use image-analysis software without moving the original specimen.

The 4IR element is therefore broader than using an algorithm to interpret a test. Robotics and automated transport manage the physical movement of specimens, digital systems coordinate testing and quality control, and AI-assisted image analysis supports specialists examining pathology slides.

HOW THE TECHNOLOGY WORKS

Laboratory requests enter through PureLab's unified platform from hospitals, clinics, and community services. The facility also supports walk-in collection and home-testing pilots. Once a specimen reaches the laboratory, automated transport and robotic systems move it through the appropriate preparation and analytical workflow.[6]

The exact process depends on the requested test. Chemistry and immunoassay systems measure compounds or biomarkers in blood and other specimens. Microbiology workflows test for infectious organisms, while molecular laboratories analyse genetic material. Anatomical pathology examines tissue, haematopathology investigates disorders affecting blood and bone marrow, and histocompatibility testing evaluates immune compatibility between transplant donors and recipients.[7]

AI supports two parts of the process. First, it is integrated with the laboratory's wider automation systems, which operate alongside real-time quality control as samples move through the facility. Second, it supports the analysis of digital pathology images by detecting disease markers and visual anomalies that require specialist attention.[8]

The digital pathology pathway begins after a tissue sample has been prepared on a glass slide. A Whole Slide Imaging scanner captures the complete slide at high resolution, creating an image that can be navigated on screen in a similar way to examining tissue through a microscope. AI-assisted image analysis searches these images for disease markers and visual anomalies, presenting its findings alongside the digital slide for specialist interpretation.[9]

Because the slide has become a digital file, it can be made available to pathologists at other connected centres. PureLab's platform supports real-time remote viewing and virtual consultation across its oncology network. The same architecture can also support second opinions without transporting the physical slide between hospitals.[10]

30M+
SAMPLES PER YEAR
processing capacity

1,800+
TEST PARAMETERS
offered by the lab

16.9M
TESTS COMPLETED
across PureLab's network in H1 2025, +19% YoY

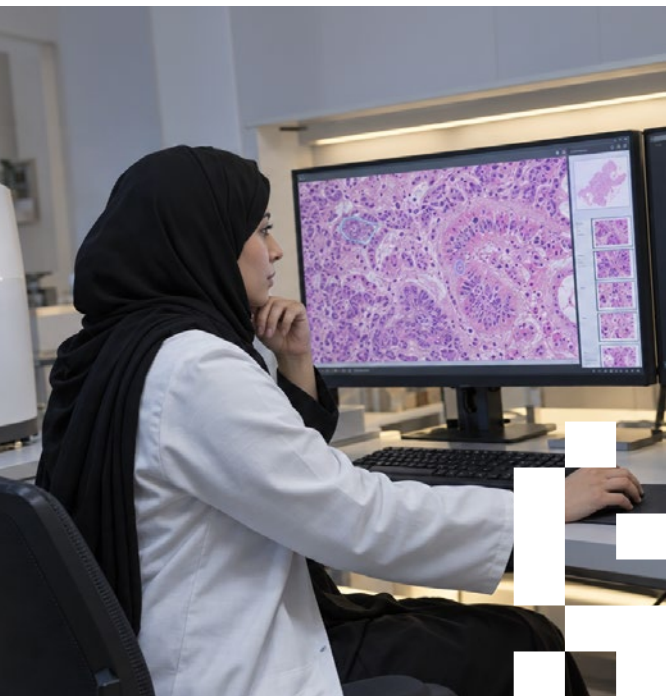
IMPACT AND RESULTS

The laboratory entered continuous operation in December 2025 with more than 30 million samples of annual processing capacity. Its 1,800-plus test parameters cover both high-volume routine diagnostics and specialist fields that previously required separate laboratory pathways. The facility is integrated with PureLab's national network rather than operating as an isolated laboratory.[11]

It was introduced into an already substantial operating system. In the first half of 2025, before the new hub opened, PureLab's wider network completed 16.9 million tests, an increase of 19% over the corresponding period in 2024. PureHealth attributed that growth principally to increased activity from SEHA and the integration of Sheikh Shakhbout Medical City's laboratory into the network.[12]

The facility also marks the operational deployment of PureLab's digital pathology programme. PureLab had previously identified major anatomical-pathology laboratories at Tawam Hospital, Sheikh Khalifa Medical City, Sheikh Khalifa Specialty Hospital, Al Qassimi Women's and Children's Hospital, and Sheikh Shakhbout Medical City for Whole Slide Imaging and advanced image analysis. The new laboratory now acts as the AI-enabled hub connecting oncology centres across the country.[13,14]

PureLab combines a continuously operating physical facility, an established national laboratory network, deployed automation, and an active digital pathology platform. It is a working diagnostic infrastructure project operating at national-network scale.



WHAT'S NEXT

The laboratory was constructed with capacity for further expansion. Its existing platform provides a base for handling more routine and complex testing and for extending digital pathology, remote specialist consultation, and AI-assisted image analysis across connected facilities.[15]

Community access is another area for expansion. The facility already supports walk-in diagnostics and home-testing pilots, potentially connecting sample collection outside hospitals with the same automated processing and reporting infrastructure.[16] PureHealth has also stated that it is continuing to invest in AI-enabled clinical technologies and capacity across its UAE healthcare system.[17]

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HEALTHCARE

4IR Technologies:
AI

Emirate:
Abu Dhabi

Maturity:
Operational Deployment

Type:
Public-Private

079

AI-Assisted Colorectal Cancer Screening

ACTORS

Cleveland Clinic Abu Dhabi
M42

SNAPSHOT

Cleveland Clinic Abu Dhabi operates the UAE's largest AI-assisted colonoscopy centre. In July 2024, the hospital reported that six AI-assisted colonoscopy units had screened more than 2,000 patients since January of that year.[1]

The system analyses live endoscopic video during a colonoscopy and helps the physician identify possible polyps or other abnormalities. It supports the doctor without replacing them, and the physician decides whether an area requires closer examination, removal or biopsy.[2]

WHY IT MATTERS

Colorectal cancer commonly develops from initially benign growths known as polyps. Identifying and removing these growths during screening can prevent them from becoming cancerous, while detecting established cancer at an early stage can improve treatment options and outcomes.[3]

In Abu Dhabi, the Department of Health recommends routine colorectal cancer screening for men and women aged 40 to 75. People at average risk are advised to undergo either an annual faecal immunochemical test or a colonoscopy every 10 years.[4]

A colonoscopy produces a continuous video of the colon as the endoscope moves through it. The physician must inspect changing folds, surfaces and angles while also controlling the instrument and conducting the procedure. Subtle abnormalities can be difficult to distinguish from surrounding tissue. Cleveland Clinic Abu Dhabi notes that a missed polyp may remain undetected for 8 to 10 years before progressing into cancer.[5]

AI-assisted colonoscopy adds computer vision to this process. The software continuously analyses the same video viewed by the physician and draws attention to areas that resemble abnormalities found in its training data. The value lies in providing the prompt while the suspected lesion is still visible and can be examined immediately.

2,000+
PATIENTS
screened using AI-assisted colonoscopy in 7 months

HOW THE TECHNOLOGY WORKS

Before the procedure, the patient completes bowel preparation so that the lining of the colon can be seen clearly. During the colonoscopy, a flexible endoscope containing a light and camera transmits live video from inside the colon to a display.[6]

Algorithms trained on endoscopic images and recordings analyse the live feed for abnormalities, lesions and possible signs of cancer. When the system identifies a suspicious area, it draws the physician's attention to it.[7]

The alert is not a diagnosis. The physician inspects the area, changes the viewing angle or clears the surface when necessary, and determines whether it represents normal tissue or a possible lesion. If a polyp is confirmed and can be removed safely, it may be excised during the same procedure and sent for pathological examination. Larger or more complex lesions can be biopsied or referred for further treatment.[8]

This arrangement keeps the clinician in control while allowing the algorithm to perform a narrowly defined task continuously. The technology does not conduct the colonoscopy, remove tissue or determine the final diagnosis. It supports visual detection during a procedure in which missed abnormalities can have consequences years later.[9]

In a separate multicentre randomised trial involving 685 patients, comparable computer-aided detection increased adenoma detection from 40.4% to 54.8%, mainly by identifying additional small lesions, without extending withdrawal time.[10]

IMPACT AND RESULTS

Cleveland Clinic Abu Dhabi used six AI-assisted colonoscopy units to screen more than 2,000 patients during the first 7 months of 2024. This was a clinical deployment involving six units and thousands of patients, not a technical demonstration.[11]

The hospital now states that AI assistance is available in every endoscopy suite where colonoscopies are performed. Patients can consequently receive AI-supported analysis as part of the hospital's standard colonoscopy workflow instead of being directed to a single specialised room.[12]

The system also changes when computational support enters the clinical pathway. Possible abnormalities are highlighted while the colonoscope is still inside the patient, allowing the physician to return to the area, inspect it more closely and remove an appropriate lesion during the same procedure. Detection and intervention can therefore take place within one appointment.

WHAT'S NEXT

With AI available in every endoscopy suite, future impact will depend less on adding equipment than on reaching more people eligible for routine screening. Abu Dhabi's colorectal cancer programme sets a desirable emirate-wide screening participation rate above 70%.[13]

For Cleveland Clinic Abu Dhabi, higher participation would increase the number of patients receiving AI-assisted colonoscopy before symptoms appear, when precancerous polyps can still be identified and removed during the procedure.[14]

Abu Dhabi has since moved to widen access. In January 2025, the Department of Health selected a blood-based screening test for use across the emirate, with around 10,000 people expected to be screened in the first year, addressing the low participation that limits early detection.[15]

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4IR Technologies:
IoT

Emirate:
Abu Dhabi

Maturity:
Pilot Deployment

Type:
Public-Private

HEALTHCARE

080

Connected Diagnostic Capsule for Upper Gastrointestinal Bleeding (PillSense)

ACTORS

Sheikh Shakhbout Medical City
Abu Dhabi Department of Health
EnteraSense

SNAPSHOT

Sheikh Shakhbout Medical City introduced PillSense in June 2026, a swallowable diagnostic capsule that detects blood in the upper gastrointestinal tract. The system has been in clinical use internationally since the United States Food and Drug Administration approved it in February 2023, and it is distributed across the United States by Cook Medical. An optical sensor inside the capsule analyses light absorption and transmits its findings wirelessly to a handheld receiver. Clinicians receive a “Blood Detected” or “No Blood Detected” result in under 10 minutes.[1]

PillSense is based on technology licensed from Brigham and Women's Hospital and Harvard Medical School and was developed by Galway-based EnteraSense, the system's manufacturer.[2,3] During its pilot at Sheikh Shakhbout Medical City, PillSense supported clinicians in determining that an invasive procedure was not immediately required in 86% of assessed cases. The Abu Dhabi Department of Health is supporting its expansion across the emirate.[4]

WHY IT MATTERS

The Department of Health – Abu Dhabi builds its model on four pillars, with prevention and proactivity first, alongside quality of care, innovation, and preparedness and response; faster diagnosis in emergency care sits within that last pillar. Upper gastrointestinal bleeding originates in the oesophagus, stomach, or duodenum. It can range from limited blood loss to a medical emergency requiring resuscitation and urgent treatment. Patients may arrive with vomiting of blood, black stools, dizziness, weakness, or unexplained anaemia, but these signs do not always reveal whether bleeding is active or how urgently an intervention is needed.[5]

Clinicians traditionally combine the patient's symptoms, vital signs, blood tests, and clinical risk scores to decide what should happen next. Endoscopy can then locate the source of bleeding and provide treatment during the same procedure.[6] It requires specialist staff and facilities, however, and many patients assessed for suspected bleeding do not ultimately need immediate endoscopic intervention.[7]

PillSense provides information during the gap between initial assessment and endoscopy. A positive result can help prioritise a patient for urgent investigation, while a negative result can support continued observation or a less urgent pathway when consistent with the rest of the clinical assessment. The capsule does not produce images or locate a lesion. It answers the narrower and more immediate question of whether blood is present in the upper gastrointestinal tract.[8]

The Internet of Things element is the connection between a sensor operating inside the body and an external clinical receiver. The capsule performs the measurement at the point of concern, transmits the data wirelessly, and delivers a result while the patient remains in the emergency department.

HOW THE TECHNOLOGY WORKS

PillSense consists of a single-use capsule and a reusable handheld receiver. A trained healthcare professional pairs the two devices wirelessly before the patient swallows the capsule. The test does not require special patient preparation or specialist imaging equipment.[9]

As the capsule enters the upper gastrointestinal tract, its optical sensor measures light absorption across multiple wavelengths. Blood and haematin produce recognisable optical signals, allowing the device to determine whether either is present. The capsule transmits its readings to the receiver in real time, where they are processed into one of two messages: "Blood Detected" or "No Blood Detected". The complete process takes less than 10 minutes.[10]

The result becomes an additional input to clinical decision-making. It can be considered alongside blood pressure, heart rate, haemoglobin levels, symptoms, medical history, and established risk scores. If blood is detected, clinicians can escalate the patient for endoscopy and treatment. If it is not detected, they can assess whether an immediate invasive procedure is necessary.

86%
PROCEDURES AVOIDED
in cases where an invasive procedure was found not immediately required

IMPACT AND RESULTS

During the Sheikh Shakhbout Medical City pilot, PillSense supported a decision that an invasive procedure was not immediately required in 86% of assessed cases. This connects the capsule's rapid diagnostic result with a practical clinical outcome: determining which patients require urgent intervention and which can be managed through a less invasive pathway.[11]

The result also has implications for emergency department workflow. A "Blood Detected" reading can help clinicians prioritise endoscopy capacity for patients with evidence of bleeding. A "No Blood Detected" result can reduce diagnostic

IMPACT AND RESULTS CONT'D

uncertainty while other observations and tests continue. Sheikh Shakhbout Medical City reports results in under 10 minutes, so patients receive an initial answer instead of waiting hours for a specialist procedure.[12]

Evidence from a separate prospective clinical trial involving 126 patients supports the reliability of this triage function. Each patient underwent endoscopy within 4 hours of taking the capsule, allowing the PillSense result to be compared with direct examination of the upper gastrointestinal tract. The capsule achieved sensitivity of 92.9%, specificity of 90.6%, and a negative predictive value of 97.8%. No adverse events or deaths related to the system were reported.[13]

At Sheikh Shakhbout Medical City, the capsule has therefore been tested as part of an emergency care pathway and not as a standalone technology demonstration. Its principal contribution is speed, converting an internal physiological signal into information that clinicians can use before deciding whether to proceed with an invasive examination.

WHAT'S NEXT

Following the pilot, the next phase is to provide wider availability across Abu Dhabi. Supported by the Department of Health – Abu Dhabi, the expansion is intended to extend rapid blood detection beyond the original hospital pilot into emergency care pathways across the emirate.[14]

The wider deployment is intended to help hospitals prioritise patients who require urgent intervention while avoiding immediate endoscopy when it is not clinically necessary. Abu Dhabi authorities expect this approach to shorten waiting times, reduce pressure on emergency departments, and improve the use of specialist resources across the healthcare network.[15]

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4IR Technologies:
AI, Robotics

Emirate:
Abu Dhabi

Maturity:
Pilot Deployment

Type:
Public-Private

HEALTHCARE

081

AI-Assisted Tele-Stroke Robot (LEO360)

ACTORS

SEHA
Sheikh Tahnoon bin Mohammed Medical City
Tawam Hospital
Lyons Global

SNAPSHOT

In January 2025, SEHA deployed the LEO360 AI-assisted tele-stroke robot at Sheikh Tahnoon bin Mohammed Medical City and Tawam Hospital. Described as the UAE's first AI-assisted tele-stroke hub, the system connects emergency department teams with remote neurologists through a physician-controlled mobile robot.[1]

When a suspected stroke patient arrives, the hospital can activate the robot as part of its stroke response. A neurologist connects remotely, communicates with the patient and clinical team, conducts a neurological examination, and reviews available imaging and clinical information. Six patients assessed through the system between January and April 2025 were included in a published case series.[2]

WHY IT MATTERS

Stroke sits high among the UAE's health priorities: cerebrovascular disease is among the top three causes of death and disability in the country, and the Department of Health – Abu Dhabi established a stroke network in 2022 and classified stroke-treating facilities to route patients to the right level of care. An ischaemic stroke occurs when a vessel supplying blood to the brain is obstructed. Eligible patients may receive clot-dissolving medication or undergo mechanical thrombectomy, but both treatments are highly time-sensitive.[3] The case-series authors report a shortage of vascular neurologists outside major urban centres and estimate that patients in remote or rural areas may face 60 to 90 minutes of travel to reach a hospital equipped for neuroimaging and specialist stroke treatment.[4]

Suspected stroke can resemble other neurological conditions. Rapid specialist assessment is therefore needed to interpret the patient's symptoms, neurological signs, and imaging before selecting treatment, admitting the patient, or deciding whether transfer is necessary.[5]

Tele-stroke care allows a limited pool of neurologists to cover multiple hospitals without travelling to each patient. The bedside robot extends this model beyond a conventional video call by giving the specialist a controllable physical presence within the clinical environment.[6]

HOW THE TECHNOLOGY WORKS

The process begins when emergency staff activate a stroke code. An alert is sent to the neurologist covering the service, who connects to the robot remotely. Before deployment, SEHA trained 56 nurses, 30 emergency physicians, and 11 neurologists in stroke-code activation, robot operation, troubleshooting, and integration with existing hospital workflows.[7]

The neurologist controls the robot's movement and examination camera. The camera provides high-definition video, optical zoom, and remote pan-and-tilt controls, allowing close observation of the patient's pupils, facial symmetry, speech, and limb movement. The remote neurologist conducts and documents the neurological assessment, including National Institutes of Health Stroke Scale scoring, while bedside staff assist with hands-on components where required.[8]

The platform can connect with clinical and monitoring devices and was reported to include more than 16 diagnostic tools capable of capturing 63 clinical parameters. Information from these devices can be presented within the teleconsultation, allowing the remote specialist to examine the patient while reviewing supporting clinical data.[9]

The robot also connects with SEHA's electronic medical records and Picture Archiving and Communication System, giving the neurologist access to the patient's history and CT, CTA, or MRI images. AI supports automated alerts, imaging integration, workflow coordination, and the synthesis of incoming information. It does not perform the neurological examination or make the final diagnosis and treatment decision, which remain under the neurologist's control.[10]

IMPACT AND RESULTS

This case is a strong example of 4IR technology convergence across robotics, AI, and real-time telemedicine. The robot provides a mobile physical presence at the bedside, while its digital platform connects clinical devices, hospital records, and imaging systems. AI supports the movement of information through the stroke pathway without replacing the neurologist.

SEHA's published evaluation covered six consecutive patients assessed between January and April 2025. Their presentations were subsequently identified as strokes, stroke mimics, or other neurovascular conditions, including vertigo, possible hemiplegic migraine or transient ischaemic attack, arteriovenous malformations, and a lacunar infarct. The system supported remote assessment and decisions on admission, monitoring, further imaging, and treatment.[11]

The clearest measurable result was faster access to a neurologist. Patient-level consultation times ranged from 8 to 14 minutes and averaged 10.7 minutes, compared with historical records indicating waits of more than 40 minutes before implementation. The study's authors described this as an approximately 75% reduction.[12]

Real-patient use at two hospitals is supported by trained emergency staff and continuous specialist coverage. The published evaluation, involving six patients and historical benchmarks, provides evidence of feasibility and workflow performance.[13]

WHAT'S NEXT

The study's authors identify expansion to additional hospitals across the UAE as the next stage of deployment. Connecting more facilities to the same tele-stroke network could extend specialist coverage beyond the original two-hospital pilot, particularly where an on-site vascular neurologist is not continuously available.[14]

Further development could also incorporate AI-assisted imaging triage, enabling urgent scans to be prioritised and presented to the neurologist more quickly. The authors recommend collecting longer-term clinical outcomes, including 90-day functional assessments, and conducting comparative cost-effectiveness studies to determine whether faster specialist access translates into improved recovery and lower system costs at a larger scale.[15]

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4IR Technologies:
IoT

Emirate:
Abu Dhabi

Maturity:
Pilot Deployment

Type:
Private

HEALTHCARE

082

Implantable Remote Heart-Failure Monitoring (CardioMEMS)

ACTORS

Cleveland Clinic Abu Dhabi
Abbott

SNAPSHOT

In July 2026, Cleveland Clinic Abu Dhabi became the first hospital in Abu Dhabi to implant an advanced wireless monitoring sensor designed to detect deterioration in chronic heart-failure patients before symptoms occur. The device has been in clinical use internationally since the United States Food and Drug Administration approved it in May 2014, and more than 26 million people worldwide live with heart failure. The implant brings an established standard of monitoring into routine use in the emirate. The first recipients were two Emirati patients, aged 62 and 79, both with histories of repeated hospital admissions as their heart failure worsened.[1]

The implant is Abbott's CardioMEMS CM2000, a wireless pulmonary-haemodynamic monitoring system approved by the Department of Health – Abu Dhabi (DoH) for use at Cleveland Clinic Abu Dhabi. The device was also identified as CardioMEMS in subsequent reporting on the hospital's first two procedures.[2,3] A sensor implanted permanently in the pulmonary artery measures pressure that can indicate deterioration before symptoms become apparent.[4]

WHY IT MATTERS

Heart-failure admissions are commonly preceded by congestion, which can be signalled by rising intracardiac and pulmonary-artery pressures. DoH's assessment of CardioMEMS notes that these pressure changes can begin days or weeks before overt clinical congestion requires hospital admission.[5]

The implant gives clinicians access to these pressure readings while the patient is at home. Regular remote monitoring allows increases in pulmonary-artery pressure to be identified earlier and can support intervention and medication adjustment before deterioration progresses to hospitalisation.[6]

HOW THE TECHNOLOGY WORKS

CardioMEMS uses a small wireless pressure sensor, approximately the size of a paper clip, that is permanently implanted in the pulmonary artery during a catheterisation procedure. At Cleveland Clinic Abu Dhabi, implantation is performed under local anaesthesia and mild sedation and typically takes 1 to 2 hours.[7]

At home, the patient uses the wireless monitoring system to transmit a daily pressure reading. The responsible physician receives regular reports on the patient's haemodynamic status, together with alerts when pressures increase, supporting earlier intervention and adjustment of medication.[8] The system therefore links an implanted sensor, a home-based wireless monitoring unit, and a hospital reporting platform into a remote heart-failure management pathway.[9]

37%
HOSPITALISATIONS REDUCTION
for heart-failure related hospitalisation cases

IMPACT AND RESULTS

The July 2026 procedures marked the first deployment of this type of implantable heart-failure monitoring in Abu Dhabi. The first two patients, aged 62 and 79, had both experienced repeated hospital admissions associated with worsening heart failure.[10]

The technology enters Abu Dhabi with an established international clinical evidence base. In its assessment, DoH cited the CHAMPION study, in which CardioMEMS-guided monitoring was associated with a 37% reduction in heart-failure hospitalisations among patients whose devices were activated compared with the control group. DoH also identified reduced hospital admissions and improved management of heart-failure symptoms among the demonstrated advantages of the technology.[11]

WHAT'S NEXT

Following the first implants, Cleveland Clinic Abu Dhabi says it is expanding access to advanced heart-failure management solutions closer to home.[12]

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4IR Technologies:
Blockchain

Emirate:
UAE-wide

Maturity:
Operational Deployment

Type:
Public

FINTECH

083

Multi-CBDC Cross-Border Settlement on Distributed-Ledger Infrastructure (mBridge)

ACTORS

Central Bank of the UAE
mBridge partner central banks
R3
G42 Cloud

SNAPSHOT

mBridge is the world's first operational platform for settling cross-border payments using multiple central bank digital currencies. Built on shared distributed-ledger infrastructure, it enables participating central banks to transfer and settle funds directly in central bank money, without relying on correspondent banking networks.[1] The Central Bank of the UAE (CBUAE) co-developed the platform and moved its own implementation from pilot testing into live production in November 2025.[2] The UAE participates through the Digital Dirham, which was first used for a real-value cross-border transaction in January 2024, while mBridge was still in its pilot phase. The

transaction saw Sheikh Mansour bin Zayed Al Nahyan, Chairman of the Central Bank, transfer AED 50 million to China over the platform.[3] Since then, transaction volumes across mBridge have exceeded USD 55 billion, reflecting its evolution from experimental infrastructure into an operational cross-border settlement network.[4]

WHY IT MATTERS

Cross-border payments still rely heavily on correspondent banking, a chain of intermediary banks that can add cost, delay, and operational complexity to international transfers. mBridge was designed to address these inefficiencies while preserving each jurisdiction's control over its own currency.[5] For the UAE, participation in mBridge forms part of the CBUAE's Central Bank Digital Currency Strategy, one of the initiatives under its Financial Infrastructure Transformation Programme, launched in 2023. The strategy establishes the Digital Dirham as new financial infrastructure for domestic and cross-border payments.[6]

mBridge changes the mechanics of cross-border settlement. With participating central banks operating on a shared distributed ledger, payments can move directly between jurisdictions and settle within seconds in sovereign digital currency, without passing through a chain of correspondent banks.[7] The Digital Dirham is the UAE's instrument within that architecture, designed to support retail, wholesale, and cross-border settlement in central bank money.[8]

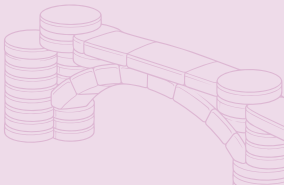
HOW THE TECHNOLOGY WORKS

mBridge is a shared distributed ledger that connects the central banks of the UAE, China, Hong Kong, Thailand, and Saudi Arabia with more than 20 commercial banks. A cross-border payment can be transferred and settled directly on the platform in central bank money, within seconds and at near-zero cost, without passing through traditional correspondent banking networks.[9,10] The platform began in 2021 as a collaboration between the Bank for International Settlements (BIS) Innovation Hub and its founding central banks. Saudi Arabia joined in 2024, and the BIS has since stepped back, leaving mBridge under the stewardship of its participating central banks.[11]

The Digital Dirham is the UAE's settlement currency on mBridge: a digital form of the dirham issued by the Central Bank of the UAE using distributed-ledger technology. Domestically, it operates through a two-tier model. The Central Bank issues the currency, while licensed intermediaries, including banks, exchange houses, finance companies, and fintechs, provide the wallets through which individuals and businesses can hold, transfer, top up, and redeem Digital Dirhams.[12] R3 and G42 Cloud were appointed to build and implement the underlying infrastructure.[13]

4K+
Cross-border transactions processed on mBridge

USD 55B+
Combined value of transactions processed across the platform



IMPACT AND RESULTS

mBridge has processed more than 4,000 cross-border transactions with a combined value exceeding USD 55 billion, demonstrating that multi-CBDC settlement can operate at meaningful scale while completing payments in seconds at near-zero cost.[14] The UAE has also recorded several of the platform's defining milestones. Its January 2024 transaction marked the first issuance of the Digital Dirham as legal tender[15] and the first real-value cross-border CBDC payment between a MENA country and a country outside the region.[16] In November 2025, the CBUAE moved its mBridge implementation into live production.[17]

In November 2025, the UAE Ministry of Finance and the Dubai Department of Finance executed the first live government financial transaction in Digital Dirham, completed in under 2 minutes and launching the pilot phase of the wholesale programme.[18] A real-value retail pilot was completed in early 2024,[19] and the Central Bank reported the Financial Infrastructure Transformation (FIT) Programme 85% complete at the start of 2025.[20]

WHAT'S NEXT

The CBUAE is preparing Phase 2 of its mBridge implementation as the platform expands beyond its original group of participating central banks.[21,22] The next stage is therefore both deeper UAE integration and a broader network of jurisdictions able to settle directly with one another in central bank digital currency.

Domestically, the Digital Dirham is moving toward wider use through a phased rollout via licensed financial institutions.[23] This sits within the final stage of the Financial Infrastructure Transformation Programme, which targets full integration of its nine initiatives in 2026.[24] Together, these developments would extend the Digital Dirham from targeted pilots and institutional transactions toward a more established part of the UAE's domestic and cross-border payment infrastructure.

"The Digital Dirham represents one of the CBUAE's key strategic initiatives shaping the future of financial services in the UAE and marks an important achievement in the global development of central bank digital currencies. The Digital Dirham will help ensure a secure and efficient financial infrastructure for the UAE, enhance the efficiency of our payment ecosystem, support monetary stability, expand financial inclusion, and strengthen the international standing of the UAE Dirham," said H.E. Khaled Mohamed Balama, Governor, Central Bank of the UAE.[25]

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4IR Technologies:
Blockchain

Emirate:
Dubai

Maturity:
Pilot Deployment

Type:
Public-Private

FINTECH

084

Blockchain Tokenisation of Property Title Deeds (Real Estate Tokenisation Project)

ACTORS

Dubai Land Department | **VARA**
Dubai Future Foundation | **Central Bank of the UAE**
Prypco | **Ctrl Alt**
Zand

SNAPSHOT

Dubai Land Department has opened individual properties to fractional investment, with each holding tied to a registered title deed. It launched the pilot phase of its Real Estate Tokenisation Project in March 2025 with the Virtual Assets Regulatory Authority (VARA), the Dubai Future Foundation, and the Central Bank of the UAE, a project the department describes as the first of its kind launched by a real estate registration authority in the Middle East.[1] The investment platform, Prypco Mint, went live on 25 May 2025, with Prypco operating the platform, Ctrl Alt providing the tokenisation infrastructure, and Zand serving as banking partner.[2] In February 2026, Phase Two introduced secondary trading, opening approximately 7.8 million property tokens to resale between investors.[3]

WHY IT MATTERS

Buying into Dubai's property market has meant buying a whole unit, which sets the minimum investment at the price of the property and limits participation to those able to commit that capital. Dubai Land Department's stated aim for the project is to broaden the investor base while improving transparency and accelerating transactions, in line with the Dubai Real Estate Strategy 2033 and the Dubai Economic Agenda D33.[4]

What distinguishes the approach is where ownership sits. The tokens represent fractional ownership linked directly to registered title deeds, rather than shares in a special purpose vehicle that holds the asset, the indirect structure used in other jurisdictions.[5] The project is being integrated into Dubai's existing land registration and regulatory framework, and is not intended to displace the role of the land register.[6]

HOW THE TECHNOLOGY WORKS

Ctrl Alt, the project's designated tokenisation provider, converts individual properties into digital ownership units recorded on blockchain infrastructure. These tokens represent fractional interests in a property, allowing multiple investors to hold shares in the same underlying asset rather than purchasing an entire unit.[7]

The tokens are issued on the XRP Ledger and connected to Dubai Land Department systems so that the blockchain record remains aligned with the official property register.[8] Investments start from AED 2,000,[9] with purchases made exclusively in UAE dirhams rather than cryptocurrency. During the pilot, participation is restricted to Emirates ID holders.[10]

Zand Digital Bank provides the banking infrastructure for the pilot.[11] Ctrl Alt operates under a VARA licence covering broker-dealer and issuance activities, while the secondary market introduced in Phase Two functions within a regulated pilot framework.[12]

224
INVESTORS
bought into the first tokenised property, sold out in 24 hours

44
NATIONALITIES
represented among the investors

7.8M
TOKENS
created from AED 18.5M of tokenised property value

IMPACT AND RESULTS

Demand was immediate. The first tokenised property sold out within 24 hours to 224 investors, 70% of whom were entering Dubai's real estate market for the first time. Investors represented 44 nationalities and committed an average of AED 10,714 each, while the waiting list exceeded 6,000 requests.[13] Dubai Land Department subsequently issued what it describes as a first-of-its-kind Property Token Ownership Certificate, formally linking fractional digital ownership to the emirate's property-registration system.[14]

Across the pilot, 10 properties with a combined value of AED 18.5 million were tokenised, creating approximately 7.8 million property tokens.[15] On 20 February 2026, the project entered its next stage with the launch of round-the-clock secondary trading, allowing investors to buy and resell existing tokens rather than holding them until the underlying property is sold.[16] This moved the programme beyond primary issuance into an operating marketplace for tokenised real estate.

WHAT'S NEXT

Phase Two will test whether tokenised property ownership can support an active secondary market at greater scale, while strengthening the rules around transparency, governance, and investor protection.[17] Dubai Land Department also plans to broaden participation beyond UAE-based investors and bring additional platforms into the programme, expanding both its reach and the infrastructure supporting it.[18]

The longer-term ambition is significantly larger. DLD estimates that tokenised assets could account for 7% of Dubai's real estate transactions by 2033,[19] equivalent to a market of around AED 60 billion.[20] If achieved, that would move property tokenisation from a regulated pilot into a meaningful part of Dubai's real estate market.

"The introduction of a regulated secondary market marks an important step in bringing greater liquidity and flexibility to a traditionally long-term asset class. It sets a new benchmark for investor confidence and market efficiency, supported by the regulatory framework established by the Virtual Assets Regulatory Authority (VARA)," said Essa Ibrahim, Co-Founder and President, Prypco.[21]

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4IR Technologies:
AI

Emirate:
Dubai

Maturity:
Pilot Deployment

Type:
Private

FINTECH

085

Agentic AI Payments for Autonomous Commerce (Mastercard Agent Pay)

ACTORS

Mastercard Dataiera | **Majid Al Futtaim**

SNAPSHOT

On 19 November 2025, Mastercard introduced Agent Pay in the UAE through a pilot with Majid Al Futtaim and fintech company Dataiera. The framework allows a consumer's AI agent to move beyond searching and recommending products to completing a purchase on the consumer's behalf.[1] The UAE is the first market outside the United States in which Agent Pay has processed a transaction.[2] Once opened to consumers, the service will allow cardholders to use an AI agent to search for products and services, make a selection, and complete payment within the same interaction. Early use cases include booking tickets at Majid Al Futtaim's VOX Cinemas.[3]

WHY IT MATTERS

Mastercard's choice of market reflects the UAE's standing in digital payments and artificial intelligence adoption.[4] Agentic commerce turns on the question a merchant faces the moment software rather than a person arrives at the checkout: whether the agent is acting for a cardholder who authorised it. Agent Pay is designed to settle that question before the transaction begins. AI agents must be registered and verified so that merchants, issuers, and other participants in the payment chain can identify when an agent is acting on a customer's behalf and distinguish an authorised agent from an unknown or malicious one.[5]

Mastercard calls this process Know Your Agent.[6] Only verified agents can transact, and each payment must be tied to authenticated user intent and explicit consent before it is completed.[7]

HOW THE TECHNOLOGY WORKS

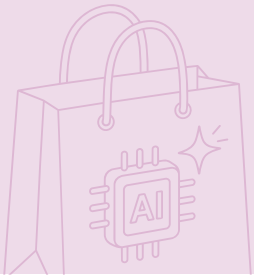
Mastercard describes Agent Pay as four components: Know Your Agent, interface standards and upgraded network tokens, consumer intent capture, and biometric authentication.[8] Together, these determine who the agent is, what it has been authorised to do, and whether a specific payment should be allowed to proceed.

After completing the Know Your Agent process, an AI agent receives a verified identity and can transact using an agentic token. Rather than exposing the consumer's underlying card credentials, the token acts as a cryptographically secured payment credential tied to that agent and to the permissions granted by the consumer. It can carry transaction-level controls such as spending limits or other restrictions, while creating a traceable record of which agent initiated the purchase.[9] Only agents that have completed the registration and verification process can obtain and use these credentials.[10]

The consumer's instructions then define the boundaries of the transaction. Each payment is linked to a specific authorised interaction, allowing the system to verify that the agent is acting within those instructions and giving the consumer visibility over which agent made the purchase and where it was made. Existing fraud-prevention and dispute-resolution protections remain part of the payment flow.[11] Where additional confirmation is required, the consumer can approve the transaction on a mobile device using biometric authentication such as a fingerprint or facial scan.[12]

1ST MARKET
outside the US where Agent Pay has processed a transaction

3–6 MONTHS
targeted timeline for Agent Pay's broader global rollout



IMPACT AND RESULTS

The launch was built around a live demonstration in Dubai. On stage, Prakriti Singh, Mastercard's Head of Core Payments for Eastern Europe, Middle East and Africa, used an AI agent to purchase a ticket from VOX Cinemas.[13,14] The transaction marked Agent Pay's first completed payment outside the United States.[15]

The UAE pilot forms part of Mastercard's broader rollout of agentic payments. By late January 2026, the company reported live Agent Pay activity in the United States, pilots in the UAE and Latin America, and Australia's first authenticated agentic transactions.[16]

WHAT'S NEXT

At a launch held in Dubai during the Dubai Future Forum 2025, Mastercard outlined a rapid international rollout for Agent Pay, with expansion across North America, Europe, Australia, and Singapore and a target of broader global availability within three to six months of that launch.[17] In the UAE, Majid Al Futtaim will use the pilot to test how AI agents can support shopping and entertainment across its physical destinations and digital channels.[18]

Mastercard is also working on the standards needed for agentic payments to scale across different platforms and providers. Through the Fast Identity Online (FIDO) Payments Working Group, it is contributing to work on verifiable credentials that can authenticate both the AI agent and the consumer behind a transaction.[19] The aim is to make those credentials interoperable and portable, so trusted agents can operate across merchants and payment environments without each system having to establish identity and consent from scratch.

"The UAE has set a new global benchmark in embracing and deploying artificial intelligence to simplify everyday life, advancing innovations that enhance the efficiency, reliability, and quality of digital interactions. The introduction of the AI Agent in payment solutions represents a significant milestone, opening new horizons for the growth and development of the UAE's digital economy," said H.E. Omar Sultan Al Olama, Minister of State for Artificial Intelligence, Digital Economy, and Remote Work Applications.[20]

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FINTECH

4IR Technologies:
AI

Emirate:
Abu Dhabi

Maturity:
Operational Deployment

Type:
Private

086
AI-Powered SME Lending

ACTORS

Magnati | **Biz2X**
RAKBANK | **WIO Bank**

SNAPSHOT

In February 2024, Abu Dhabi payments provider Magnati partnered with Biz2X to launch an AI-powered embedded-finance platform for SMEs in the UAE.[1] The platform combines Magnati's real-time payment transaction data with Biz2X's AI-powered credit evaluation, allowing merchants to view and select financing offers from multiple lenders through Magnati's payment-as-a-platform environment.[2] Later in 2024, RAKBANK and Wio Bank joined Magnati's Biz2X-powered platform as lending partners.[3]

WHY IT MATTERS

At the end of June 2024, the cumulative balance of loans and financial facilities extended by UAE banks to SMEs stood at AED 81.2 billion. This represented 9.5% of the facilities extended to the country's commercial and industrial sectors.[4] Expanding access to finance is a national policy priority under the UAE's National Agenda for Entrepreneurship and SMEs, which identifies both access to finance and digital transformation among its seven principal themes and aims to establish the UAE as an entrepreneurial nation by 2031.[5]

Conventional underwriting typically depends on financial statements, credit histories, and documents supplied during an application. These records may not fully capture the current position of merchants whose revenues are seasonal, fast changing, or concentrated in card and point-of-sale transactions.[6]

Payment data offers an additional view of business performance. Magnati processes transactions continuously across its merchant network, producing an up-to-date record of sales and settlement activity. Embedding lending into that environment allows merchants to be assessed using information generated through normal trading and to access finance through a platform they already use.[7]

HOW THE TECHNOLOGY WORKS

Magnati supplies merchant payment and settlement data, while Biz2X provides the digital-lending infrastructure and AI-powered underwriting tools. Participating lenders establish their own credit parameters and use the platform's analysis to make lending decisions and issue finance.[8]

The AI engine analyses historical and current transaction data to identify revenue patterns, assess merchant performance, and forecast daily sales. Eligible merchants can receive offers from multiple lenders through Magnati's platform, allowing them to compare available financing within a single digital environment.[9]

Repayment can also be linked to merchant settlements. Under Magnati's arrangement with RAKBANK, repayments are deducted automatically from daily payouts, aligning the collection process with the merchant's sales activity. The platform supports business loans as well as invoice, equipment, point-of-sale (POS), and receivables financing.[10]

USD 37B+

SME lending powered worldwide by the underlying Biz2X platform

48 HOURS

the fastest loan approval turnaround reported by partner lenders

IMPACT AND RESULTS

The platform moved into operational deployment in 2024, with RAKBANK and Wio Bank participating as lenders.[11] Their integrations established a multi-lender model in which Magnati's payment data supports underwriting and repayments can be incorporated directly into merchant settlement flows.[12,13]

The model has also gained traction across the wider UAE financial-services market. Network International announced a Biz2X embedded-finance partnership in July 2024,[14] followed by NEO PAY in November 2025[15] and Deem Finance in February 2026.[16] These partnerships extend transaction-data-based SME financing across payment processors, merchant platforms, and regulated lenders.

The wider deployments also demonstrate the speed the model is designed to deliver. NEO PAY reported that its integration could support loan approvals in as little as 48 hours while using transaction data to prequalify merchants and reduce lender acquisition costs.[17] Deem similarly reported that credit assessments and approvals made through its POS-based proposition are typically completed within 48 hours.[18]

Biz2X reported in February 2026 that its platform powered more than USD 37 billion in SME lending worldwide, bringing the underwriting technology, analytics, and digital infrastructure used in the UAE to financial institutions across multiple markets.[19]

WHAT'S NEXT

Magnati has positioned the platform as a marketplace that can support additional banks, finance companies, and financing products. Expanding lender participation would give merchants access to a wider range of offers while allowing financial institutions to reach businesses through Magnati's existing payments network.[20]

The technology is also extending beyond loan origination. Biz2X's wider platform direction includes AI-powered portfolio monitoring, allowing lenders to reassess risk as borrower performance changes instead of relying only on information collected at origination.[21] The combination of transaction-based underwriting, automated repayments, and ongoing monitoring creates a pathway towards a more responsive SME-lending model.

Ramana Kumar, then Chief Executive Officer of Magnati, said the partnership combined "our robust payment data with Biz2X's AI-powered underwriting platform" to simplify lending for merchants and lenders.[22]

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4IR Technologies:
AI, Blockchain, Cloud computing

Emirate:
UAE-wide

Maturity:
Scaled Deployment

Type:
Public-Private

FINTECH

087

Trade-Finance Fraud Prevention Platform (haifin)

ACTORS

e& enterprise
First Abu Dhabi Bank
UAE banking consortium
Avanza Innovations

SNAPSHOT

In April 2021, Etisalat Digital, now e& enterprise, and seven UAE banks commercially launched UAE Trade Connect, a nationwide platform for detecting duplicate and potentially fraudulent invoices before they are financed. Originally proposed by First Abu Dhabi Bank and developed with Avanza Innovations, the platform combines AI with blockchain technology to compare transactions submitted by competing lenders. The Central Bank of the UAE participated in its steering committee alongside the founding banks.[1]

UAE Trade Connect was renamed haifin in March 2024 as the company began expanding beyond the UAE. The network had grown to 15 participating lenders by the time of the rebrand. By 2026, it had expanded to 19 participants, comprising 14 commercial and Islamic banks and five fintechs.[2,3]

WHY IT MATTERS

Financial crime prevention is a national priority: the UAE adopted a National Strategy for Anti-Money Laundering, Countering the Financing of Terrorism and Proliferation Financing for 2024 to 2027, built around 11 strategic goals, and enacted a new anti-money-laundering law in October 2025. Invoice financing allows a business to raise working capital against money owed by its customers. The risk is that the same invoice can be presented to multiple banks, causing several lenders to finance the same underlying transaction. Before UAE Trade Connect, banks had no shared mechanism for detecting this form of duplicate financing across institutions.[4]

The problem cannot be solved through one bank's internal controls because each institution sees only its own financing applications. Nor can competing banks simply pool complete customer and transaction records, which contain commercially sensitive information. Haifin provides a shared verification layer through which essential invoice information can be compared without requiring lenders to disclose their complete customer files to one another.

The platform gives the bank a risk assessment before financing is approved. It does not make the lending decision: each institution remains responsible for its credit assessment, customer due diligence, and final approval. By reducing uncertainty over whether an invoice has already been financed elsewhere, the system can give banks greater confidence when lending against trade receivables, including those submitted by smaller businesses.[5]

HOW THE TECHNOLOGY WORKS

The process begins when a participating bank submits invoice details through its private blockchain node. Smart contracts replicate the information required for fraud analysis to haifin's node, where a fraud-investigation engine performs duplicate checks and risk assessments. The bank receives a pass, fail, or inspect result and decides whether to proceed. Its final financing decision is then recorded on the blockchain.[6]

Artificial-intelligence and machine-learning models compare the submitted invoice with records already supplied by other participating lenders. The system looks for exact duplicates and less obvious similarities, calculates a risk score, and flags suspicious invoices for further review. It processes more than four million data points each month, allowing its detection capability to improve as the shared dataset expands.[7]

The blockchain provides a tamper-resistant record of submitted invoices and financing decisions across the consortium. Each institution operates through its own private node, and only the data required for fraud analysis are replicated to haifin's node. The platform is cloud-native and operates on e& enterprise's E1 Cloud infrastructure in the UAE.[8]

Security is supported by a Security Operations Centre that monitors the platform in real time and a security-information and event-management system that analyses activity across the network. Haifin also reports using layered firewalls and regular vulnerability assessments and penetration testing to protect the participating institutions and their financial data.[9]

IMPACT AND RESULTS

During its first 8 months of commercial operation, the platform checked invoices worth more than AED 10 billion for duplicate financing and fraud risks.[10]

Usage continued to grow. Haifin evaluated more than AED 116 billion in trade-finance transactions during 2023, approximately 70% more than in 2022. By March 2024, the cumulative value of transactions examined since launch had exceeded AED 200 billion.[11,12]

In its 2025 integrated annual report, e& stated that haifin had identified AED 328 million in potential fraud across its UAE consortium.[13]

Haifin has also begun replicating the model internationally. In 2025, it partnered with Vodacom Business to launch Saif, a trade-finance de-risking platform that applies its blockchain and AI-based approach within the South African banking sector.[14]

These results show that haifin has developed from a seven-bank consortium project into shared financial infrastructure used across a substantial part of the UAE lending sector. Its value increases as the network expands: every additional participating lender broadens the pool of transactions against which new invoices can be assessed. The platform has been in commercial operation since 2021, with expanding institutional membership, sustained transaction volumes, and international replication.

WHAT'S NEXT

The platform's next domestic use case is digital bank guarantees. In July 2025, the Emirates Institute of Finance Innovation Hub brought together haifin, e&, and six UAE banks to test the issuance and management of guarantees through haifin's distributed-ledger platform. The controlled pilot is intended to examine the legal, operational, and technical requirements for wider implementation.[15]

E& enterprise is also applying its haifin capabilities to the UAE's national e-invoicing programme. Through a partnership with Cygnet.One, it is developing an end-to-end service that will validate and exchange structured invoices through the country's planned Peppol-based system. This connects haifin's original fraud-prevention function with a broader digital infrastructure for creating, transmitting, and verifying commercial invoices.[16]

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SPACE

4IR Technologies:
AI, Space data and Earth observation, Cloud computing

Emirate:
UAE-wide

Maturity:
Operational Deployment

Type:
Public-Private

088

The UAE's Geo-Spatial Analytics Platform (GIQ)

ACTORS

UAE Space Agency
Space42

SNAPSHOT

GIQ is the name used for the UAE's Geo-Spatial Analytics Platform, a national system for accessing satellite imagery and applying artificial intelligence to geospatial analysis.[1] Through a single environment, users can request archival or newly captured imagery from 10 providers, run analytical models, and access or publish space-data applications through a marketplace.[2]

Developed by Space42 in partnership with the UAE Space Agency, GIQ entered its operational phase at COP28 in December 2023.[3] The partners launched a next-generation version at GITEX Global in October 2025, and Space42 listed the platform on Microsoft Azure Marketplace later that month.[4,5]

WHY IT MATTERS

Satellite imagery is increasingly available but obtaining the right data and converting it into usable intelligence remains complex. Organisations may need to work with multiple providers, navigate lengthy ordering procedures, compare differences in sensor type, resolution, coverage, and revisit frequency, and rely on specialists to select and analyse suitable imagery.[6]

These barriers affect governments, businesses, and researchers seeking to use Earth observation data. In the UAE, the National Space Strategy 2030 aims to increase the space sector's contribution to the economy, develop competitive space services, and encourage partnerships among government, industry, and research institutions.[7] Achieving these objectives requires users to be able to convert satellite data into practical services and operational decisions.

GIQ addresses this gap within the UAE Space Data Center ecosystem by bringing imagery procurement, artificial intelligence analysis, and application distribution into a single environment. By connecting satellite data with the tools needed to interpret it and develop applications, the platform provides a clearer route from imagery acquisition to operational use.[8]

10 IMAGERY PROVIDERS
integrated into a single analytics environment

50 AI MODELS
internally developed and hosted on the platform

HOW THE TECHNOLOGY WORKS

Access is organised through programme partnerships and commercial contracts. During the first phase, services are provided without charge to partners in the Space Analytics and Solutions programme, including researchers, entrepreneurs, and startups. Other public and private sector organisations can obtain access through commercial contracts with Space42.[9] Within participating organisations, role-based permissions determine who can order imagery and access particular data or platform functions.[10]

An authorised user begins by defining the location, time period, and type of information required. GIQ can then retrieve archived imagery or commission a satellite to capture new data. The platform provides access to 10 imagery providers: Space42, Airbus, BlackSky, NASA Landsat, Maxar, Planet, Satellogic, the European Space Agency through Sentinel-1 and Sentinel-2, Umbra, and the Mohammed Bin Rashid Space Centre. Together, these providers operate more than 300 satellites with different optical, radar, and multispectral capabilities.[11]

GIQ includes an artificial intelligence assistant that guides users through imagery-selection and analytical workflows. It recommends suitable imagery, resolution, and models, allowing non-specialists to compare available options without examining each provider separately.[12]

Once the imagery has been obtained, users can apply existing artificial intelligence models or build their own through a no-code interface. The platform supports object detection, change analysis, mapping, and the preparation of interactive reports that combine imagery, annotations, and analytical results.[13]

Space42 also supplies GIQ with data from its Foresight constellation of synthetic aperture radar satellites. Radar imaging can collect data during the day or night and through cloud cover, providing more consistent monitoring than optical imagery alone. By June 2026, five Foresight satellites were operational and supplying imagery with resolution of up to 25 centimetres. Their integration gives GIQ access to a sovereign Earth observation capability alongside data obtained from external providers.[14]

IMPACT AND RESULTS

The next-generation platform combines access to 10 imagery providers within one environment. An agreement between the UAE Space Agency and the Mohammed Bin Rashid Space Centre also brought data from the centre's high-resolution satellites into GIQ, connecting national Earth observation assets with international imagery sources.[15]

The value of this integration lies in the decisions the resulting analysis can support. Space42 has reported using GIQ to assess flood impacts and guide emergency response, monitor environmental conditions, support urban planning, and inform food and water security planning.[16] The Space Analytics and Solutions programme supports researchers, entrepreneurs, and startups developing applications in these and other fields.

In May 2025, Space42 reported that GIQ hosted approximately 50 internally developed artificial intelligence models and had supported more than 30 operational

IMPACT AND RESULTS CONT'D

use cases across environmental resilience, disaster response, urban planning, and food security. The wider UAE Space Data Center also received the UAE Government's Future Fit Seal in recognition of its digital readiness and operational contribution.[17]

Space42's results for the first quarter of 2026 reported 939 active GIQ users across 78 organisations, providing a more recent measure of adoption.[18]

WHAT'S NEXT

GIQ's listing on Microsoft Azure Marketplace provides a route for extending the UAE-developed platform to governments, research institutions, and businesses internationally. Customers can purchase access through their existing Azure arrangements and use GIQ for applications such as environmental monitoring, infrastructure management, and urban development.[19]

The UAE Space Agency has set targets of increasing satellite-imagery requests by 50% over 2 years and achieving user satisfaction above 80% for ease of use and accuracy.[20] In its August 2026 half-year results, Space42 reported that it was continuing to scale GIQ through automated ordering from the Foresight constellation, additional artificial intelligence models, and new applications.[21]

The five operational Foresight satellites have increased the supply of national Earth observation data available through GIQ.[22] Space42 plans to continue developing the programme towards full constellation maturity in 2027, which would provide greater coverage, more frequent observations, and a stronger domestic source of imagery.[23]

Salem Butti Al Qubaisi, Director-General of the UAE Space Agency, described the wider objective: "Our Space Strategy had a clear goal: to harness space-based insights and integrate them with AI to empower nations, enterprises, and communities to make better decisions."[24]

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4IR Technologies:
Space data and Earth observation

Emirate:
Abu Dhabi

Maturity:
Pilot Deployment

Type:
Public

SPACE

089

Hyperspectral Earth Observation Mission (Arab Satellite 813)

ACTORS

UAE Space Agency | **National Space Science and Technology Center**
UAE University

SNAPSHOT

Arab Satellite 813 was launched on 10 December 2025 aboard a Lijian-1 Y11 rocket from China. Led by the UAE, it is the first joint space project among Arab countries and, according to the UAE Space Agency, the first Arab satellite equipped with hyperspectral imaging technology.[1,2] The mission is being led by the National Space Science and Technology Center (NSSTC) at UAE University and funded by the UAE Space Agency.[3]

The approximately 260-kilogram satellite carries a hyperspectral imager, panchromatic imager, and atmospheric polarimeter. It was designed for a 550-kilometre sun-synchronous orbit and a planned operating period of 3 years.[4] NSSTC reported that payload commissioning began 48 hours after launch and referenced a first end-to-end mission check.[5] The mission is progressing through commissioning towards routine scientific data delivery.

WHY IT MATTERS

Environmental changes are not always visible in conventional satellite imagery. Hyperspectral imaging records reflected light across numerous narrow wavelength bands, allowing analysts to distinguish materials and conditions through their spectral characteristics. Arab Satellite 813 is designed to apply this capability to crop health, water quality, soil conditions, coastal pollution, mineral mapping, and methane emissions.[6]

The UAE Space Agency plans to provide Arab Space Cooperation Group members with open data for their environmental and climate priorities. It also proposes a shared database to support regional environmental and development policies, enabling participating countries to develop applications around a common source of Earth observation data.[7]

For the UAE, the mission builds domestic capability in satellite qualification, mission control, and scientific data handling through NSSTC's facilities in Al Ain.[8] This supports the National Space Strategy 2030 priorities of advanced local capacity, national expertise, and partnerships among public, academic, and research institutions.[9]

550
KILOMETRES
sun-synchronous orbit altitude

10
ENGINEERS
from Arab countries trained through the mission

HOW THE TECHNOLOGY WORKS

The hyperspectral imager is the primary scientific instrument. It measures wavelengths between 400 and 1,700 nanometres across 205 spectral bands, with a spatial resolution of 20 metres and a swath width of 13 kilometres.[10] Each image pixel contains a spectral profile that can help distinguish vegetation, water, soil, minerals, and other surface materials that may appear similar in an ordinary image.[11]

The other instruments provide complementary information. The Panchromatic Imager captures black-and-white imagery at a finer spatial resolution of 5 metres. Its imagery can be combined with hyperspectral data to add geographic detail to material classifications and environmental maps. The atmospheric polarimeter measures the polarisation of reflected light across 12 bands, helping to account for aerosols and atmospheric scattering when hyperspectral observations are processed.[12]

Once an observation is scheduled, the satellite is pointed towards the target area and its instruments collect the required measurements. An onboard processing unit packages and compresses the resulting data. Observation data is transmitted through the satellite's X-band system, while telemetry and commands use S-band communications. At the NSSTC ground segment, the data is received, processed, and prepared for scientific use.[13]

The planned user workflow begins with an observation request submitted through the Mission Control Centre. The request is converted into commands by the Satellite Control Centre, after which the satellite acquires and transmits the data to the NSSTC ground station. The mission design includes a user interface through which researchers can search for areas of interest and obtain processed products in formats including GeoTIFF.[14]

IMPACT AND RESULTS

The successful launch moved Arab Satellite 813 from spacecraft development into orbital deployment. NSSTC subsequently reported the start of payload commissioning and a first end-to-end mission check connecting the spacecraft, mission-control functions, and ground segment.[15]

Before launch, NSSTC completed the spacecraft's qualification campaign at its Assembly, Integration, and Testing facility in Al Ain. The work was conducted using national infrastructure by certified UAE engineers and technicians, with Airbus acting as a knowledge-transfer partner. NSSTC described it as the first complete spacecraft qualification campaign of this scale conducted at the centre. The mechanical ground-support equipment was designed by Emirati engineers and manufactured locally, while the Al Ain team was designated to command and guide the spacecraft after launch.[16]

The mission also provided a regional training component. The UAE Space Agency reported that the project attracted and trained 10 engineers and researchers from Arab countries.[17]

The verified results are therefore the deployment of the satellite, completion of a national qualification campaign, establishment of mission-control and ground-segment capability, and delivery of regional technical training. Environmental results will depend on the release and use of scientific data following commissioning.

WHAT'S NEXT

The UAE Space Agency states that Arab Satellite 813 will provide open data to Arab Space Cooperation Group members for applications addressing their environmental and climate priorities. It also plans to support a shared regional database and analytical applications using artificial intelligence for water, soil, vegetation, coastal pollution, forest health, and agriculture.[18]

Data delivery is intended to use the NSSTC ground segment described in the mission's technical design. Users submit observation requests, the Satellite Control Centre converts them into spacecraft commands, and the resulting data is downloaded, processed, and made available through a user interface in formats including GeoTIFF.[19]

Salem Butti Al Qubaisi, Director-General of the UAE Space Agency, described the mission's regional purpose: "It serves as a unified platform to enhance scientific cooperation, knowledge exchange, and support sustainable development."[20]

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4IR Technologies:
Space data and Earth observation, AI

Emirate:
Dubai, Abu Dhabi

Maturity:
Scaled Deployment

Type:
Public-Private

SPACE

090

Sovereign Earth Observation Capabilities

ACTORS

Mohammed Bin Rashid Space Centre
Space42

SNAPSHOT

In 16 years, the UAE moved from launching its first Earth observation satellite to operating advanced optical and radar systems. The result is a sovereign capability spread across two distinct operational programmes. The Mohammed Bin Rashid Space Centre (MBRSC) operates satellites that capture detailed optical imagery and, since 2025, Etihad-SAT, its first synthetic aperture radar satellite, which can observe the surface through cloud and darkness. From Abu Dhabi, Space42 operates the separate Foresight radar constellation, five satellites of which were fully operational by June 2026.[1,2]

The journey began with DubaiSat-1 in 2009, which also trained the UAE's first generation of space engineers in South Korea, and reached a decisive transfer of capability with KhalifaSat in 2018, the first satellite designed and manufactured entirely in the UAE. The first images from each were released in October, demonstrating that the new capabilities were functioning in orbit.[3,4]

WHY IT MATTERS

The UAE set the framework for this capability in its National Space Strategy 2030, launched in March 2019, which sets out six objectives, 21 programmes, and 79 initiatives spanning government, commercial, and scientific space activity. A government can purchase satellite imagery, but sovereign Earth observation capabilities allow direct control over what is observed, when it is tasked, and how quickly the data is delivered. This is particularly important when a particular location must be observed at short notice. By operating its own satellites, the UAE can set mission priorities and data-delivery timelines. Space42 describes domestic assembly, integration, and testing capability as providing strategic agility over timelines, missions, and system design.[5]

For the UAE, this capability serves concrete public and economic purposes, including urban planning, infrastructure management, maritime navigation, oil spill detection, environmental monitoring, and disaster response. The capability also supports international cooperation. Through the International Charter: Space and Major Disasters, a voluntary coalition of 17 space agencies and satellite operators founded by the European Space Agency and France's CNES in 1999, the UAE shares and receives satellite imagery during major emergencies, with MBRSC responsible for providing and receiving data through its satellites and ground stations.[6,7]

Each successive mission has brought more satellite design and manufacturing commitments into the UAE, allowing expertise to accumulate across programmes while new generations of Emirati engineers develop their skills through operational missions.[8]

From a regulatory perspective, Cabinet Resolution No 203 of 2025 regulates authorisations for space activities and space-data management activities, and defines space data to include remote-sensing data.[9]

HOW THE TECHNOLOGY WORKS

Optical and radar satellites observe Earth in different ways. Optical sensors record reflected sunlight, producing detailed images but remaining constrained by darkness and cloud cover. Synthetic aperture radar (SAR) is an active system: it transmits microwave pulses and measures the signals reflected from the surface. Because it supplies its own energy, it can collect imagery during day or night and in most weather conditions.[10]

MBZ-SAT is MBRSC's latest optical satellite and, according to MBRSC, the most advanced in the Middle East and North Africa region for high-resolution imagery. Launched in January 2025, the 750-kilogram satellite operates in a sun-synchronous orbit between 500 and 550 kilometres and carries one of the highest-resolution cameras in the region. Compared with its predecessor, MBRSC reports double the image-capture accuracy, four times faster data transfer, and the capacity to produce ten times as many images. Onboard scheduling and processing allow those images to be delivered within 2 hours of capture.[11,12]

Etihad-SAT adds the day-and-night, all-weather coverage that optical imaging cannot provide. Launched in March 2025 and weighing 220 kilograms, it is MBRSC's first SAR satellite. It offers spot mode for detailed images of small areas, scan mode for wide-area coverage, and strip mode for extended regions. AI systems process the resulting data to improve the speed, accuracy, and usability of the imagery for applications including oil spill detection, disaster management, and maritime navigation.[13]

Space42's Foresight constellation pairs 25-centimetre imagery with a daily revisit rate, meaning any given location can be imaged once every 24 hours. Distributing satellites across complementary orbits reduces the interval between observations and increases the frequency with which changes can be detected. By June 2026, five satellites were fully operational, supplying SAR data to Space42's AI-powered GIQ platform, which the company says converts raw data into decision-grade intelligence within minutes.[14,15]

IMPACT AND RESULTS

The value of the UAE's Earth observation capability is already visible in how its imagery has been used across sectors: urban planning and infrastructure management, maritime navigation, oil-spill detection, environmental and climate monitoring, agriculture, and disaster response. DubaiSat-1 contributed to the development of Palm Jumeirah and Al Maktoum International Airport and supported relief efforts following the 2011 earthquake and tsunami in Japan. KhalifaSat has since supplied governments and organisations with imagery for environmental monitoring, urban planning, and disaster response.[16]

The latest satellites have broadened that operational capability. In October 2025, MBRSC released the first images from MBZ-SAT and Etihad-SAT, demonstrating complementary optical and radar coverage across civil, infrastructure, maritime, and environmental applications. In June 2026, Foresight-3, -4, and -5 entered full operation, expanding Space42's operational SAR constellation to five satellites.[17,18]

The impact extends beyond the imagery itself to the localisation of advanced space capabilities. Ninety per cent of MBZ-SAT's mechanical structures were manufactured in the UAE. Foresight-3, -4, and -5 were produced with ICEYE in

IMPACT AND RESULTS CONT'D

Finland but underwent critical integration and testing at Space42's Abu Dhabi facility, the first time advanced SAR satellites had completed those activities in the country. A separate joint venture between Space42 and ICEYE is intended to take the next step by establishing SAR satellite manufacturing in the UAE.[19,20,21]

WHAT'S NEXT

The next phase has two dimensions: greater scale and deeper domestic expertise. Space42 is continuing to build out Foresight, with full constellation maturity targeted for 2027.[22]

At MBRSC, the priority is to embed SAR expertise in the same way that optical-satellite capability was progressively localised. Through the Etihad-SAT partnership, MBRSC engineers moved from defining specifications and conducting technical testing to leading final design and manufacturing alongside Satrec experts. The partnership therefore serves not merely as a route to one radar satellite, but as a mechanism for transferring the knowledge behind it.[23]

Salem Humaid AlMarri, Director General of MBRSC, described that purpose directly when Etihad-SAT was announced: "Etihad-SAT is the result of our collaboration with Satrec Initiative as part of a knowledge-transfer programme, marking a new milestone that enables us to gain expertise in SAR satellite development."[24]

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4IR Technologies:
Space data and Earth observation

Emirate:
Dubai

Maturity:
Operational Deployment

Type:
Public

SPACE

091

Municipal Air Quality Monitoring from Orbit (DMSat-1)

ACTORS

Dubai Municipality
Mohammed Bin Rashid Space Centre
Space Flight Laboratory, University of Toronto

SNAPSHOT

DMSat-1 gives Dubai Municipality a dedicated view of air quality from orbit. Developed by the Municipality and the Mohammed Bin Rashid Space Centre (MBRSC), and manufactured by the University of Toronto's Space Flight Laboratory, the 15-kilogram microsatellite was launched on 22 March 2021 from the Baikonur Cosmodrome in Kazakhstan, aboard a Soyuz 2.1a rocket, into a 550-kilometre orbit.[1]

The satellite monitors airborne particles and greenhouse gases over Dubai and the wider UAE. By July 2022, Dubai Municipality was generating data and findings from the mission to support environmental measures. Dubai Municipality describes DMSat-1 as the region's first environmental nanometric satellite, while MBRSC has committed to making its information available to international partners through the Space Climate Observatory.[2,3]

WHY IT MATTERS

Air pollution in the Gulf is difficult to interpret because mineral dust overlaps with pollution transported from elsewhere and emissions from urban and industrial activity. Ground stations provide accurate measurements at fixed locations, while satellite observations help map how pollution varies across wider areas and over time. Separating natural from human-generated pollution matters because regional research found that more than 90% of hazardous fine particulate matter was anthropogenic and distinct from coarser desert dust.[4,5,6]

DMSat-1 provides that wider spatial perspective. Its role is to map greenhouse-gas concentrations and seasonal patterns, providing evidence for the UAE's national greenhouse-gas management system and the assessment of the Dubai Clean Energy Strategy 2050 and UAE Energy Strategy 2050.[7]

The collection and use of this evidence now sit within the UAE's federal space regulatory framework. Cabinet Resolution No 203 of 2025 requires UAE Space Agency authorisation both for remote-sensing and Earth-observation activities and for receiving, storing, processing, and distributing the data they generate.[8]

HOW THE TECHNOLOGY WORKS

DMSat-1 detects airborne particles by measuring how they affect reflected sunlight. Multi-angle polarimetry records changes in light intensity and polarisation from several viewing directions, providing information that can help characterise aerosol amount, size distribution, refractive properties, and shape.[9]

The satellite's primary instrument is a multispectral polarimeter operating in blue, red, and near-infrared bands, designed to observe a target from up to seven angles across a period of 3 to 5 days. Two additional spectrometers were designed to detect carbon dioxide and methane, allowing particles and gases to be observed from the same platform.[10,11]

Obtaining several viewing angles of the same location requires the spacecraft to point precisely as it passes overhead. Measuring 20 by 30 by 40 centimetres, DMSat-1 uses the Space Flight Laboratory's Next-generation Earth Monitoring and Observation platform, which provides that ground-target-tracking capability in a satellite weighing 15 kilograms.[12,13]

The satellite was designed to cover up to 80,000 square kilometres a day, storing observations onboard for transmission to MBRSC's ground station, where the data is downloaded and MBRSC manages its provision to Dubai Municipality.[14,15]

15 KILOGRAMS
mass of the DMSat-1 microsatellite

550 KILOMETRES
orbital altitude

18 MONTHS
from manufacture to orbital validation

IMPACT AND RESULTS

DMSat-1 moved from manufacture to orbital validation in 18 months. It established contact with MBRSC's mission control centre on 22 March 2021 and then entered in-orbit testing and calibration.[16,17]

By July 2022, Dubai Municipality reported that the satellite was monitoring aerosols and greenhouse gases over the UAE and generating data and findings used to support environmental measures. This marked its progression from a completed spacecraft to an operational source of evidence for municipal decision-making.[18]

The mission also produced institutional gains. MBRSC joined the Space Climate Observatory International in July 2022, a global consortium of space agencies and organisations led by France's Centre National d'Études Spatiales that coordinates international efforts to monitor the effects of climate change, and committed to making DMSat-1 information available to its partners. Within the UAE, MBRSC supervised the satellite's development and conducted final testing and launch integration, while Emirati personnel from MBRSC and Dubai Municipality managed the project and acquired operational expertise, even though the spacecraft itself was manufactured abroad.[19,20]

WHAT'S NEXT

The capability now extends beyond a single spacecraft. Dubai Municipality and MBRSC established the Dubai Space Laboratory, unveiled at COP28 in December 2023, to test and calibrate technologies for space missions, conduct applied research, and train Emirati specialists. As the Municipality's second space initiative after DMSat-1, it carries the effort from one mission into lasting institutional capacity, and it addresses the part of DMSat-1 that was done abroad, since the spacecraft was manufactured in Toronto while Emirati teams managed the project and operated the satellite in orbit.[21]

Continued value from the mission rests on three foundations the programme has already laid: a steady flow of observations into the UAE's national greenhouse-gas management system and the assessments of the Dubai Clean Energy Strategy 2050 and the UAE Energy Strategy 2050; UAE Space Agency authorisation for the Earth-observation activity and for receiving, storing, processing, and distributing its data under Cabinet Resolution No 203 of 2025; and the international exchange opened by MBRSC's membership of the Space Climate Observatory.

Dawoud Al Hajri, Director General of Dubai Municipality, described the intended shift: "The laboratory represents a shift in the scope of the municipality's work, which will now encompass developing innovative solutions to challenges based on scientific research."[22]

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UAE Centre for the Fourth Industrial Revolution

4IR Technologies:
Space data and Earth observation

Emirate:
Abu Dhabi, Dubai, Ras Al Khaimah

Maturity:
Pilot Deployment

Type:
Public

SPACE

092

Student-Developed CubeSat Missions

ACTORS

Khalifa University
American University of Ras Al Khaimah
Higher Colleges of Technology
UAE University
Mohammed Bin Rashid Space Centre
UAE Space Agency

SNAPSHOT

Building the workforce for advanced technology is a national objective in its own right, and satellites are among the most demanding places to learn it. University student teams in the UAE have produced three missions that reached orbit: MeznSat, HCT-SAT1, and Al Ain Sat-1. MeznSat was developed by postgraduate students at Khalifa University and undergraduates at the American University of Ras Al Khaimah, with funding from the UAE Space Agency. Launched on 28 September 2020, the 3U CubeSat carried a shortwave infrared spectrometer designed to estimate atmospheric concentrations of carbon dioxide and methane.[1,2]

HCT-SAT1 and Al Ain Sat-1 followed on 14 January 2025, launching together aboard a SpaceX Falcon 9. HCT-SAT1 was the first Earth observation satellite developed by Higher Colleges of Technology students under the guidance of the Mohammed Bin Rashid Space Centre (MBRSC). Al Ain Sat-1 was UAE University's first satellite, developed through a joint programme between its National Space Science and Technology Center (NSSTC) and the Geoscience and Remote Sensing Society of the Institute of Electrical and Electronics Engineers (IEEE). It is a 3U CubeSat measuring 10 by 10 by 30 centimetres and weighing 3.7 kilograms, carrying remote-sensing instruments in low Earth orbit, and the programme is intended to give student teams from local and international universities direct experience of building small satellites.[3,4]

WHY IT MATTERS

The programme is intended to give engineers practical experience rather than classroom study alone. Satellite development involves judgements that are difficult to reproduce in a classroom: how a design survives testing, how subsystem problems are resolved during integration and how a mission is prepared for operations once the spacecraft is beyond physical reach. Student missions provide that experience on flight hardware and against a real launch schedule.[5]

These university programmes are intended to produce graduates who already understand the disciplines, constraints, and sequencing of a complete mission.[6]

CubeSats make that training model practical. Their modular architecture is based on standardised units of approximately 10 by 10 by 10 centimetres, while dedicated rideshare programmes provide comparatively low-cost access to orbit for educational and research missions. This allows student teams to work across an entire mission rather than contributing to only one subsystem.[7,8]

HOW THE TECHNOLOGY WORKS

Each mission combined a compact CubeSat platform, a mission-specific payload, and a ground segment for commanding the spacecraft and receiving its data. Student teams worked across these elements under specialist supervision, although their responsibilities differed between programmes.

MeznSat used a 3U configuration comprising three standard CubeSat units. Its principal instrument was the Argus 2000, a shortwave infrared spectrometer weighing less than 230 grams and drawing less than one watt. Carbon dioxide and methane absorb light at characteristic wavelengths, so measurements across the instrument's 1,000 to 1,650 nanometre range could be used to estimate their atmospheric concentrations. A secondary camera connected those measurements to locations on Earth, while ground stations at Khalifa University and the American University of Ras Al Khaimah received and processed the mission data.[9,10]

HCT-SAT1 used the smaller 1U format, measuring 10 by 10 by 11.35 centimetres, and carried an Earth observation payload. Thirty-four students contributed to its development over more than a year. MBRSC specialists guided the design and supported the assembly, integration, testing, launch preparation, and communications needed to turn the student project into a flight-ready satellite.[11,12]

Al Ain Sat-1 remains in orbit. The 3U CubeSat measures 10 by 10 by 30 centimetres and weighs 3.7 kilograms. Its payloads were developed through the IEEE GRSS Student Grand Challenge: the Spanish team contributed instruments for soil-moisture and vegetation monitoring; the Indonesian team developed imaging and atmospheric-sensing instruments; and the Japanese team produced onboard algorithms that identify the most useful images for transmission to Earth.[13,14]

IMPACT AND RESULTS

All three satellites reached orbit. The American University of Ras Al Khaimah received MeznSat's first decoded signal, while UAE University confirmed contact with Al Ain Sat-1 through its ground station. HCT-SAT1 also completed its launch successfully in January 2025.[15,16,17]

The missions placed students directly inside the development process. HCT-SAT1 involved 34 students from aeronautical sciences, airframe design, and electrical engineering, alongside media students who handled project communications. Nine faculty members and MBRSC specialists supported their work. MeznSat brought together postgraduate and undergraduate teams from two universities.[18,19]

MeznSat's development also generated formal research outputs. Its mission architecture and technical analysis were published in the peer-reviewed journal Aerospace, while its operations and science plan were presented at the IEEE International Geoscience and Remote Sensing Symposium.[20,21]

The capability created through these missions extends beyond the spacecraft themselves. Khalifa University's Yahsat Space Lab has supported MYSat-1, MeznSat, DhabiSat, and Light-1, giving successive student cohorts access to facilities for CubeSat assembly, integration, and verification, together with a ground station for mission communications.[22]

WHAT'S NEXT

The next phase is to turn individual flight projects into repeatable university capability. Khalifa University's Yahsat Space Lab retains facilities for CubeSat assembly, integration, testing, and communications. The American University of Ras Al Khaimah's ground station can receive data from satellites beyond MeznSat, while NSSTC operates UHF, S-band, and X-band systems for satellite communications and mission control. Successive student teams can therefore begin with established development and operational infrastructure.[23,24,25]

At UAE University, the intended path from student training to national missions is already taking shape. Mohammed Al Tamimi began his career as a student on Al Ain Sat-1 before joining the engineering team developing Arab Satellite 813. His progression illustrates the longer-term objective: using university CubeSat missions to prepare engineers for increasingly complex national space programmes.[26]

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SPACE

4IR Technologies:
AI, Edge computing, Space data and Earth observation

Emirate:
Abu Dhabi

Maturity:
Operational Deployment

Type:
Private

093

Commercial Satellite Manufacturing Platform (Orbitworks)

ACTORS

Orbitworks
Marlan Space
Loft Orbital

SNAPSHOT

Orbitworks was established in August 2024 as a joint venture between Abu Dhabi's Marlan Space, an affiliate of International Holding Company, and San Francisco-based Loft Orbital. Backed by an initial investment of more than USD 100 million, the company opened a 4,645-square-metre satellite assembly, integration, and testing facility at KEZAD in November 2025. The first commercial satellite-production facility of its kind in the Middle East, it can accommodate spacecraft weighing up to 500 kilograms and is designed to produce as many as 50 satellites a year.[1,2]

Its first product is Altair, a planned constellation of 10 AI-enabled Earth-observation satellites carrying sub-metre optical, shortwave infrared, thermal, hyperspectral, and radio-frequency sensors. Orbitworks states that the constellation is intended to support national security, disaster response, smart cities, agriculture, energy, and maritime surveillance. Altair-1 was completed in the UAE and transported to Los Angeles in August 2026 ahead of its scheduled launch in October. The constellation will combine optical, infrared, thermal, and radio-frequency sensing with onboard AI processing.[3]

WHY IT MATTERS

The UAE has developed sophisticated satellites through individual government missions, under a National Space Strategy 2030 that identifies local manufacturing capability as a national objective. Orbitworks changes this model by establishing a permanent commercial production capability designed to manufacture multiple spacecraft for domestic and international customers.[4]

The facility brings satellite assembly, payload integration, environmental testing, and functional verification together at one site in Abu Dhabi. This gives customers in the UAE and the wider region an alternative to sending spacecraft or major components abroad for integration and testing.[5]

Commercial-scale production also reduces the need to develop every mission entirely from scratch. Reusable spacecraft platforms and standardised interfaces allow different payloads and software to be integrated while retaining common satellite systems.

Altair extends this approach into data processing. Instead of sending every raw observation to Earth before analysis begins, its onboard computers are designed to identify significant events and produce usable information in orbit. This can shorten the time between detecting a change and delivering an alert to the customer.[6]

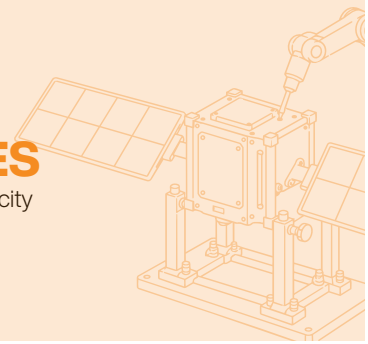
HOW THE TECHNOLOGY WORKS

At the centre of Orbitworks' production model is a standard satellite platform that can be configured for different missions. For Altair, that platform is Loft Orbital's Longbow, derived from a flight-proven design that has flown more than 600 times. Adaptable hardware and software interfaces allow different sensors, computing systems, and customer payloads to be integrated without redesigning the entire spacecraft.[7]

Once configured, the spacecraft is assembled inside an approximately 1,400-square-metre ISO-class cleanroom. It then undergoes vibration testing to reproduce launch forces, thermal-vacuum testing to simulate conditions in orbit, and electromagnetic-compatibility testing to identify interference between electronic systems. Functional checks and final verification are completed before it is declared ready for launch.[8]

Across the Altair constellation, planned payloads include sub-metre optical cameras, shortwave-infrared, thermal, and hyperspectral instruments, and radio-frequency sensors.[9] Onboard computing systems will use NVIDIA graphics processors to run AI models against the data as it is collected. Instead of transmitting everything for analysis on Earth, the satellites are designed to identify relevant activity and deliver an alert or analysis-ready output within minutes.[10]

50
SATELLITES
annual production capacity of the new facility



IMPACT AND RESULTS

Orbitworks completed its manufacturing facility within 12 months and began producing Altair there. The opening established a commercial-scale satellite assembly and testing capability in Abu Dhabi rather than a facility created for a single government mission.[11]

Altair-1 was completed in the UAE and transported to the United States on 13 August 2026 for launch preparations.[12] Orbitworks is manufacturing and integrating all 10 Altair satellites at its KEZAD facility.[13]

The constellation has also secured customers before its first launch. Abu Dhabi Fund for Development reserved dedicated Altair capacity to monitor projects, verify construction progress, and assess development outcomes across its international portfolio.[14] In August 2026, France's space agency, CNES, secured dedicated Altair capacity through a multi-year contract with Loft Orbital.[15]

WHAT'S NEXT

Altair-1 is scheduled for launch in October 2026.[16] Orbitworks plans to deploy the remaining nine satellites during the following 12 months.[17]

The company has also outlined a USD 1 billion expansion programme over 5 years. The plan includes launching a further 40 satellites beyond the initial Altair constellation, creating a larger AI-enabled Earth-observation network for government and commercial customers.[18]

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4IR Technologies:
IoT

Emirate:
Abu Dhabi, Dubai

Maturity:
Operational Deployment

Type:
Public-Private

CREATIVE INDUSTRIES

094

Immersive Digital Art Museums

ACTORS

Department of Culture and Tourism Abu Dhabi
Miral
teamLab
d'strict

SNAPSHOT

ARTE Museum Dubai and teamLab Phenomena Abu Dhabi are two of the largest immersive digital art venues. Software, projection, sound, and other digital systems generate works that unfold across entire rooms and, in some installations, change in response to visitors. ARTE Museum Dubai opened in The Dubai Mall in March 2024 as d'strict's first ARTE Museum in the Middle East. Created by the Korean digital design company, the venue spans 30,000 square feet and 14 exhibition zones.[1,2]

teamLab Phenomena Abu Dhabi followed in April 2025 in the Saadiyat Cultural District. Developed by the Department of Culture and Tourism with Miral and the Tokyo art collective teamLab, and operated by Miral Experiences, its 17,000 square metres make it the largest digital art museum in the world, ahead of teamLab's own previous record holder in Tokyo.[3,4]

WHY IT MATTERS

Both emirates treat culture as economic policy: Dubai's Creative Economy Strategy targets a 5% creative-sector share of GDP, while Abu Dhabi has built the Saadiyat Cultural District as a national cultural asset. The museums extend the cultural offer of both emirates beyond conventional collections. teamLab Phenomena joins Louvre Abu Dhabi, Zayed National Museum, and Natural History Museum Abu Dhabi in the Saadiyat Cultural District, where Guggenheim Abu Dhabi is scheduled to open in December 2026. The Department of Culture and Tourism Abu Dhabi describes the completed district as the world's largest concentration of leading cultural and educational institutions. In Dubai, ARTE Museum brings immersive digital art into one of the emirate's most visited commercial and tourism destinations.[5,6,7]

The 4IR element is the combination of real-time computation, sensor networks, and projection at architectural scale. The works are generated continuously by software rather than played back from recorded files, and sensors register where visitors are and how they move, so the artwork changes in response and no two visits are identical. The museums' contribution is therefore not simply another exhibition space but a different model of cultural production. At teamLab Phenomena, software and digital systems generate works that change over time and through interaction, placing the museum at what the Department describes as the intersection of art, science, and technology. The experience is therefore continually produced rather than fixed when an artwork is installed.[8]

The format has demonstrated broad audience appeal internationally. In 2024, Guinness World Records recognised teamLab Planets in Tokyo as the world's most visited museum dedicated to a single art collective after it received 2,504,264 visitors between 1 April 2023 and 31 March 2024.[9]

HOW THE TECHNOLOGY WORKS

The museums use digital systems to turn physical space into the artwork, but they do so differently. ARTE Museum overlays synchronised digital content onto existing surfaces; teamLab Phenomena integrates software, architecture, and environmental conditions into a single generative system.

ARTE Museum combines projection mapping, multi-image control, and sensor-based interaction. Projection mapping fits images precisely to walls, floors, and objects, allowing the surfaces of each room to carry the visual environment. Multi-image control synchronises content across numerous projectors, while sensors enable selected scenes to respond to visitors' movements.[10]

The Dubai installation uses 76 projectors: 47 Barco G62-W9 units and 29 higher-powered UDM-4K22 units. Each exhibition zone combines the projected imagery with a dedicated soundscape and specially designed scent, creating a coordinated visual, auditory, and spatial experience.[11,12]

teamLab Phenomena follows a more integrated approach. Under the collective's concept of "Environmental Phenomena", the artwork is generated through the interaction of digital systems with light, air, water, and the engineered space itself. The installations also respond to the presence and movement of visitors, causing their form and behaviour to change continuously.[13,14]

This approach made the building part of the technological system. teamLab Architects first defined the artistic concept and designed the internal spaces around the movement and behaviour of visitors. MZ Architects then developed the exterior around those predetermined volumes, reversing the conventional sequence in which artworks are fitted into an existing building.[15] teamLab Phenomena is the collective's first purpose-built museum and incorporates technologies developed internally by teamLab.[16,17]

IMPACT AND RESULTS

Both museums have moved from concept to operational deployment. When ARTE Museum Dubai opened in 2024, it introduced d'strict's ARTE Museum format to the Middle East. Its inaugural Eternal Nature exhibition spans 14 zones, using digital media to reinterpret natural landscapes through imagery shaped by Dubai's cultural setting.[18,19]

teamLab Phenomena established a new benchmark for scale. Its 17,000-square-metre building is substantially larger than teamLab Borderless in Tokyo, the collective's previous record-holder at 10,000 square metres, making Abu Dhabi home to the world's largest digital art museum.[20]

The Abu Dhabi venue has also continued to evolve after opening. On 16 December 2025, teamLab added two further works: Megaliths in the Roots Garden, which extends the installation over two floors so that illuminated tree roots hang freely in the air among clusters of stone, and Massless Suns and Dark Suns, in which visitors move among glowing spheres that respond to their presence. Both extend the experience beyond the museum's opening installation.[21]

WHAT'S NEXT

The next stage is shaped by the wider platforms surrounding each museum. ARTE Museum Dubai forms part of a growing international network, while teamLab Phenomena is embedded within Abu Dhabi's expanding cultural district.

Founded in 2004, d'strict opened the first ARTE Museum in Jeju in 2020 and now operates seven venues: four in South Korea, two in the United States, and one in the UAE. Dubai therefore serves as the Middle Eastern presence of a format being replicated across major international markets.[22,23]

teamLab Phenomena will develop within the broader Saadiyat Cultural District. Zayed National Museum and Natural History Museum Abu Dhabi opened in 2025, while Guggenheim Abu Dhabi is scheduled to open on 11 December 2026, positioning the venue as part of an interconnected cultural destination rather than a standalone attraction.[24,25]

Jin Lee, Vice President at d'strict and Creative Director of ARTE Museum, summarised the direction of the format: "ARTE Museum pushes the boundaries of innovation to the next level by blending art and technology into a unique digital canvas."[26]

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4IR Technologies:
AI, Autonomous systems

Emirate:
Abu Dhabi

Maturity:
Operational Deployment

Type:
Public-Private

CREATIVE INDUSTRIES

095

Autonomous Racing League (A2RL)

ACTORS

ASPIRE
Technology Innovation Institute, Autonomous Robotics Research Centre
Dallara
Yas Marina Circuit

SNAPSHOT

The Abu Dhabi Autonomous Racing League (A2RL) is a motorsport competition in which international teams race full-size cars controlled entirely by software. Each team receives the same Dallara Super Formula vehicle but develops the AI controlling its racing line, braking, acceleration, overtaking, and response to rival cars.[1]

ASPIRE, the grand challenges arm of Abu Dhabi's Advanced Technology Research Council (ATRC), launched A2RL at Yas Marina Circuit in April 2024, with eight teams, four of which raced together in the Grand Final. By November 2025, A2RL had expanded to 11 teams competing for a share of the season's USD 2.25 million prize pool. Six teams advanced to the 20-lap Grand Final. Germany's Technical University of Munich retained the title, followed by the UAE's TII Racing and Italy's PoliMOVE.[2]

WHY IT MATTERS

A2RL changes what makes the difference in a motor race. Every team uses the same car and there is no human driver, so the main contest is between the software systems developed by the teams. One car may brake later, take a faster line, or respond more effectively to an opponent because its software has interpreted the situation differently.[3]

The 4IR element is the full autonomous stack running at racing speed: sensor fusion from cameras, radar, and lidar, real-time perception and localisation, and decision-making software that plans a racing line and executes overtakes without human input. A2RL is therefore a competition between AI systems rather than a demonstration of a single autonomous vehicle. Teams compete under the same rules and on the same circuit, translating differences in code into outcomes that spectators can readily judge: qualifying times, overtakes, mistakes, and the final classification.

The racing also anchors a broader live event designed to make autonomous technology accessible to the public. A2RL's inaugural edition featured a Human-versus-AI contest, digital team avatars, virtual reality, racing simulators, an AI museum, live performances, and a drone display. More than 10,000 spectators attended that first edition at Yas Marina Circuit, while over 600,000 watched online during the first 12 hours. Organisers later reported more than one million streaming views across the debut season.[4,5]

HOW THE TECHNOLOGY WORKS

The cars are autonomous versions of Dallara's SF23, the single-seater used in Japan's Super Formula championship. Seven cameras provide a continuous view around the vehicle. Four radar sensors and three LiDAR sensors measure the circuit boundaries and surrounding cars, while satellite positioning and inertial sensors track the car's own movement.[6]

The software performs three main functions. Perception identifies the track and other vehicles. Planning selects a racing line and decides how to respond. Control converts those decisions into steering, throttle, braking, and gear commands through the drive-by-wire systems. Each team receives the same vehicle and basic autonomous functions, then develops its own perception, planning, and control software.[7]

Trackside officials can activate an emergency stop but cannot steer the car. The upgraded EAV-25 also introduced active hydraulic emergency braking, a secondary inertial sensor for redundancy, and battery-management protections.[8]

Teams develop their software further through A2RL's SIM-Sprint competition. Digital races allow them to test overtaking, multi-car traffic, and unusual situations without damaging the physical vehicles. The simulations also help organisers refine rules for collisions, penalties, and protests.[9] By July 2026, the 11 teams had completed more than 5,000 collective hours of simulated testing and racing.[10]

IMPACT AND RESULTS

A2RL demonstrated clear technical progress between its first two seasons. In 2024, the Grand Final had to be stopped after a spinning car blocked the field.[11] By 2025, six autonomous cars were competing simultaneously at speeds above 250 kilometres per hour. Italy's Unimore Racing team, representing the University of Modena and Reggio Emilia, overtook Germany's Technical University of Munich (TUM) team and maintained a lead of less than 1 second for much of the next 10 laps. TUM regained the lead after Unimore collided with a slower car during another overtaking attempt.[12]

Autonomous lap times also approached professional human performance. Unimore completed the Yas Marina North Circuit in 58.87 seconds, beating the 59.30-second professional-driver benchmark recorded during data collection.[13] In the direct Human-versus-AI contest, former Formula One driver Daniil Kvyat remained faster, but his advantage fell from 10.38 seconds in 2024 to 1.58 seconds in 2025. This represents an approximately 85% reduction in 18 months.[14,15]

During 6 weeks of track testing in 2025, the teams completed 1,640 laps and 5,400 kilometres, generating more than 300 terabytes of data.[16] Separately, researchers released the open A2RL Vmax dataset using data contributed by all eight teams that competed in the inaugural 2024 season. It contains 305,531 LiDAR point clouds, 386,006 radar point clouds, and 28,791 annotated LiDAR frames from single-car and multi-car racing.[17]

For the 2025 final, more than 8,000 spectators filled Yas Marina's North Grandstand. A parallel programme involved over 140 students from all seven emirates, who programmed and raced scaled autonomous cars.[18] Two seasons are complete, international participation continues, and racing performance has improved measurably.

WHAT'S NEXT

A2RL held its first race outside Abu Dhabi at Italy's Imola Circuit on 5 September 2026, the first multi-car autonomous race staged in Europe. Run over 12 laps as part of the ACI Racing Weekend, the race was won by the UAE team Kinetiz. Imola's elevation changes, narrow racing lines and limited run-off areas provided teams with a substantially different setting from Yas Marina Circuit. The series is expected to return to Abu Dhabi for its 2026 season finale.[19]

The simulation programme could also widen access to the competition. A2RL has proposed a progression from Sim Academy to Sim Pro and eventually to qualification for physical racing. If implemented, programmers could enter through virtual competition before gaining access to the more expensive full-scale cars. This could connect esports, engineering education, and autonomous motorsport within the same competitive structure.[20]

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UAE Centre for the Fourth Industrial Revolution

4IR Technologies:
Blockchain

Emirate:
Dubai

Maturity:
Pilot Deployment

Type:
Public-Private

CREATIVE INDUSTRIES

096

Curated Blockchain Platform for Digital Art (Materia)

ACTORS

Artifact Art Limited
Art Dubai
Dubai Culture and Arts Authority

SNAPSHOT

Materia is a blockchain-based platform developed by Artifact Art Limited for creating, exhibiting, selling, and collecting digital art as non-fungible tokens (NFTs). Unlike a general NFT marketplace, Materia was designed around curated exhibitions involving artists, curators, galleries, and cultural institutions.[1]

Materia's principal UAE deployment came through Campus Art Dubai 9.0 Blockchain Edition in 2022, which remains its flagship programme in the emirate. Materia powered an 8-week programme through which 12 artists learned about blockchain, art tokenisation, and NFTs before developing and minting their own digital artworks. The completed works were exhibited at the inaugural Art Dubai Digital and offered for sale through Materia.[2]

Materia subsequently launched This Cannot Be Erased, a collection of 111 NFT portraits of Julian Assange by artist Miltos Manetas, with music by Howie B and curation by Jérôme Sans.[3]

WHY IT MATTERS

Dubai has backed digital art at institutional level through its Creative Economy Strategy, which targets a 5% creative-sector share of GDP, and through the Dubai Metaverse Strategy; Art Dubai launched a dedicated digital section in 2022, among the first at a major international fair, and has run it every year since. Digital files can be copied without any reduction in quality, making a copy visually indistinguishable from the file released by its creator. NFTs separate access to the media from ownership of a specific token. Each token has a unique identifier, is assigned to an owner address, and can be transferred through a blockchain transaction.[4,5]

Materia applied this mechanism within a curated fine-art model. Artists could release digital works as NFTs, curators could organise exhibitions, and collectors could acquire the resulting tokens.[6] The platform was therefore designed to bring established relationships among artists, curators, institutions, and collectors into a blockchain-based marketplace.

For Campus Art Dubai, this model gave artists a structured route into blockchain-based art. Participants moved from learning about blockchain and art tokenisation to creating, minting, and publicly exhibiting completed NFT artworks at an established international art fair.[7]

HOW THE TECHNOLOGY WORKS

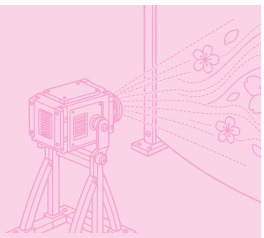
A blockchain platform for art works as a shared, append-only ledger: each artwork is registered as a token whose creation, ownership, and every subsequent transfer are recorded in entries no single party can alter, so provenance travels with the work rather than depending on a gallery's records. Materia operated as a curated platform rather than an unrestricted public marketplace. Artists and art professionals were invited to develop exhibitions, while Materia provided the digital environment through which the resulting works could be presented and sold as NFTs.[8]

At the end of Campus Art Dubai 9.0, each participating artist minted a completed work on Materia and listed it for sale through the platform. Minting is the act of recording a work on a blockchain as a token, which fixes its origin and ownership in a public ledger.[9] NFT standards such as ERC-721 assign each token a unique identifier and record its ownership and transfers through a smart contract, creating a verifiable transaction history.[10]

The Campus Art Dubai programme combined this infrastructure with 8 weeks of training and mentorship. Weekly sessions covered blockchain principles, cryptocurrencies, security tokens, art tokenisation, and applications of blockchain within the art market. Participants then received individual support to develop and mint their final works.[11]

12
NFT ARTWORKS
produced by local and international artists in Dubai's flagship programme

8
WEEKS
duration of the artist training and minting programme



IMPACT AND RESULTS

Materia's Dubai deployment produced 12 completed NFT artworks by six UAE-based and six international artists. The works were presented in a dedicated display at Art Dubai 2022 and listed for sale through Materia.[12] The project demonstrated a complete process extending from artist training and artwork development to tokenisation, public exhibition, and market listing.

Materia later supported This Cannot Be Erased, an international release of animated portraits of Julian Assange by Miltos Manetas. The collection was planned as three drops, or timed public releases of a limited batch of works, the first of which began on 27 June 2022 at a listed price of 0.876 ETH per NFT. Proceeds were intended to support the Internet Pavilion and activities connected with Assange. Released in connection with the independently organised Internet Pavilion during the 2022 Venice Biennale, the project extended Materia beyond artist training into a curated public release involving an established artist, curator, and music producer.[13,14]

Together, the Art Dubai and Venice projects demonstrate Materia's ability to support both the development of new digital artworks and their release to collectors.

WHAT'S NEXT

Materia's lasting asset in the UAE is the cohort it trained. Campus Art Dubai remains the platform's principal UAE deployment, and the artists who completed it hold working knowledge of tokenisation and of how blockchain applies to the art market, which is the capability any further edition would build on. The platform is now presented through the Artifact Labs website as one project within a wider Web3 portfolio, which continues to associate Materia with Jérôme Sans, Art Dubai, and the Internet Pavilion presented during the Venice Biennale.[15]

The wider Artifact platform advertises a private proof-of-stake blockchain, transactions without external wallets or user-facing fees, and the ability to bridge digital assets to public networks including Ethereum, Solana, and Base.[16] This broader infrastructure provides the technical foundation for future Materia exhibitions and collections.

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4IR Technologies:
Digital twins

Emirate:
Sharjah

Maturity:
Pilot Deployment

Type:
Public-Private

CREATIVE INDUSTRIES

097

Immersive Archaeology Platform (Sharjah Archaeology Metaverse Center)

ACTORS

Sharjah Archaeology Authority
3D Stoa
Overlat
Global Digital Heritage

SNAPSHOT

In December 2024, the Sharjah Archaeology Authority launched the Sharjah Archaeology Metaverse Center, a virtual reality application that allows users to explore archaeological sites and artefacts from the emirate remotely. The experience was developed with 3D Stoa, Overlat, and Global Digital Heritage and released for Meta Quest and Pico headsets.[1,2]

Users enter a virtual museum where they can examine 3D artefacts before moving into reconstructed archaeological experiences. These include observing the development of the Tomb of Amud, excavating objects at Mleiha, restoring a collection of historical coins and exploring rock carvings from Khorfakkan and Kalba. Explanations are available in Arabic and English.[3]

WHY IT MATTERS

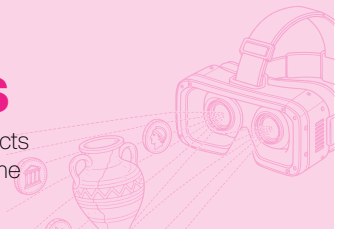
Sharjah's archaeological collection extends across remote sites, museum displays, and stored artefacts. Environmental change, natural hazards, and human activity can also alter the physical landscapes in which archaeological evidence is found. Digital documentation creates a lasting record while allowing these sites and objects to be studied and presented beyond their original locations.

The Sharjah Archaeology Authority has therefore been creating detailed digital records of the emirate's material heritage. By July 2024, its wider documentation work had recorded more than 500 artefacts using 3D, virtual reality, and augmented reality technologies, together with 300 rock carvings and 35 archaeological sites.[4]

The Metaverse Center turns part of this digital material into an interactive experience. Instead of viewing an artefact behind glass or looking at a photograph of a site, users can move through reconstructed environments, inspect objects from different angles, and participate in simulated archaeological work. This makes Sharjah's heritage accessible beyond the physical locations where it was discovered and preserved.

The 4IR element is the combination of photogrammetry, interactive 3D modelling, and immersive virtual reality. Physical sites and objects are converted into detailed digital models, which are then placed inside environments that respond to the user's movements and actions.

500+
ARTEFACTS
digitally documented artefacts across the wider programme



HOW THE TECHNOLOGY WORKS

The application draws on several years of archaeological digitisation. Global Digital Heritage began working in Sharjah in January 2019 and subsequently documented sites including Mleiha, Jebel Faya, Khatm Al Melaha, and the forts of Khorfakkan and Dibba Al Hisn, together with objects held by the Sharjah Archaeology Authority.[5] This digital collection explains why the VR application can bring together artefacts, tombs, rock carvings, and excavation sites within one experience.

Sites and objects are converted into 3D models using photogrammetry, which combines overlapping photographs taken from multiple angles. Laser scanning can be added for larger or more complex structures. The Tomb of Amud model, for example, combined terrestrial photography with measurements from a FARO laser scanner, while one pre-Islamic silver coin from Mleiha was reconstructed from 450 close-range images.[6,7]

3D Stoa documented additional assets, prepared selected models for use in virtual reality and developed the experience's narrative and immersive concept. Overlat worked with 3D Stoa on the application, which runs on Meta Quest 2, Quest Pro, Quest 3, and Quest 3S and was also released for Pico headsets. The headset follows the user's movement, while handheld controllers allow virtual objects to be selected, lifted, rotated, and examined.[8,9]

One experience presents the Tomb of Amud, a monumental grave near Mleiha dating from between the third and first centuries BCE, and allows the user to observe its development from antiquity to the present. Another places the user inside a simulated excavation, where buried objects can be uncovered and examined.[10]

Rock carvings are presented within virtual landscapes rather than as isolated photographs. Earlier demonstrations of Sharjah's wider metaverse programme included a digital reconstruction of the Khatm Al Melaha trail, where more than 120 Neolithic rock inscriptions were identified and interpreted within a reconstructed mountain environment.[11]

IMPACT AND RESULTS

The Sharjah Archaeology Authority first presented its wider metaverse initiative at GITEX Global in October 2023.[12] In December 2024, it launched the Sharjah Archaeology Metaverse Center as a publicly downloadable VR application. Distribution through the Meta Quest and Pico stores made the experience available to VR users outside Sharjah rather than limiting it to a physical exhibition or specialist research facility.[13]

The released application contains several forms of heritage interpretation within one experience. Users can browse a searchable collection of artefacts, enter reconstructed archaeological settings, and interact with objects through excavation and restoration activities. Arabic and English audio explanations support access for both local and international users.[14]

The application also demonstrates how assets created for archaeological documentation can be reused for public engagement. The same digital model can

IMPACT AND RESULTS CONT'D

preserve the recorded condition of an object, support scholarly examination, and become part of an interactive museum or educational simulation.

The available evidence measures the creation of digital content and the deployment of the application rather than its audience reach. Sharjah Archaeology Authority has reported more than 500 digitally documented artefacts, 300 rock carvings, and 35 archaeological sites across its wider programme, but has not published user figures for the VR experience itself.[15]

WHAT'S NEXT

The Metaverse Center draws on a larger digital collection created through the Sharjah Archaeology Authority's collaboration with Global Digital Heritage. Global Digital Heritage's project catalogue covers major Bronze Age tombs, the pre-Islamic city of Mleiha, rock-art sites, forts, and more than 1,000 artefacts from the Authority's collection.[16]

These assets can be reused in online 3D models, augmented-reality displays, and future immersive experiences. The underlying digital collection provides material for further forms of archaeological documentation and public interpretation.

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4IR Technologies:
AI, Cloud computing

Emirate:
Dubai

Maturity:
Scaled Deployment

Type:
Private

CREATIVE INDUSTRIES

098

AI Dubbing and Live Voice Translation for Global Media (CAMB.AI)

ACTORS

CAMB.AI Hyperfusion | **Dubai Future District Fund**

SNAPSHOT

CAMB.AI is a Dubai-founded company that translates recorded and live speech into other languages while keeping the original speaker's voice, tone, and delivery, a capability that determines how far Emirati film, media, and live content can travel under the UAE's national strategy for the cultural and creative industries. Founded in 2022 by Avneesh and Akshat Prakash, it was part of the Dubai Future Accelerators cohort in 2023, counts the Dubai Future District Fund among its early investors, and was named in the UAE's Future 100.[1,2]

Rather than assembling existing tools, the company built its own models: MARS for speech and BOLI for translation. Its work includes Emirati director Nayla Al Khaja's film Three, described as the world's first fully AI-dubbed multilingual feature,[3] and live commentary and localisation for clients including Major League Soccer, the Australian Open, NASCAR, and IMAX.[4]

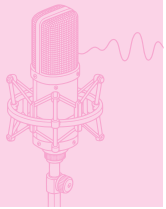
WHY IT MATTERS

Content reaches only the audience that shares its language. Translating it has traditionally been slow and costly, and for live events largely impossible, since a broadcast cannot wait for a dubbing process carried out after the fact.

Automated approaches reduced the cost but lost the performance. Companies traditionally relied on tools such as Google Translate to handle speech-to-text conversion followed by text-to-speech,[5] a sequence in which intonation, timing, and emotion are discarded at the first step and the result is rebuilt by a synthetic voice unrelated to the original speaker.[6]

For the UAE, where the cultural and creative industries are the subject of a national strategy, this determines how far the country's output travels. A film made in the Emirates reaches audiences who understand its language; the same film localised reaches considerably more. The capability works in the other direction too, allowing international content to be delivered in Arabic and its dialects.[7]

120+
LANGUAGES
and accents available for dubbing on the platform



HOW THE TECHNOLOGY WORKS

CAMB.AI operates two proprietary models. MARS synthesises speech and reproduces a speaker's voice from a short reference recording, capturing prosody, rhythm, and emotional delivery. BOLI performs the translation, producing contextual and colloquial output rather than literal equivalents. Working together, they transfer the performance rather than only the words.[8]

MARS5 runs a two-stage pipeline. An autoregressive transformer takes the text and a reference recording and produces coarse audio features; a diffusion model then refines those features into the remaining detail, which is finally converted into sound. Because the model is trained on raw audio alongside text, its delivery can be steered by the writing itself, a comma inserting a pause or capital letters adding emphasis. A reference clip of a few seconds is sufficient, with around 6 seconds giving the best result.[9]

The current generation, MARS7, is described by its developers as remarkably lightweight at roughly 80 million parameters, built as an encoder-decoder architecture designed to capture human-like prosody and range at broadcast quality. It supports over 150 languages with voice cloning and fine-grained emotional control,[10] and the MARS model was the first voice model made available on both Amazon Bedrock and Google Cloud's Vertex AI Model Garden.[11]

Live events impose a harder constraint, since the translation must be produced while the speaker is still talking. The company's streaming system performs translation and dubbing in real time, which is what allows it to carry live sports commentary rather than only finished recordings.[12]

IMPACT AND RESULTS

The most notable application to date is a feature film. Nayla Al Khaja, the country's first female Emirati feature director, used the technology to release her horror film *Three* in multiple languages, described as the world's first fully AI-dubbed multilingual feature film after its debut at the Red Sea Film Festival. The film premiered across the MENA region on 1 February 2024 and was released in Mandarin on 14 March 2024, the first Arab film to be dubbed into Mandarin using AI. Al Khaja said the system generated dialogue in over 120 languages and accents using the artists' own voices.[13,14]

In live media the company reports a series of firsts, including the first AI-driven multilingual live sports commentary and the first such delivery in motorsport and at a press conference. On 2 April 2024 it became the first company to live dub professional soccer commentary into four languages.[15,16] At the Australian Open it produced translated player press conferences within 12 hours during the tournament itself.[17]

The client list is the strongest evidence of scale, spanning Major League Soccer, the Australian Open, NASCAR, IMAX, Comcast NBCUniversal, Dentsu, and Eurovision Sport. Dubbed content produced through the platform has been viewed more than 100 million times, and the company has raised USD 18.5 million from investors including Comcast NBCUniversal Sports Tech, Courtside Ventures, and the Dubai Future District Fund.[18,19]

The models were built by a team published at Interspeech and drawn from Carnegie Mellon, Apple, and Amazon, and the English MARS5 model has been released as open source, allowing its architecture to be examined and used by others.[20,21]

IMPACT AND RESULTS CONT'D

The platform has since been used at one of the largest live events on the international calendar. Eurovision Sport selected CAMB.AI to provide live and on-demand subtitling across the Milano Cortina 2026 Paralympic Winter Games, held from 6 to 15 March 2026.[22]

WHAT'S NEXT

In September 2025, CAMB.AI and Hyperfusion, a sovereign AI cloud provider, announced a partnership to run MARS7 on GPU infrastructure inside the UAE. Compute and data remain in-country, with private networking, encryption, and auditability intended to meet regional regulatory requirements, and the deployment is specialised for Arabic.[23,24]

That matters beyond media. The same platform is intended to support voice agents and assistants for customer service, banking, travel, and government services, capable of operating in Arabic by default, which extends the technology from entertainment into everyday public and commercial interaction.[25]

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CREATIVE INDUSTRIES

4IR Technologies:
AI, Robotics

Emirate:
Dubai

Maturity:
Scaled Deployment

Type:
Public-Private

099

Immersive Foresight and Interactive Exhibition Platform (Museum of the Future)

ACTORS

Dubai Future Foundation
Museum of the Future
Atelier Brückner
AVI-SPL
Superflux
Engineered Arts

SNAPSHOT

The Museum of the Future opened in Dubai on 22 February 2022 as an immersive institution focused on possible futures rather than a conventional collection of historical objects. Its original visitor experience spanned five exhibition floors and used large-scale projection, augmented reality, audiovisual systems, haptic effects, and physical environments to create scenarios involving space exploration, ecosystem restoration, and wellbeing.[1,2]

At the centre of the experience was Journey of the Pioneers, which occupied approximately 3,000 square metres across three floors and presented a connected narrative set in 2071. Future Heroes provided a separate 1,200-square-metre environment for children aged 12 and under.[3] The Tomorrow, Today gallery presented advanced technologies and included an AI-enabled humanoid robot that interacted directly with visitors.[4]

By February 2026, the museum had welcomed close to five million visitors since opening. It had also hosted 620 events, conferences, and talks and delivered 224 educational programmes, workshops, and interactive learning experiences.[5]

WHY IT MATTERS

The Museum of the Future was designed to make possible futures tangible. Its first visitor experience used immersive environments to explore space travel, biodiversity, ecosystem restoration, advanced technologies, and human wellbeing. Instead of presenting these subjects through conventional displays, it placed visitors inside fictional scenarios that they could see, hear, touch, and explore. Visitors were given roles within these environments and invited to consider how technological and social choices could shape life in the decades ahead.

In the Orbital Space Station Hope experience, visitors joined a fictional mission involving an energy system that harvests solar power from the Moon and transmits it to Earth. The HEAL Institute moved the story towards bioengineering and the restoration of damaged ecosystems.[6] Its Vault of Life contained 2,400 laser-engraved crystal specimens representing organisms that remained alive or had become extinct within the exhibition's imagined future.[7]

Rather than displaying technologies as separate objects, the museum used projection, augmented reality, interactive interfaces, haptics, sound, and physical scenery as narrative infrastructure. These systems connected space, biodiversity, health, and robotics within a continuous visitor journey.[8]

HOW THE TECHNOLOGY WORKS

During the first exhibition cycle, the installation contained 48 displays, 44 projectors, 300 speakers, and 76 media servers across five floors.[9] Media servers delivered exhibition content, while standardised touch panels, control processors, and network switches connected the different audiovisual systems. A central control room managed the technology, with two technical staff available continuously to provide proactive maintenance and respond to support requests.[10]

The visitor journey began with a simulated high-speed capsule journey from Dubai to Orbital Space Station Hope. Large projection surfaces, physical sets, soundscapes, and a choreographed sequence of installations created the impression of entering a future world rather than moving through a series of separate displays.[11,12]

The Vault of Life's crystal specimens were created from scientifically reviewed digital models. Superflux developed a procedural process that converted the models into point clouds with the density and dimensions required for subsurface laser engraving.[13] Visitors used Biosynth devices to browse the archive and collect genetic codes for a subsequent activity in which they created an enhanced species intended to support ecosystem restoration.[14]

Artificial intelligence and robotics were represented in the Tomorrow, Today gallery. In 2025, the museum introduced an enhanced version of Ameca, a humanoid robot manufactured by Engineered Arts. The robot used voice recognition, analysed facial expressions and emotions, and produced controlled facial and body movements during conversations. It could communicate with visitors in more than six languages, including Arabic, English, Chinese, Hindi, Spanish, and Russian.[15]

5M
VISITORS
welcomed in the museum's first 4 years

10K
SPECIES
preserved in the future BioVault, opening 2027

IMPACT AND RESULTS

The museum drew close to five million visitors in its first 4 years. Alongside the galleries, it delivered 620 events, conferences, and talks and 224 educational programmes, workshops, and interactive learning experiences.[16]

The Dubai Future Foundation established the Global Futures Society at the museum, bringing together 40 international foresight institutions. The museum also hosted the Artificial Intelligence Retreat, attended by more than 1,000 government and private-sector decision-makers and technology specialists. The first two editions of the Dubai Future Forum held at the museum involved 3,500 experts from more than 100 countries.[17]

During the museum's first iteration, the exhibition infrastructure was designed for long-term, high-volume use. Centralised management, networked content delivery, and continuous technical support allowed large numbers of visitors to interact with complex projection, audio, and digital systems as one coordinated experience.[18]

WHAT'S NEXT

The Museum of the Future remains an active institution, although its main exhibitions were temporarily closed to visitors at the beginning of September 2026 for a complete renewal. Selected activities and services may continue during this period, and the auditorium remains available for event bookings. The museum is scheduled to reopen in the first quarter of 2027 with an entirely new narrative, exhibitions, spaces, and interactive experiences. The original exhibitions will not return in their previous form.[19]

The renewed museum will include the World Preservation Lab and BioVault, developed in collaboration with Colossal Biosciences. First presented as a temporary exhibition during the 2026 World Governments Summit, it will become a permanent installation at the museum.[20] The public-facing cryogenic biobank will preserve cell and tissue samples from more than 10,000 species and is expected to open in 2027.[21]

The BioVault will turn an idea explored by the original exhibition into working conservation infrastructure. The Vault of Life displayed engraved crystal specimens of species preserved in a fictional 2071, while the BioVault will hold real cell and tissue samples.[22,23]

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4IR Technologies:
AI

Emirate:
Abu Dhabi

Maturity:
Operational Deployment

Type:
Public-Private

CREATIVE INDUSTRIES

100

Open-Weight Language Models for Underserved Languages (Jais · NANDA · SHERKALA)

ACTORS

Inception (G42)
Mohamed bin Zayed University of Artificial Intelligence
Cerebras Systems

SNAPSHOT

In August 2023, Inception, a G42 company, released Jais, a 13-billion-parameter Arabic large language model trained on a purpose-built dataset of 395 billion Arabic and English tokens, and released it as open source.[1] It was built with the Mohamed bin Zayed University of Artificial Intelligence (MBZUAI) and Cerebras Systems, and Inception described it on release as the world's highest quality Arabic large language model.[2] It takes its name from Jebel Jais, the UAE's highest peak, and was made in Abu Dhabi for the more than 400 million people who speak Arabic.[3]

Inception now has three bilingual model families in the open: Jais for Arabic, NANDA for Hindi, and SHERKALA for Kazakh.[4]

WHY IT MATTERS

A language model can only learn from text that has been written down, digitised, and collected, and that material is distributed very unevenly across the world's languages. Speaker numbers are no guide to it: Arabic has more than 400 million speakers, but the text available to train a model on it was the constraint. Inception and its partners describe their models as built to overcome that barrier of data availability,[5] and SHERKALA as a response to the needs of underserved linguistic communities.[6]

Rather than wait for such a corpus to accumulate, Inception assembled one. That is what makes this a national capability rather than a procurement.

The models are then released as open weights rather than sold as a service,[7] so researchers and developers can download them and build on them directly, subject to each model's licence.

400M+
ARABIC SPEAKERS
served by the Jais model

HOW THE TECHNOLOGY WORKS

Jais was trained on 116 billion Arabic tokens and 279 billion English tokens, the English included so that capability learned in the larger language would carry across to the smaller one.[8] Training, fine-tuning, and evaluation were done by a joint Inception and MBZUAI team, and an academic partnership gave early access to researchers at Carnegie Mellon University, École Polytechnique, Hamad bin Khalifa University, Sorbonne Paris Nord, New York University Abu Dhabi's CAMeL Lab, and the University of Edinburgh.[9]

The result held up on both sides of that trade. Cerebras reports that Jais achieved the best performance of any open Arabic model at release, while its English performance remained comparable to leading open English models despite being trained on less data.[10] The training ran on Condor Galaxy 1, the multi-exaFLOP supercomputer co-developed by G42 and Cerebras.[11]

The later models take a different route to the same end. Rather than training from scratch, NANDA 87B adapts Llama-3.1 70B and is trained on a curated Hindi-English dataset of more than 65 billion Hindi tokens,[12] with a custom Hindi-centric tokeniser that improves efficiency and reduces both training and inference time.[13]

SHERKALA applies the method to Kazakh at a fraction of the size: 8 billion parameters, built on Llama 3.1, trained on 45 billion words across Kazakh, English, Russian, and Turkish, with the base vocabulary extended by 25% with high-frequency Kazakh tokens to suit the language's morphology.[14] Russian and Turkish are in the mix by design, so that capability transfers into Kazakh where Kazakh text alone runs short.[15]

IMPACT AND RESULTS

The strongest evidence that the approach works comes from the smallest model. Cerebras reports that SHERKALA, at 8 billion parameters, surpasses larger counterparts (including 70-billion-parameter models) in Kazakh generative capability, tested against human-curated queries on Kazakh culture, history, and knowledge.[16]

Nor has the programme stopped at first releases. Jais reached a second generation in December 2025, with models trained on the largest Arabic-first dataset assembled to date, covering Modern Standard Arabic alongside regional dialects and published in 8-billion-parameter and 70-billion-parameter chat versions.[17] NANDA reached 87 billion parameters in the same month.[18]

The models are distributed through public repositories rather than as a hosted product. NANDA 87B is published as an open-weight model on MBZUAI's Hugging Face page,[19] and SHERKALA is likewise published for download, under a non-commercial licence.[20]

WHAT'S NEXT

Inception and MBZUAI have said they will continue to expand and refine Jais as its user community grows.[21] The three languages have followed a consistent route in two respects: a dataset assembled for the language and release as open weights. The model itself has been trained from scratch for Arabic and adapted from an existing model for Hindi and Kazakh.[22]

"By combining cutting-edge research with open access, NANDA is designed to serve content creators, educators, developers, and enterprises working across India's digital landscape. This milestone reflects our continued commitment to building AI-native solutions for the Global South and accelerating AI adoption across high-impact sectors," said Ashish Koshy, Chief Executive Officer, Inception.[23]

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