



# Capitalizing on Artificial Intelligence Opportunities

## The Journey to Building a World-Class Artificial Intelligence Practice

An IDC White Paper

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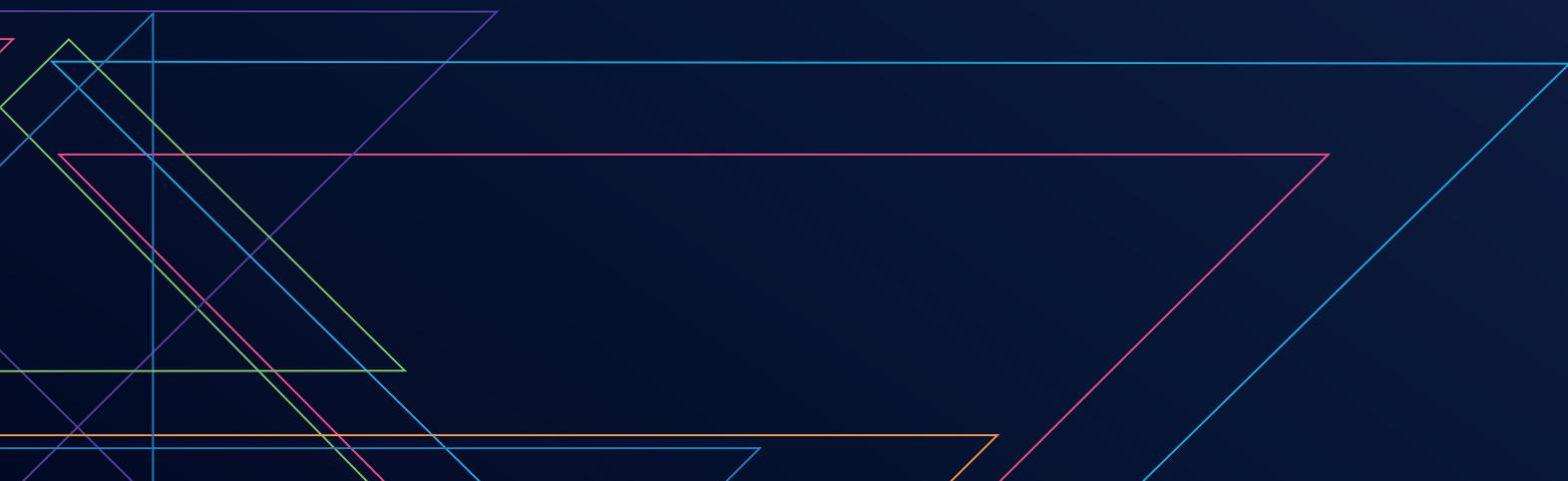


SAUDI BUSINESS MACHINES  
السعودية للحاسبات الإلكترونية

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# The Global Rise of Artificial Intelligence

Artificial Intelligence (AI) has become a common topic for countries worldwide, and both public- and private-sector organizations have already started leveraging it as a response to continuous digital technology and business disruption. According to IDC's 2022 Artificial Intelligence Spending Guide, global AI spending reached \$88.6 billion in 2021, and it is forecast to grow at a compound annual growth rate (CAGR) of 25.6% over the 2021–2025 period.

An important indicator of progress in AI adoption is that many countries have already announced national AI strategies with ambitious long-term goals and have committed to fostering local AI ecosystems that include technology solution providers, universities, government authorities, startups, and public- and private-sector entities.

Canada, China, and the United States are among the countries in which many organizations began their AI journeys early, supported by government initiatives, with these markets already having made notable progress in terms of AI usage and use cases. Canada launched the Pan-Canadian Artificial Intelligence Strategy in 2017, with a strong focus on AI research, skills, ecosystem collaboration, and policy and legal framework development. In 2016, the U.S. published two studies presenting its plans to identify research and development requirements and investment priorities for AI. Its National Artificial Intelligence Initiative was announced in 2019, followed by the announcement of another strategic initiative, Promoting the Use of Trustworthy Artificial Intelligence in the Federal Government. China is another important actor in the global AI market. The country released its national AI plan in 2017 to enhance national competitiveness and protect national security. China's AI strategy is one of the world's most comprehensive.

In terms of metrics for AI readiness (as shown in table 1), both China and the U.S. have been performing strongly against global benchmarks, such as the number of AI-related scientific publications and patent applications. Canada is among the top countries in areas such as AI-related scientific publications, adoption of emerging technologies, and government promotion of emerging technologies.

**Table 1: A Comparative View of Select Countries' AI Market Readiness**

(Ranking out of 130 countries)

	Government Promotion of Investment in Emerging Tech	Adoption of Emerging Technologies	Investment in Emerging Technologies	AI-Related Scientific Publications	PCT Patent Applications (per Million Population)
Saudi Arabia	4	23	30	21	32
U.S.	7	2	1	2	12
China	N/A	N/A	33	1	13
Canada	12	11	20	9	23

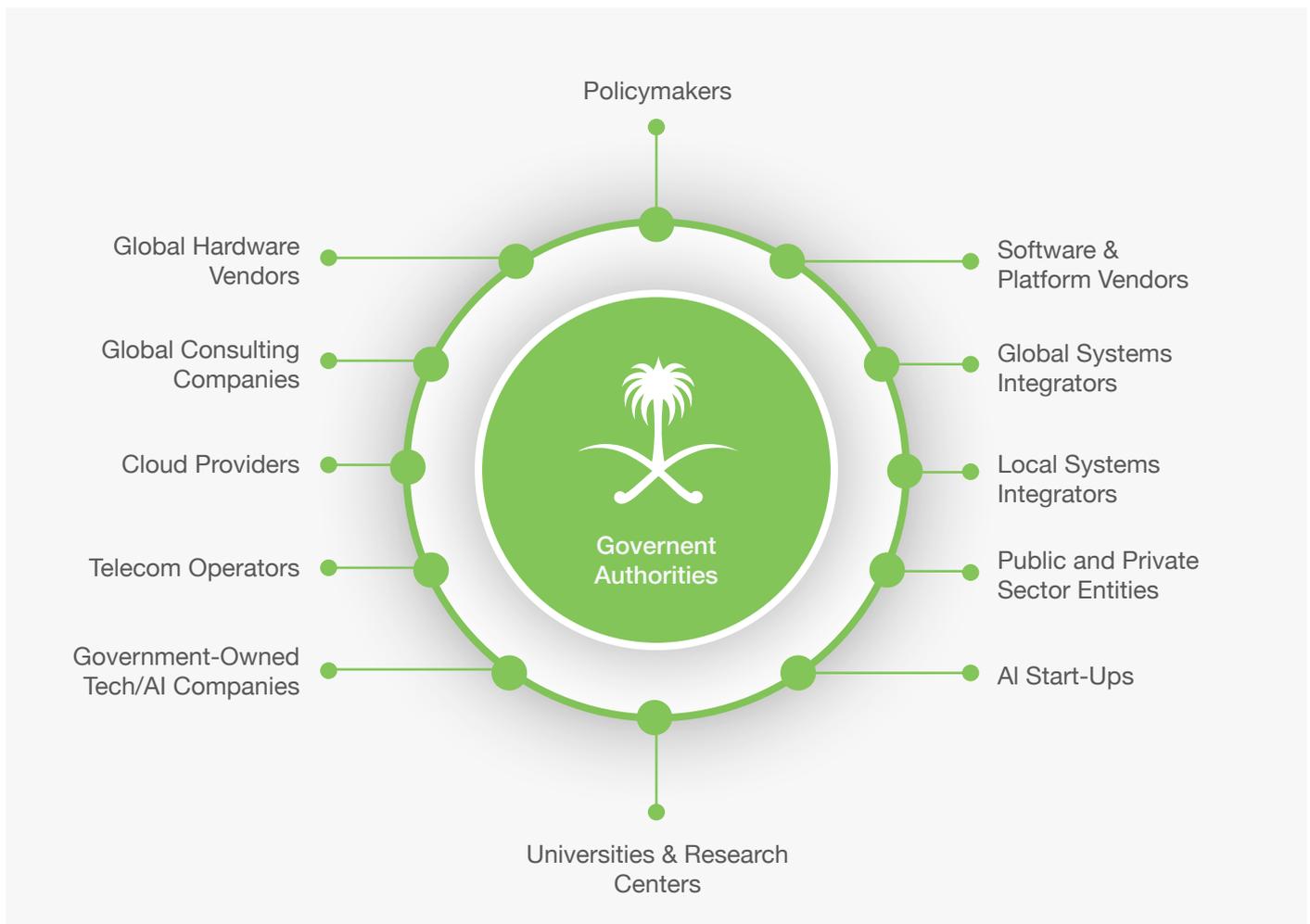
Saudi Arabia is no different from the above countries in terms of its commitment to becoming an AI powerhouse. As an extension of the country's Vision 2030, the Saudi Data and AI Authority (SDAIA) was established in 2019, followed by the release of the National Strategy for Data and AI in 2020.

According to a Network Readiness Index study, Saudi Arabia ranked fourth out of 130 countries in terms of government promotion of emerging technologies. In the 2019 edition of the report, the country was in 41st place in the number of patent applications, but it rose to 32nd place in the 2021 report. This shows the fast pace of progress in Saudi Arabia. Given its strong focus on and dedication to fostering an AI ecosystem and driving the adoption of this emerging technology, Saudi Arabia is poised to see strong growth in overall AI spending, with a CAGR of 29% forecast for the 2021–2025 period, resulting in a market value of \$563 million in 2025.

# Fostering a Strong AI Ecosystem in Saudi Arabia

Saudi government authorities — such as the Ministry of Communication and Information (MCIT), the Communications and Information Technology Commission (CITC), and SDAIA — are working in a highly collaborative manner to create the right environment for a local AI ecosystem that could drive industry innovation and transformation.

**Figure 1: Key AI Ecosystem Stakeholders in Saudi Arabia**



Fostering an AI ecosystem that can deliver holistic use-case-driven solutions is essential to ensuring the continuous and sustainable adoption of AI technologies in any market. This ecosystem includes global software and hardware vendors, local technology providers (e.g., local systems integrators, telecom operators, vendors, and start-ups), cloud services providers, global systems integrators, consulting companies, universities and research institutions (e.g., the King Abdulaziz City for Science and Technology and the AI Center of Advanced Studies [Thakaa]), government-owned technology companies (e.g., the Saudi Company for Artificial Intelligence [SCAI]), and government authorities and policymakers.

The large-scale transformational projects outlined in Vision 2030 — including the Red Sea Project, NEOM, Amaala, and Qiddiya — have prioritized investments in emerging technologies. In this regard, different ecosystem players working collectively toward the same goal will play an important role in ensuring the success of national AI initiatives and megaprojects.

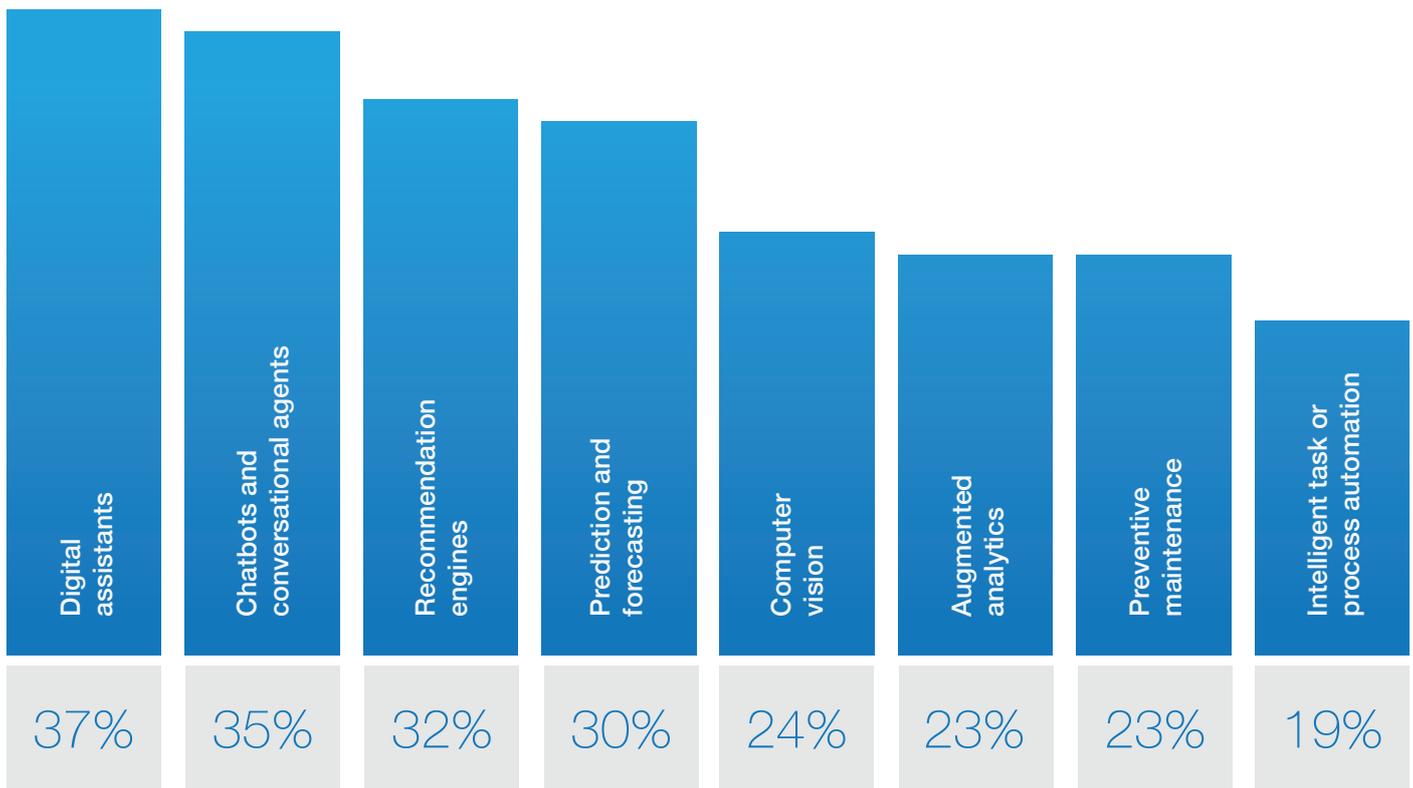
Another important initiative by the Saudi government is the introduction of events and gatherings bringing together the global AI community. One example is the Global AI Summit, which will be held September 13–15, 2022, with the participation of ecosystem players from Saudi Arabia and around the world. Such gatherings will help local providers to connect with global ecosystem providers, learn from the experience of these providers, share their capabilities and experience, and explore new partnership opportunities around new industry-specific AI use cases.

# Momentum for AI Adoption in the Kingdom

Saudi Arabia's progress on AI adoption has been notable. Several very large organizations embarked on their AI journeys four or five years ago. A significant number of Saudi organizations, triggered mostly by the COVID-19 pandemic, have started exploring how they can leverage AI to drive customer experience, operational efficiency, workforce experience, and cost reduction.

According to a recent IDC survey among CIOs, almost half of the Saudi organizations who invest in AI technologies prefer to customize off-the-shelf solutions to meet their needs. This shows end users' appetite to work with local and global technology solution providers to meet their organizations' specific business requirements. In terms of in-demand AI applications, more than one-third of Saudi organizations are investing in digital assistants, chatbots, and conversational agents augmented by Arabic natural language processing (NLP)/natural language understanding (NLU) capabilities, which they are integrating into various business processes. For example, oil & gas companies and utility companies leverage digital assistants with augmented reality capabilities to support field operations, using these tools to access guidelines and manuals and deliver support and maintenance services. Interest in voice- and text-enabled chatbots and conversational agents is strong across the telecommunications, finance, and retail verticals; organizations in these verticals want to enhance their omni-channel operations by enabling more intuitive customer journeys.

Figure 2: Saudi Arabia AI Application Investment Plans for the Next 12–18 Months



Source: IDC's Innovation Survey, 2022; META; N = 79; 250+ employees only

Recommendation engines (32%) and prediction & forecasting (30%) are other key investment areas that will be leveraged in various vertical markets to drive customer engagement and to help companies make meaningful decisions across sales, marketing, operations, and the supply chain throughout the business cycle.

Computer vision is being heavily used in certain verticals for various use cases, including patrolling robots and surveillance cameras for ground services and site security and drones that combine aviation technologies, immersive technologies, and AI for aerial inspection.

# Industry Dynamics and Emerging AI Use Cases

Some organizations from verticals such as finance, oil & gas, government, manufacturing, and telecommunications have been making rapid progress on their AI and data journeys. A number of organizations in these verticals already have world-class AI implementations. Investments made by such organizations — alongside investments being pursued as part of Saudi Arabia’s megaprojects — are quite sophisticated and will certainly drive AI adoption across the rest of the market. To give an example, Aramco has been heavily investing in emerging technologies and established a Fourth Industrial Revolution Center several years ago. The center features 279m<sup>2</sup> of media walls, providing AI-based insights on companies’ operations and assets. A partnership was recently announced between Aramco and the King Abdullah University of Science and Technology to build an AI Excellence Center. This is a good example of how organizations are building partnerships with industry ecosystem players to expand their capabilities.

In terms of AI solutions investment, finance, government, and energy & resources stand out as the verticals with the highest spending. In particular, organizations in the finance and energy & resources sectors have implemented very sophisticated use cases, including fraud management, recommendation systems, threat intelligence in finance and asset management, threat intelligence, and sales process recommendation systems with predictive analytics capabilities in energy & resources.

In contrast, government entities are more focused on transforming their internal processes through process redesign and automation, and they use AI techniques such as NLP/NLU, image recognition, and machine learning (ML)/classification to drive operational efficiency. One example is how some governments are moving to a paperless operational model, digitizing their document hardcopies and using the abovementioned technologies to create intelligent content management systems that are integrated with automated business processes.

**Table 2: Top 3 Use Cases for Key Vertical**

	<b>Finance</b>	<ul style="list-style-type: none"> <li>• Fraud analysis and investigation</li> <li>• Augmented threat intelligence and prevention systems</li> <li>• Program advisors and recommendation systems</li> </ul>
	<b>Government</b>	<ul style="list-style-type: none"> <li>• Public safety and emergency response</li> <li>• Smart business innovation and automation</li> <li>• Augmented threat intelligence and prevention systems</li> </ul>
	<b>Energy and resources</b>	<ul style="list-style-type: none"> <li>• Automated preventative maintenance</li> <li>• Augmented threat intelligence and prevention systems</li> <li>• Sales process recommendation and augmentation</li> </ul>
	<b>Communications</b>	<ul style="list-style-type: none"> <li>• Automated customer service agents</li> <li>• Augmented threat intelligence and prevention systems</li> <li>• Smart networking</li> </ul>
	<b>Manufacturing</b>	<ul style="list-style-type: none"> <li>• Quality management investigation and recommendation systems</li> <li>• Automated preventative maintenance</li> <li>• Augmented customer service agents</li> </ul>
	<b>Retail and wholesale</b>	<ul style="list-style-type: none"> <li>• Expert shopping advisors and product recommendations</li> <li>• Merchandising for omni-channel operations</li> <li>• Augmented customer service agents</li> </ul>

Source: IDC AI Spending Guide, 2022

More information on industry-specific AI use cases is shown in Table 2. Although transportation, tourism, healthcare, construction, and education are not covered above and the AI spending in these verticals is relatively small compared with other verticals, they also present a solid opportunity. The transportation vertical has especially large potential due to the strong tourism industry, the opening of new airports, and the implementation of new transportation routes and systems (e.g., the Riyadh Metro). In terms of transportation, aviation stands out as an important spender on AI solutions. Companies in this vertical are striving to build a unified data layer to improve overall travel experience, from passenger experience at airport terminals to air travel itself, including integration with ground transportation channels.

AI is being used more in operational areas (e.g., fuel consumption optimization), contributing to these organizations' sustainability goals. Healthcare, construction, and education have several strong use cases, and the pandemic has certainly accelerated technology adoption across these verticals. Although AI spending in these verticals has been relatively low, especially in healthcare, many research initiatives are exploring the use of AI in patient care (e.g., remote patient monitoring). In construction, AI is being used for site surveillance and to ensure worker health and safety.

# Traits of Successful AI Companies in Saudi Arabia and Key AI Adoption Challenges

AI is not a feature or a tool but an architectural shift — one that disrupts fundamental assumptions regarding the implementation of new applications and use cases. This triggers a change not only in IT architecture but also in business architecture. Organizations in Saudi Arabia should therefore approach AI as a strategic initiative rather than a one-off project so that they can drive organization-wide innovation and become AI disruptors. To understand an organization's AI readiness, five maturity traits of AI disruptors need to be evaluated.

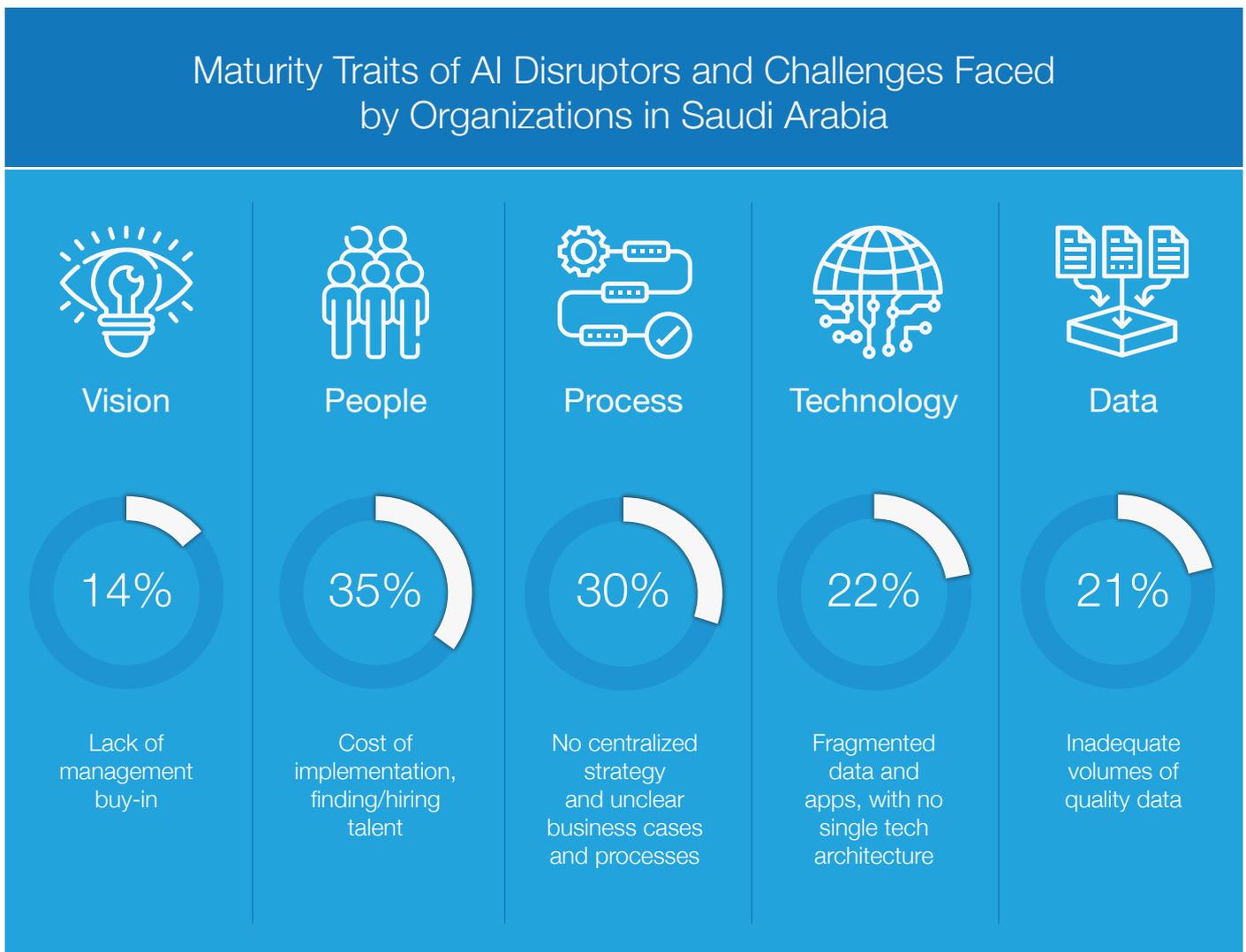
**Figure 3: Five Maturity Traits of AI Disruptors**

	<b>Vision</b>	Adaptable enterprise-wide strategy, “AI first” culture, and alignment with business goals
	<b>People</b>	AI skillset fed by continuous processes, redeployment, recruitment, and training
	<b>Process</b>	Organization-wide business processes, automation, and digitization
	<b>Technology</b>	Enterprise platform with universal access to data and intelligence services, and structured operationalization of AI/ML model deployment
	<b>Data Readiness</b>	Data acquisition and data preparation as a service, and the real-time provisioning of resources such as data sets, expertise, and tools

Source: IDC, AI MarketScape Framework

Although AI adoption in Saudi Arabia has been progressing rapidly, challenges remain regarding organizational readiness to adopt AI at scale. Only a select number of organizations have embraced a holistic, transformational approach to implementing an AI- and data-driven culture.

Figure 3: Journey to Disruptive AI – Saudi Arabia View



Source: IDC META Tech & Innovation Survey 2022, n:80, 250+ employees only, IDC META DX Survey 2022, n:74, 100+ employees only

According to the findings of IDC's recent Saudi Arabia CIO survey, 35% of organizations named identifying and hiring talent and the cost of implementation as major challenges. Having the right skills is essential to succeeding in the AI journey, as is the strong alignment of these skills with business goals. A lack of a centralized strategy and unclear processes are among the key challenges for 30% of organizations. This represents a major threat for these organizations, as a lack of alignment across business and IT functions and the availability of defined processes will hamper any major AI initiative. Another major challenge is a lack of a single technology architecture and platform, as identified by 22% of organizations in Saudi Arabia as an inhibitor of sophisticated AI use-case adoption. Data is a vital component of AI projects. Without adequate volumes of high-quality data, AI use cases will not be successful. For example, Arabic NLP/NLU use cases demand a large training dataset that covers different dialects of the language. A lack of volume and quality in such datasets hinders many associated AI use cases.

Many organizations in Saudi Arabia implemented AI app by app and slowly came to realize its potential to transform the organization. Due to the variety of AI/ML use cases, they are now recognizing AI as a foundational technology — one that must be built into the platform.

It is highly important for Saudi organizations to adopt an organization-wide approach to AI, starting with management support and vision and the restructuring of business processes. These efforts should be supported by skillset development; the implementation of an AI platform to develop, test, and run various AI use cases; and strong data architecture to unlock the value of data using AI.

# Building a Sustainable and Secure AI Practice

AI adoption in Saudi Arabia is increasing. Like most other areas of technology, AI is prone to cybersecurity threats. Threat actors and adversaries launch attacks to compromise the confidentiality, availability, and integrity of AI systems. Security is an important aspect of a sound AI mechanism. Integrating security controls during the design phase and throughout the AI life cycle can make AI more reliable. This is crucial for cases in which AI performs critical functions, such as in healthcare and manufacturing. The following are some common concerns related to AI security:



## Training Data Security

After deployment, AI systems collect data to retrain themselves to detect new attacks. This method can be compromised by threat actors, who inject data that can contaminate the training data, impairing the normal functioning of the AI system. Deep learning requires many training samples. As such, it is difficult to monitor the quality of training data. Moreover, concerns have been raised about the privacy of training data. The training data itself can be of interest to threat attackers, which can lead to compromised privacy for individuals.



## Algorithm Security

AI algorithms are at risk of exploitation by adversarial examples. Adversarial examples exploit AI systems by modifying input data. They are usually obtained by adding small perturbations to the original legitimate samples. These changes might not be noticeable to humans but can greatly affect the output of deep learning models. AI algorithm security has been the largest focus area in terms of AI threats. Attempts have been made to build AI systems that offer robust defenses against such threats or are able to detect them.



## Trained Model Security

Trained model security is commonly breached through backdoors. The backdoor can be triggered by special inputs from the threat actor who created it. Additionally, unlike traditional software, which consists of code, neural networks consist of parameters, which makes backdoor detection more difficult. It is also difficult to identify issues in such networks, with problems spreading through the continued use of incorrect models. Another type of attack is training-data extraction, whereby the threat actor tries to speculate on the parameters or training data to analyze an AI system's input, output, and other external information. Attackers also try to manipulate APIs for trained data or AI model theft.



## Platform Security

Like most other software and hardware, AI models, platforms, and hardware are prone to vulnerabilities. The underlying system that generates and trains the networks can be exploited through open vulnerabilities. These vulnerabilities can result in incorrect outputs, even if the algorithms and the training data were error free. Thus, it is necessary to focus on and manage platform vulnerabilities that can affect AI systems.

Some other important concepts in AI security include transparency, ethics, and responsibility. As AI adoption in Saudi Arabia grows, organizations are becoming more vigilant about AI governance. Most organizations are still experimenting with ethical and responsible AI, but a few have started projects to develop standards, guidelines, and tools for formal AI governance.



## Explainability and Transparency

At present, most AI models are complicated black-box systems with decision-making processes, reasoning, and justification logic that are hard to interpret. It is therefore difficult to understand why a model created a specific output. And, if the output is somehow incorrect, it is difficult to debug the model due to its inexplainability. The inexplainability of AI systems mostly does not cause any problems in the translation mechanism of AI systems. It only leads to issues in cases in which explainability or model transparency are sought for legal purposes or for business risk quantifications. Examples include healthcare and loan analysis.



## Bias

Bias is inherent and unavoidable in human lives. Whether we like it or not, we still live with our biases. Because all AI models are ultimately created, trained, and overseen by humans, these biases are likely to affect AI models as well. While this flow of human biases to AI models is inevitable, organizations can consciously try to reduce it. This can be done by implementing governance around training data selection and maintenance of this data across the AI lifecycle and also by choosing a diverse design team for AI related projects that is a fair representation of society and various cultures.



## Trustworthy

AI ethics set guidelines for designing trustworthy outcomes from AI models. A trustworthy AI model follows the principles of respect for people, respect for their consent, and respect for their right to be fully aware of the risks of AI. People involved in AI models should not intentionally cause harm to others and should work to reduce bias around topics such as gender, race, and ethnicity. Fairness and equality should also be central in terms of distributing the benefits of AI.

# SBM and IBM's Approach to Delivering Differentiated Value with AI & Data

SBM has been heavily investing in its emerging technology capabilities, and AI stands out as a key strategic focus area for the company. SBM views data and AI as the key enablers of many sophisticated technology use cases and as critical instruments for helping Saudi Arabia to achieve its Vision 2030 goals.

SBM's competitive edge in the AI domain stems from its longstanding partnership with IBM, which was first established in 1968, as well as from its in-house capabilities, which enable it to build AI products in house and deliver custom solutions. IBM is deeply rooted in Saudi Arabia, with its history in the Kingdom dating back to 1947, when the company installed the first computer in the Middle East for Saudi Aramco.

SBM and IBM have a team of data scientists, data engineers, cloud engineers, domain experts, solution architects, business transformation consultants, security experts, and other experienced emerging-technology professionals on the ground in the Kingdom. These capabilities enable both technology providers to work closely with customers to deliver customized solutions around Big Data and analytics, AI, automation, data governance and compliance, and security. These solutions can be delivered through IBM Cloud Pak for Data, a fully integrated data and AI platform that enables organizations to accelerate AI-powered transformation, and through RedHat OpenShift, an open-source container platform.

In addition to these product capabilities, SBM, together with IBM Consulting, has the services capabilities to support clients throughout their AI journeys. These capabilities include:

- Providing consulting and advisory services through design-thinking workshops to understand clients' business challenges, data readiness, and platform/architecture requirements
- Supporting the entire AI stack, spanning infrastructure, platforms, and applications
- Building industry-specific AI use cases by using internal development and customization capabilities alongside product/platform capabilities
- Implementing and integrating AI use cases into public, private, or hybrid cloud environments
- Operating end-to-end AI use case/model life cycles through the use of MLOps models
- Ensuring model consistency and security via a comprehensive set of trust and transparency competencies

As a part of its efforts to create local value, SBM has recently introduced its flagship AI product suite, SBM Quadra, which is built on a cloud-native microservices architecture and provides containerized AI services with common operation and integration frameworks and AI assets. SBM Quadra is built on IBM Cloud Pak for Data. The key products that are part of the suite are as follows:

- SBM Quadra Core is a cloud-native platform that leverages API and microservices capabilities to enable the agile development, deployment, and integration of innovative AI applications and use cases.
- SBM Quadra Consent is a containerized out-of-the-box solution that ensures a secure and transparent flow of consumer data in an open banking environment that is consistent with changing central banking requirements. Quadra Consent oversees the process for consent provisioning, granting, verification, revocation, expiration, and logging over the lifetime of a relationship between a fintech app and consumer data.
- Quadra Conversational AI, which is powered by IBM Watson, helps businesses that want to expand the capabilities of their digital assistant and chatbot solutions and create a more unified customer experience, with an eye to security, scalability, ease of integration, and analytics for better business outcomes.

- Quadra Digital Human is an AI-powered human-like virtual assistant that takes the human and AI conversation to the next level. The solution recreates the most important parts of human communication, such as voice tones, conversations, and expressions to strengthen emotional ties with consumers, cultivate attachment to corporate brands, and drive customer satisfaction.

Other key SBM solutions include:

- SBM Correspondence Management is built on top of IBM Cloud Pak and is the only ICN (IBM Content Navigator) bilingual correspondence solution that has the ability to securely manage the life cycle of incoming and outgoing documents/records from creation to final storage. It enables organizations to receive, automate, track, and monitor the movement of all internal and external correspondences.
- Sarie is the instant payment system of Saudi Arabia. It has been introduced together with Saudi Payment (under the supervision of SAMA) and Mastercard as part of SBM's commitment to creating an inclusive digital economy that is accessible to all Saudis. This offering aims to enhance financial services in the Kingdom through faster payments and advanced banking reconciliation. In line with the Saudi Vision 2030 goal of creating a 70% cashless society by the end of the decade, Sarie now supports all Saudi banks and allows their customers to send and receive money in real time using a wider range of services and transfer options.

One of SBM and IBM's very strong differentiators is that both companies already have field-proven AI use cases deployed across various industries. Additionally, leveraging IBM's regional and global capabilities, IBM and SBM can bring best practices to the Kingdom. Some examples of these deployments are outlined below:

Customer	Business Challenge	AI Transformation	Business Outcome
ABN AMRO Bank Netherlands	The initial chatbot technology didn't have the scalability and intelligence required to anticipate customers' needs.	The engagement involved building IBM Watson powered virtual assistants. Anna, is an external-facing customer service virtual agent that assists the bank's retail and commercial banking customers.	Available 24x7 on the bank's chat channel, it provides answers by both assessing a customer's need and taking their profile into account.
A Bank in the Middle East	The analytics program relied on siloed data sets, developers working in isolation and disparate development methods. This led to inconsistent business results.	IBM Cloud Pak for Data was deployed to make data simple & accessible, create a business-ready analytics foundation, and build and scale trustworthy AI.	Now the bank has the data, tools and processes in place to produce high quality and trusted AI solutions
Prudential Singapore	Prudential Singapore sought a cost-effective solution to help its financial consultants respond to product and policy questions more quickly, with the objective of providing an enhanced customer experience.	The company used IBM Watson Discovery and IBM Watson Assistant to develop an intelligent interface for financial consultants seeking answers to common queries.	Improvements include enhanced responsiveness, consistently exceptional service quality, and 32% reduction in call volume.
Indue Australia	Real-time payments mean greater risk of fraud and cybercrime, as fraudsters can move money extremely fast. Indue needed to create a real-time, full-service offering to help its customers meet the challenges in Real-time Payments	They identified IBM Safer Payments as the ideal solution to bring AI and real-time detection capability to fraud detection.	Using IBM Safer Payments, Indue was able to help its customers reduce false positive rates, make rule changes faster and manage all its payment channels in one system.

Source: <https://www.ibm.com/case-studies>

SBM and IBM are not only focusing on building in-house capabilities in the Kingdom; they are also committed to creating ecosystem value by providing extensive training programs for both public- and private-sector organizations. For example, in addition to forming an agreement with the Ministry of Communication and Information Technology to train its employees and other government officials, they have also joined forces with Tuwaiq Academy to deliver a range of online courses to improve the digital skills of government and private-sector employees, with a strong focus on AI and other emerging technologies. SBM will continue to partner with authorities and introduce innovative new solutions by leveraging emerging technologies to meet the requirements of businesses in the Kingdom, thereby contributing to the realization of Saudi Vision 2030.

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