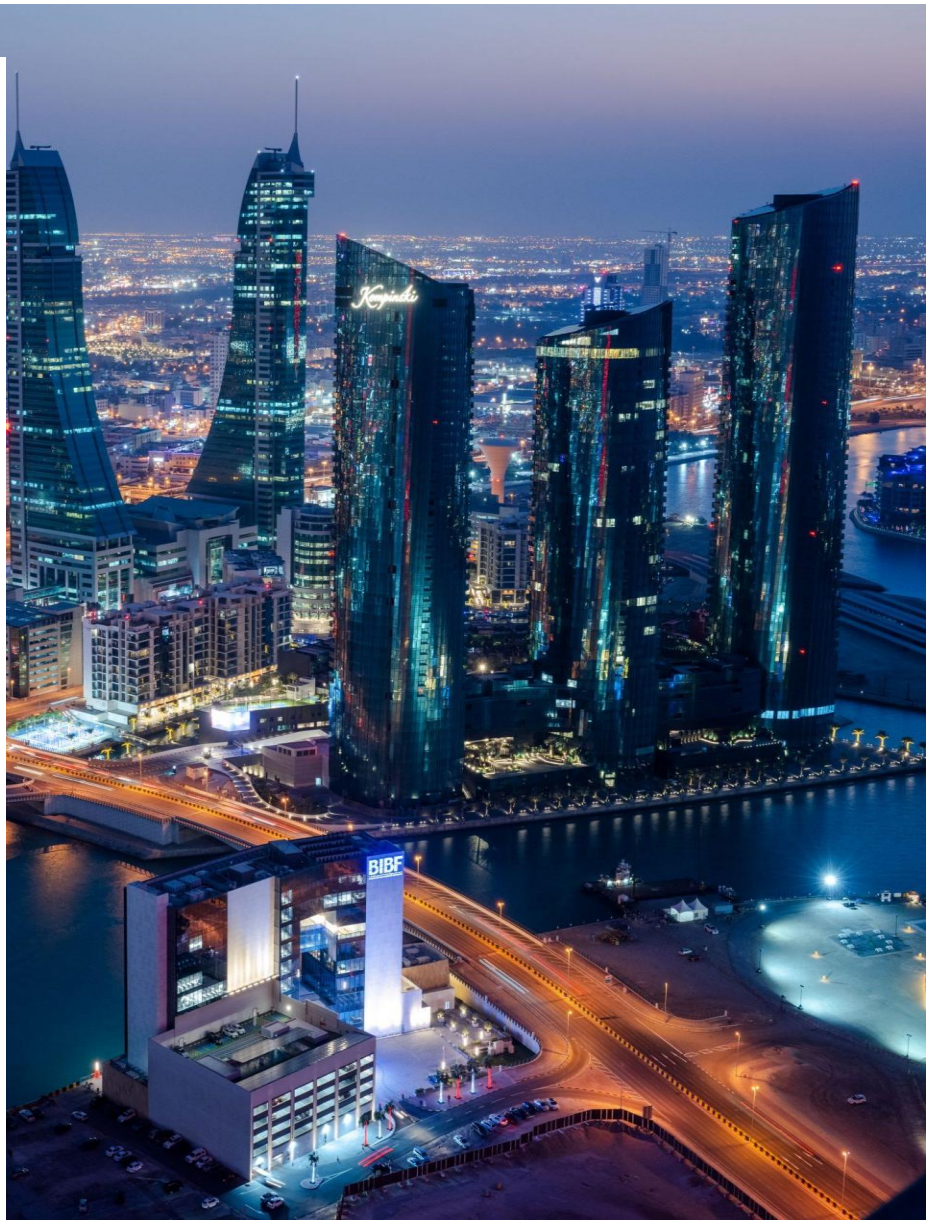
KINGDOM OF BAHRAIN

UNESCO'S ARTIFICIAL INTELLIGENCE READINESS ASSESSMENT METHODOLOGY REPORT - RAM



Government of Bahrain

NOVEMBER 12, 2025

KINGDOM OF BAHRAIN

ACKNOWLEDGEMENT

The Kingdom of Bahrain's dedication to collaboration, innovation, and responsible progress is clearly reflected in this report, showcasing its unwavering commitment to advancing the national AI landscape. Bahrain has adopted a comprehensive and inclusive approach to developing its AI ecosystem, engaging stakeholders across sectors through workshops, public consultations, strategic partnerships, and advisory committees. We extend our sincere appreciation to UNESCO for its valuable partnership and contributions, which have been instrumental in shaping Bahrain's AI journey and supporting its strategic direction.

Since the early stages of its AI transformation, the Kingdom of Bahrain has worked to establish a robust AI and data governance framework, supported by leading national entities such as the Information & eGovernment Authority (iGA), the Ministry of Education, the Ministry of Industry and Commerce, and Tamkeen. We also recognize the important contributions of the National Cybersecurity Center, the Telecommunications Regulatory Authority, and the Central Bank of Bahrain, whose expertise continues to enhance the Kingdom's digital and AI ecosystem.

Through these unified national efforts, Bahrain is not only strengthening its domestic AI ecosystem but also playing an active role in the global dialogue on responsible and ethical AI development. The Kingdom's vision and coordinated action reaffirm its position as a regional leader in innovation, governance, and the sustainable advancement of artificial intelligence.

ACRONYMS AND ABBREVIATIONS

AI: Artificial Intelligence

BUB: British University of Bahrain

CBB: Central Bank of Bahrain

EDB: Economic Development Board

GCC: Gulf Cooperation Council

GDP: Gross Domestic Product

ISO: International Organization for Standardization

iGA/iGA: Information and eGovernment Authority

IoT: Internet of Things

MoE: Ministry of Education

MoIC: Ministry of Industry and Commerce

MoH: Ministry of Health

MTT: Ministry of Transportation and Telecommunications

NCA: National Cybersecurity Center

PPDL: Personal Data Protection Law

PDP: Personal Data Protection

Tamkeen: Labor Fund

TRA: Telecommunications Regulatory Authority

UCB: University College of Bahrain

UOB: University of Bahrain

VET: Technical and Vocational Education and Training

NSCS: National Cybersecurity Strategy

NAO: National Audit Office

MoFNE: Ministry of Finance and National Economy

IPA: Institute of Public Administration

MoW: Ministry of Works

BNA: Bahrain News Agency

HEC: Higher Education Council

Assistant Director General (ADG) Foreword

We have officially entered the Age of Artificial Intelligence. The world is now set to change at a pace not seen in decades, even centuries. AI-based tools and applications make our lives easier, smoother, and richer. They help us move efficiently, get informed, get credit, get a job, and get our taxes done.

But in its current form, AI reproduces and amplifies many of the social challenges we face. It is not acceptable that around a third of the world's population still lacks adequate internet access. Upstream, the AI industry is highly concentrated, with just two countries – the United States and China – and a dozen companies accounting for a major share of the sector. This can lead only to greater inequality of outcomes – including gender disparities – downstream. Non-diverse AI teams, unrepresentative datasets, and opaque and biased algorithms can cause harm, particularly to those who are already vulnerable, whether companies or individuals, children and young people, women, or entire democracies.

That is why UNESCO drafted the Recommendation on the Ethics of Artificial Intelligence, which was adopted in 2021 by 193 countries to make sure AI delivers fair, sustainable, and inclusive outcomes.

The Recommendation is based on the protection and promotion of human rights, human dignity, and environmental sustainability, and these values are then translated into principles such as accountability, transparency, and privacy. The Recommendation also sets out concrete policy actions that governments can draw on to steer technological developments in a responsible direction, premised on the belief that light-touch regulation, which has until now remained the norm, is insufficient. We need capable governments that are well equipped, in terms of competencies, institutions and laws, to frame responsible AI development and protect the rule of law online, and public and private developers who are accountable for putting human rights and fundamental freedoms – not profits or geopolitical considerations – first.

The Readiness Assessment Methodology (RAM) is a diagnostic tool intended to assist Member States in upholding their commitment to the Recommendation by helping them understand how prepared they are to implement AI ethically and responsibly for all their citizens. By highlighting any institutional, regulatory, or data gaps and obstacles, it enables UNESCO to tailor support for governments to fill those gaps to ensure an ethical AI ecosystem aligned with the Recommendation.

In the Kingdom of Bahrain, the RAM exercise highlights both significant achievements and areas requiring further development. The country has taken important steps to establish a foundation for responsible AI, including ongoing work on a National AI Strategy and participation in regional efforts such as the GCC's AI Ethical Guidelines.

The assessment also notes Bahrain's rapid rise in the UN E-Government Development Index and its Tier 1 ranking in the ITU Global Cybersecurity Index, reflecting the Kingdom's commitment to digital transformation and secure innovation. At the same time, challenges remain—particularly in strengthening coordination across government entities, accelerating the implementation of the national data sharing framework, and investing in advanced AI research and specialized skills.

Based on the RAM findings, the report recommends consolidating these achievements by embedding AI ethics more deeply into national practice, expanding capacity-building programs to develop a skilled workforce, and enhancing mechanisms for transparency, accountability, and public engagement. By advancing these priorities while leveraging its ongoing policy initiatives, Bahrain is well-positioned to become a regional leader in responsible and human-centered AI development.

Overall, this report presents a fundamentally optimistic vision that we at UNESCO share: that ethical governance and responsible regulation of AI is entirely consistent with innovation and economic growth and is essential for ensuring a technological ecosystem that benefits the public good. With the RAM data and this report, Kingdom of Bahrain has a clear roadmap for how to get there.

It was a pleasure working with the Government of Bahrain to conduct this exercise. We are grateful for their engagement with the RAM, and I am sure that by following the path laid out in this report, Kingdom of Bahrain will be able to reap the benefits of AI while making sure that AI technologies deliver fair, sustainable, and inclusive outcomes.

Lidia Brito

Assistant Director-General ad interim for Social and Human Sciences, UNESCO

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I. EXECUTIVE SUMMARY

This report provides a comprehensive analysis of Bahrain's evolving artificial intelligence (AI) ecosystem, underscoring its potential to drive innovation, economic growth, and societal enhancement.

Key highlights include:

Bahrain's AI Landscape
An exploration of the current AI environment in Bahrain, identifying significant players, initiatives, and the supportive infrastructure that encourages technological advancement. The landscape includes government agencies, private sector innovators, and academic institutions that collaborate to foster a vibrant AI community.

Legal Frameworks
A thorough examination of the critical need for well-defined AI policies and regulatory frameworks. This includes:

- Data Protection: Ensuring robust measures to safeguard personal data in AI applications.
- Ethical Standards: Promoting ethical AI usage to mitigate biases and ensure fairness.
- Accountability Mechanisms: Establishing clear responsibilities for AI system outcomes to build public trust.

Social and Cultural Aspects
An analysis of the social implications of AI, emphasizing the importance of diversity and inclusivity in AI development. Key points include:

- Public Engagement: Strategies for enhancing community awareness and trust in AI technologies.
- Cultural Preservation: The role of AI in preserving Bahrain's cultural heritage and promoting creative expression.
- Sustainability: Utilizing AI for environmental initiatives and contributing to a circular economy.

Educational and Scientific Investment
Highlighting the necessity of investing in AI research and education to develop a skilled workforce. This includes:

- Curriculum Development: Integrating AI-related subjects into educational frameworks to prepare future generations.
- R&D Support: Increasing funding for AI research initiatives to drive innovation and entrepreneurial ventures.
- Talent Development: Fostering a pipeline of skilled professionals through partnerships with academic institutions and industry leaders.

Economic Strategy

Insights into leveraging AI for sustainable economic growth, addressing labor market transformations, and enhancing business efficiencies. This section discusses:

- Investment Opportunities: Encouraging private and public sector investments in AI technologies and startups.
- Job Creation: Exploring new job roles and skills required in an AI-driven economy.
- Economic Diversification: Utilizing AI to diversify Bahrain's economy beyond traditional sectors.

Technical Infrastructure

An overview of the essential technical requirements for successful AI deployment, including:

- Digital Infrastructure: The necessity for high-quality connectivity and computing resources to support advanced AI applications.
- Standards and Protocols: The importance of adopting industry standards for interoperability and reliability in AI systems.
- Data Governance: Establishing frameworks for data quality, availability, and management to support AI initiatives.

National AI Roadmap

A proposed multi-stakeholder roadmap aimed at unifying efforts across government, industry, academia, and civil society. This roadmap includes:

- Collaborative Frameworks: Encouraging partnerships to drive AI innovation and implementation.
- Monitoring and Evaluation: Establishing metrics to assess progress and impact of AI initiatives.
- Strategic Priorities
  Actionable guidance for stakeholders to ensure the ethical and effective development of AI technologies. Key priorities include:
- Fairness and Transparency: Ensuring AI systems are designed to be fair and transparent, with mechanisms for public oversight.
- Public Awareness: Promoting understanding of AI technologies among citizens to enhance acceptance and trust.
- Continuous Learning: Adapting policies and practices in response to the evolving AI landscape and societal needs.

Key Recommendations

To maximize the benefits of AI while ensuring responsible adoption, the report recommends that Bahrain:

1. ***National AI Data Infrastructure & Framework:*** *Develop a centralized, secure, and interoperable data ecosystem that enables AI development, innovation, and evidence-based policymaking.*
2. ***Inclusive STEM Education:*** *Advance STEM learning with a focus on women, youth, and people with disabilities through targeted programs and strategic partnerships.*

3. ***National AI Strategy:*** *Finalize and implement Bahrain's AI strategy with clear pillars, measurable goals, and a defined implementation roadmap.*
4. ***Public Awareness & Engagement:*** *Enhance AI literacy and public trust through national campaigns, outreach programs, and community participation.*
5. ***AI Entrepreneurship & Innovation****: Position Bahrain as a regional hub for AI startups and private investment, accelerating innovation and economic diversification.*
6. ***Cross-sector Collaboration:*** *Strengthen coordination between academia, industry, and government to promote integrated and impactful AI initiatives.*
7. ***Ethical & Sustainable AI Research:*** *Support research focused on AI's social, economic, and environmental impacts to ensure human-centered and sustainable innovation.*

In conclusion, Bahrain's progress is both significant and promising. By consolidating its existing achievements, addressing identified gaps, and acting on the recommendations of this report, the Kingdom can accelerate its path toward becoming a regional leader in ethical, inclusive, and innovative AI. Collaborative efforts across government, industry, academia, and civil society will be essential to realizing the full potential of AI for the benefit of all citizens.

II. Bahrain's Evolving AI Ecosystem: A Landscape of Innovation

Background and Foundations

Bahrain's AI journey builds on more than a decade of digital transformation, anchored in Economic Vision 2030, which emphasizes diversification, sustainability, and innovation as pathways to long-term prosperity. The Kingdom's early reforms created the institutional, legal, and infrastructural base upon which today's AI initiatives rest.

- **eGovernment Initiatives**: Since the mid-2000s, Bahrain has invested heavily in digital government, consistently ranking among the global leaders in the UN E-Government Development Index. These efforts created a strong framework for embedding AI into public services.
- **Cloud-First Policy (2017)**: Bahrain became the first country in the region to launch a nationwide Cloud-First Policy, enabling scalable computing resources to support advanced AI applications.
- **Personal Data Protection Law (2018)**: Provided safeguards for responsible data use, a key prerequisite for ethical AI.
- **National Cybersecurity Strategy (2017)**: Established a secure digital environment for the deployment of emerging technologies, including AI.
- **Regulatory Sandboxes**: Initiatives such as the Central Bank of Bahrain's FinTech Regulatory Sandbox allowed experimentation with AI-enabled financial solutions.

- **HH Shaikh Nasser Artificial Intelligence Research and Development Centre (NAIRDC)**: Established in May 2021 under the Nasser Vocational Training Centre (NVTC), NAIRDC became Bahrain's dedicated AI hub, specializing in applied research and customized solutions for government and industry. Its collaborations with the oil and gas, finance, and telecommunications sectors, alongside international academic and technology partners, strengthened the link between innovation and Vision 2030's goal of building a knowledge-driven economy.

Institutional Leadership

As per **(IGA, 2023)**, Bahrain's efforts in the field of AI began with a national vision to harness emerging technologies as a driver of innovation, digital transformation, and socio-economic development. Recognizing the growing impact of AI on governments and societies worldwide, the Kingdom initiated several institutional measures to ensure its responsible and strategic adoption, starting with the establishment of *the Artificial Intelligence Committee* Deputy Chief Executive Officer for Operations and Governance at the Information & eGovernment Authority (iGA) on 29th March 2023.

The Committee was mandated to explore the applications of AI across national sectors, assess opportunities and risks, and provide guidance on the ethical, regulatory, and developmental dimensions of AI deployment in Bahrain.

Through a structured, multi-phase process, the Committee analyzed 177 AI use cases in collaboration with small and medium-sized enterprises (SMEs) and relevant national entities. This process aimed to evaluate Bahrain's current AI landscape, identify areas of high potential, and ensure alignment with global best practices.

The Committee's work focused on four core dimensions:

- Evaluating AI use cases to determine national priorities and societal impact.
- Identifying benefits, risks, and ethical considerations in AI adoption.
- Mapping potential public-sector application areas for AI.
- Issuing recommendations to ensure responsible and optimal utilization of AI technologies.

All assessments were benchmarked against international evaluation models, enabling a systematic classification and prioritization of AI opportunities most relevant to Bahrain's current stage of digital maturity. The Committee's findings and recommendations were submitted to the Information and eGovernment Authority, contributing to the development of national AI frameworks, governance policies, and sector-specific pilot initiatives.

The analysis identified several high-potential sectors for AI adoption, including education, healthcare, infrastructure and energy, legal and security affairs, smart cities, media and marketing, youth and

sports, and occupational safety, representing the most promising domains for leveraging AI to enhance public services, economic productivity, and societal wellbeing.

Building on these foundations, Bahrain took an important step in October 2023, when Royal Decree No. (84) of 2023 established the Directorate of Innovation and Advanced Technologies under the Information & eGovernment Authority (iGA). This marked a turning point in government-led digital transformation and reflected the leadership's directives to accelerate the adoption of advanced technologies including artificial intelligence in public services to enhance efficiency and innovation.

The Directorate, operating under iGA, is tasked with:

- Leading the adoption of advanced technologies, including AI, across government operations.
- Enhancing the quality and efficiency of services through technological innovation.
- Developing and implementing strategies for digital transformation.
- Fostering a culture of innovation within the public sector.
- Identifying and promoting the use of emerging technologies to address national challenges.

By consolidating responsibility for AI and other advanced technologies within iGA, Bahrain has ensured clear governance, stronger coordination, and alignment with national priorities under Economic Vision 2030.

National AI Vision:

Bahrain aims to strategically focus its AI research and development efforts on sectors aligned with its national priorities. The government envisions using AI to:

- Revolutionize governmental public online e-services, augmenting accessibility, efficiency, and citizen satisfaction.
- Elevate the efficacy and personalization of educational paradigms via the integration of AI-powered learning platforms and adaptive curricula.
- Transform healthcare delivery through the deployment of AI-enabled diagnostic tools, personalized treatment regimens, and predictive analytics for proactive disease management.
- Fortify the national data infrastructure through the implementation of robust cybersecurity protocols and the establishment of comprehensive data governance frameworks.
- Optimize urban mobility through the deployment of intelligent traffic management systems, leveraging AI to mitigate congestion and enhance transportation efficiency.
- Create new industries and jobs through economic diversification.

- Improve the quality of life by addressing challenges in healthcare, education, and transportation.
- Increase global competitiveness by enhancing productivity and innovation. **(IGA, Innovation in the Public Sector, 2025)**

STRATEGIC ADVANTAGES:

Bahrain's strategic advantages include:

- A Forward-Thinking Regulatory Environment: Cultivating an environment that fosters innovation within strategically targeted sectors, such as education, healthcare, data governance, transportation infrastructure, and smart cities, while simultaneously safeguarding the rights and privacy of its citizenry. Bahrain aims to become a regional leader by creating a "sandbox" environment for AI innovation, attracting companies to test and deploy new AI solutions within a well-regulated framework. This involves proactively anticipating and mitigating potential ethical and societal ramifications, ensuring responsible AI development **(bahrain.bh, 2017)**.
- Commitment to Ethical AI: Championing the principles of AI trustworthiness by emphasizing the ethical and societal dimensions of AI development and deployment, ensuring that AI systems are not only technically proficient but also aligned with Bahrain's core values and principles of fairness, transparency, and accountability. This includes promoting AI literacy among the population and fostering a public dialogue about the ethical implications of AI, building trust and acceptance of AI technologies. Bahrain can position itself as a leader in ethical AI by developing and implementing robust ethical guidelines and standards, drawing inspiration from international best practices **(Lexology, 2024)**.
- Investment in Human Capital: Targeted investment in relevant educational programs at all levels, from primary education to advanced research, to cultivate a workforce capable of developing and deploying AI solutions. Furthermore, attracting specialized talent to build a critical mass of expertise is crucial **(Bee, 2025)**.

Key Stakeholders in the Ecosystem

Government

- **Information & eGovernment Authority (iGA)**: The iGA is the central body driving Bahrain’s digital transformation and plays a pivotal role in embedding AI into public services. Through its leadership, Bahrain has consistently ranked among global leaders in digital governance.

- **Directorate of Innovation and Advanced Technologies (under iGA):** Established under Royal Decree No. (84) of 2023, this directorate spearheads the adoption of advanced technologies—including AI, blockchain, cloud, and IoT, across government operations. Its mandate extends beyond technology deployment to include policy shaping, capacity building, and fostering a culture of innovation within the public sector. By collaborating with local and international partners, it ensures that Bahrain remains at the forefront of AI governance and application. Collaboration is a cornerstone of the directorate's approach, as it actively engages with local and international technology firms, academic institutions, and research centers. This collaborative framework facilitates the transfer of knowledge and expertise in AI, nurturing an ecosystem that promotes growth and innovation.

  Moreover, the directorate plays a critical role in shaping policies governing AI, ensuring that ethical standards and responsible usage are at the forefront of all technological implementations in public services. This commitment to ethical governance is essential for building public trust in AI solutions.

  To further bolster Bahrain's AI capacity, the directorate is dedicated to enhancing local expertise through comprehensive training programs and workshops tailored for government employees and stakeholders. This focus on capacity building equips personnel with the necessary skills to implement AI solutions effectively.

  By embedding AI capabilities into essential services, such as commercial registration and citizen inquiries, the directorate aims to streamline processes, improve user experiences, and foster a more responsive governance framework. This holistic approach not only enhances the efficiency of public services but also positions Bahrain as a leader in the responsible adoption of advanced technologies **(IGA, Innovation in the Public Sector, 2025).**

- **National Cybersecurity Centre (NCSC)**: Safeguards Bahrain's AI systems and digital infrastructure, ensuring that trust, security, and resilience underpin the deployment of emerging technologies.

- **Ministry of Education**: Leads the integration of AI and digital skills into the national curriculum, preparing a future-ready workforce. By fostering awareness of AI among students and educators, it lays the groundwork for inclusive participation in the knowledge economy.

- **Ministry of Health**: Explores AI-enabled diagnostics, predictive analytics, and hospital process optimization to improve patient care and operational efficiency.

- **Ministry of Transportation and Telecommunications**: Implements AI-driven traffic management and smart mobility solutions, while strengthening the national telecommunications infrastructure to support advanced digital services.

- **Ministry of Industry and Commerce (MOIC)**: Supports AI-driven innovations in industry and commerce, encouraging local businesses to adopt AI and related technologies to enhance competitiveness and compliance.

- **Tamkeen**: Since its inception in 2006, Tamkeen has invested over BHD 2 billion in supporting Bahrain's private sector. It plays a central role in workforce development, entrepreneurship, and upskilling programs, including initiatives in AI and emerging technologies. By offering funding, mentorship, and partnerships with leading institutions, Tamkeen strengthens Bahrain's innovation ecosystem.

Academia and Research

- **Nasser Artificial Intelligence Research and Development Centre (NAIRDC)**: Established in 2021, NAIRDC is the dedicated AI research and development arm of the Nasser Vocational Training Centre. It drives applied AI research, develops customized solutions for government and industry, and partners with both local sectors (oil and gas, finance, telecoms) and international institutions. It also contributes to shaping AI policy and ethical guidelines.

- **University of Bahrain (UoB)**: The Kingdom's leading university, UoB advances AI-related research in areas such as machine learning, data science, and analytics. It also integrates AI principles into its curricula, preparing graduates with the digital skills demanded by the market.

- **Bahrain Polytechnic**: Prioritizes applied research and industry collaboration, ensuring that its graduates are prepared for immediate contributions in technology and AI-driven fields. Its focus on bridging academia and industry makes it a key player in workforce readiness.

- **Ahlia University**: Invests heavily in research and innovative academic programs, including AI-related disciplines, positioning itself as a leader in talent development for the digital era.

- **Arabian Gulf University (AGU)**: Enhances academic and research integrity by integrating advanced technologies into its educational framework. AGU's emphasis on grants and digital innovation supports AI-related scholarship.

- **Kingdom University (KU)**: Focused on improving its educational resources and programs, KU contributes to cultivating a digitally literate and AI-skilled workforce.

- **Royal College of Surgeons in Ireland – Bahrain (RCSI)**: Supported by Tamkeen, RCSI integrates AI into medical training and research, contributing to healthcare innovation and capacity building.

- **University College of Bahrain (UCB)**: Maintains structured funding strategies for educational innovation, ensuring long-term commitment to AI and digital excellence in higher education.

Private Sector and Economy

- **Bahrain Economic Development Board (EDB)**: A dynamic public agency with overall responsibility for attracting investment into the Kingdom and supporting initiatives that enhance Bahrain's investment climate. The EDB plays a catalytic role in positioning Bahrain as a hub for AI and digital innovation by attracting global technology firms, facilitating local-international partnerships, and promoting STEM education and AI awareness campaigns.
- **Startup Bahrain and Innovation Hubs**: Provide crucial support for AI-focused startups, including funding, mentorship, and incubation spaces, fostering entrepreneurship and innovation in emerging technologies.
- **Financial Services Sector**: One of Bahrain's strongest adopters of AI, applying it in fraud detection, compliance monitoring, customer analytics, and digital financial services. The sector's openness to regulatory sandboxes has made it a testbed for AI in fintech.
- **Industry Leaders**: Large enterprises in oil, gas, and telecommunications are investing in AI for predictive maintenance, operational efficiency, and customer service optimization. Their partnerships with research institutions further support technology transfer and applied innovation.

BAHRAIN'S POSITION IN KEY INTERNATIONAL INDICES (2024–2025)

INDEX	BAHRAIN GLOBAL RANK	REGIONAL RANK	SUB-INDICES	KEY HIGHLIGHTS
UN E-Government Development Index (EGDI) – by UN DESA (E-Government Survey, 2024)	18th	3rd (Arab)	Telecommunications Infrastructure Index: 10th Online Service Index (OSI): 23rd E-Participation Index (EPI): 18th Human Capital Index: 32nd	Significant improvement: Manama ranked 13th among 193 cities
UN Online Service Index (OSI) – sub-index of EGDI (E-Government Survey, 2024)	23rd	—	—	Improved by 31 positions; advanced digital public services
UN E-Participation Index (EPI) – sub-index of EGDI (E-Government Survey, 2024)	18th	—	—	Improved by 47 positions; strong civic engagement through digital tools
Government AI Readiness Index – by Oxford Insights and IDRC (Government AI Readiness Index, 2022)	Top 50	—	—	Strong national AI strategy and implementation readiness
Global AI Index – by Tortoise Media (Tortoise Media, 2023)	52nd	—	AI Investment: Strong AI Research: Good AI Infrastructure: Solid	Solid standing in AI infrastructure, talent, and research
Global Cybersecurity Index (GCI) – by ITU (Global	Tier 1 (Top Tier)	1st (Arab)	Legal: Perfect Technical: Perfect Organizational: Perfect	Near-perfect scores across all cybersecurity capability areas

Cybersecurity Index, 2024)			Capacity Building: Perfect Cooperation: Perfect	

Bahrain's Key Awards & Recognitions

- **Bahrain's Digital Projects Win at the 6th GCC Digital Government Awards in Kuwait**
  The Kingdom of Bahrain received recognition for two innovative digital initiatives at the 6th GCC Digital Government Awards. The Information & eGovernment Authority's National eParticipation Platform won first place at the GCC level in the "Best Practice in Community eParticipation" category, while the MyGov App earned the Recognition Award in the "Best Unified Government App" category. These achievements highlight Bahrain's leadership in promoting participatory governance and delivering seamless, citizen-centric digital services **(IGA, 2025)**.
- **Smart Cities Award - Advancements in Food Security and Agri-Tech**
  The Information & eGovernment Authority (iGA) also won the Smart Cities Award in the category of "Advancements in Food Security and Agri-Tech" for its Botanical Atlas Project. The award was presented during the 7th Bahrain Smart Cities Summit 2024, held under the theme "Achieving Progress through Artificial Intelligence" at the Gulf Hotel from March 5-6, 2024. The project demonstrates Bahrain's forward-thinking integration of AI and digital tools to enhance sustainability and smart urban development **(IGA, 2024)**.
- **Digital Transformation in HR Award:**
  The Government Employee App, developed in collaboration with the Civil Service Bureau, won accolades for its transformative impact on human resources within the public sector. This award acknowledges the app's role in digitizing HR services, streamlining processes, and enhancing employee experience in Bahrain's government sector.

- **HR Innovation Award:**
  The Technical Development Program (TTDP) earned recognition for its innovative approach to public sector training and employee development. The program's focus on continuous professional development and skill enhancement has set a benchmark for excellence in Bahrain's public workforce.

- **UN E-Government Survey 2024:**
  Bahrain's remarkable progress in the UN E-Government Development Index (EDGI) was recognized with a 36-place leap, securing a ranking of 18th globally. This significant rise reflects the country's strong commitment to enhancing digital governance, public sector efficiency, and service accessibility for its citizens.

- **Bahrain Digital Content Award:**
  Bahrain's Tawasul, Al-Tajir, and Sehati mobile apps received the Bahrain Digital Content Award for their innovative digital content, designed to improve citizen engagement and facilitate access to government services. These apps exemplify Bahrain's efforts to enhance public service delivery through technology.

- **Smart Cities Award:**
  The Botanical Atlas Project, developed by the Information & eGovernment Authority, won the Smart Cities Award for its contributions to food security and sustainable agriculture. By integrating technology with agriculture, the project has played a pivotal role in advancing Bahrain's sustainability goals. **(IGA, 2025)**

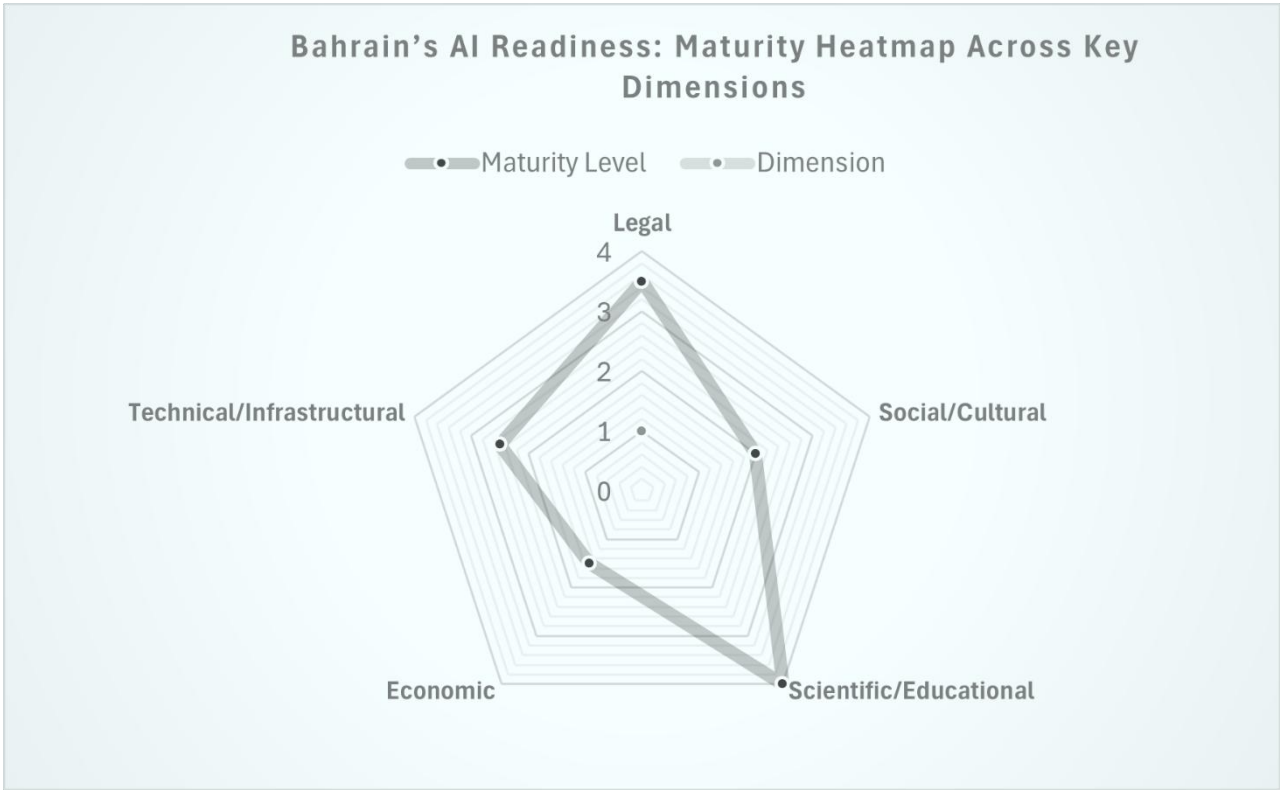

Figure 1: Bahrain's AI Readiness: Maturity Heatmap Across Key Dimensions

PART III: THE LEGAL DIMENSION: NAVIGATING THE REGULATORY LANDSCAPE OF AI

INTRODUCTION

As AI reshapes industries and societies worldwide, Bahrain is stepping forward to establish itself as a leader in creating a robust regulatory framework. The Kingdom is committed to balancing innovation with ethical governance and the protection of individual rights. This section explores the vital legal dimensions of Bahrain's AI strategy, highlighting key policies, regulations, and initiatives that define the Kingdom's approach to AI governance.

The Shura Council in Bahrain is moving toward approving the country's **first law regulating AI** in line with the directives of His Majesty the King. The legislation aims to ensure that AI technologies are used responsibly to improve public services while safeguarding society against misuse.

Bahrain is in the process of finalizing its first standalone law on artificial intelligence (AI), marking a pivotal advancement in the legal landscape surrounding emerging technologies. The draft legislation, currently under parliamentary review, establishes a comprehensive framework to regulate AI applications and ensure responsible usage across the Kingdom. It introduces regulatory oversight through a specialized unit, sets licensing requirements for AI development and deployment, and outlines penalties for misuse, including fines and potential imprisonment. By embedding provisions on liability, prohibited uses, and ethical safeguards, the law positions Bahrain among the first countries in the region to move toward binding legislation on AI, complementing its existing policy and governance frameworks.

Key highlights include:

- **Governance & Oversight:** Establishes a dedicated AI Unit responsible for coordination across government entities, monitoring compliance, and limiting risks arising from misuse.
- **Scope & Application:** Regulates programming, development, and deployment of AI systems while respecting international agreements, security requirements, and national interests.
- **Strategic Vision:** Mandates the Cabinet to develop an integrated national AI strategy to promote technology transfer, local capacity building, and research across sectors such as health, education, justice, tourism, media, and sports.
- **Ethics & Human Rights:** Prohibits the use of AI in ways that could endanger human life, restrict freedoms, or create unfair evaluations. Protects intellectual property rights and encourages national talent.
- **Liability & Redress:** Grants individuals the right to compensation for damage caused by AI systems, holding owners or operators accountable.
- **Prohibited Uses:** Bans harmful AI applications such as uncontrolled dangerous machines, full reliance on AI in life-critical decisions, and manipulative content generation (e.g., deepfakes).
- **Penalties & Enforcement:** Provides for administrative sanctions (warnings, license withdrawal, fines) and criminal penalties, including imprisonment and fines up to 20,000 BHD for serious violations.

This forthcoming law positions Bahrain among the few countries in the region actively moving toward **binding AI legislation**, complementing its existing AI policy, GCC AI ethics guidelines, and data protection framework **(Alayam, 2024) (Zawya, 2024)**.

AI POLICY AND REGULATORY FRAMEWORKS

Under the directives of His Excellency General Shaikh Rashid bin Abdullah Al Khalifa, Minister of Interior and Chairman of the Ministerial Committee for Information Technology and Communication (MCICT), the iGA launched the National Policy for the Use of Artificial Intelligence in July 2025**.** This policy establishes a comprehensive framework to regulate AI use in Bahrain, ensuring alignment with national priorities and maximizing benefits across society and the economy.

The policy aims to promote responsible and secure use of AI to drive economic and social growth while enhancing government efficiency across key sectors. It supports Bahrain's Economic Vision 2030 and the UN Sustainable Development Goals, aligning with both national regulations (such as the Personal Data Protection Law, the Protection of Information and State Documents Law, and the Open Data Policy) and international standards.

The National AI Policy is built around four key pillars:

1. Legal compliance
2. AI use and adoption
3. Public education and awareness
4. Enhancing local and international cooperation

It is intended for a broad audience, including government officials, decision-makers, legislators, academics, researchers, private sector actors, and citizens engaging with smart services. By creating a clear framework, the policy seeks to unify and regulate AI initiatives and investments, boost performance, streamline procedures, and strengthen public trust in AI-driven services **(IGA, 2025)**.

To reinforce these national efforts, Bahrain has also adopted the Guiding Manual on the Ethics of Artificial Intelligence Use in the GCC, issued by the GCC Ministerial Committee for eGovernment. This manual complements the National AI Policy by providing a shared regional reference point for the responsible use of AI. It emphasizes that AI systems deployed across the Gulf must respect human dignity, Islamic values, and the cultural identity of GCC societies, while also advancing sustainability, cooperation, and social well-being.

The manual outlines principles such as preserving human autonomy, ensuring safety and reliability, preventing discrimination, and protecting privacy and data security. By embedding these ethical considerations into AI adoption, the GCC framework ensures that innovation does not come at the expense of social cohesion or trust. For Bahrain, aligning with this regional manual strengthens its

governance approach by harmonizing national policies with Gulf-wide standards, encouraging cross-border cooperation, and facilitating knowledge-sharing among member states **(GCC, 2023)**.

In doing so, Bahrain contributes to a unified regional vision for ethical AI, one that not only reflects shared Gulf values but also positions the GCC as a responsible global partner in shaping the future of artificial intelligence .

National AI Strategy

Complementing the National AI Policy, Bahrain has prepared the draft National Artificial Intelligence Strategy, which is now in its advanced stages of development. A national workshop was conducted on 9th and 10th September 2025, bringing together stakeholders from across government to ensure the draft reflects collective priorities and a unified vision for AI adoption.

The process is designed to be iterative and inclusive. In the next phase, a series of follow-up consultations will be held with domain specific entities such as healthcare, education, transportation, and industry to gather customized insights. These sessions will enable a more granular understanding of each sector's needs and challenges, ensuring the strategy is both practical and sector driven.

The strategy is shaped around strengthening Bahrain's foundations for AI adoption, including robust data governance, modern digital infrastructure, strong human capital and talent development, and a focus on ethical and responsible use. This integrated approach allows the roadmap to be continuously updated as required, striking a balance between national alignment and sectoral specificity.

Once finalized, the National AI Strategy will serve as a cornerstone for Bahrain's AI future, complementing the National AI Policy and reinforcing the Kingdom's position as a regional leader in responsible, inclusive, and effective AI governance. The strategy is expected to be finalized and ready for publication by December 2025.

Safeguarding Privacy through Robust Data Protection

At the heart of Bahrain's legal framework are two significant laws: Law No. 30 of 2018 for the Protection of Personal Data and Law No. 16 of 2014 for the Protection of State Information and Documents **(Personal Data Protection Authority, 2018)** **(Cyrilla., 2014)**. The PDPL regulates the collection, processing, and storage of personal data, covering both public and private sectors. Key provisions include:

- Right to Access: Individuals can request access to their personal data held by organizations, promoting transparency and trust.
- Right to Rectification: This provision allows individuals to correct inaccuracies in their personal data, ensuring its integrity.

- Right to Erasure: Clearly defined conditions exist for individuals to request the deletion of their personal data when appropriate.
- Consent Requirements: Explicit consent is necessary for processing sensitive data, empowering individuals to control their personal information.

These laws reflect Bahrain's commitment to international data protection standards, serving as foundational elements of the evolving data sharing policy.

Implementation Mechanisms

- Supervisory Authority: A dedicated Data Protection Authority has been established to enforce the PDPL and address grievances, ensuring compliance across sectors.
- Public Awareness Campaigns: Initiatives aim to educate citizens about their rights under the PDPL and the responsibilities of data processors, fostering a culture of awareness and accountability.

Unlocking Data Potential: The National Data Sharing Framework

The National Digital Economy Strategy (NDES) establishes a clear vision for Bahrain's transition toward a data-driven economy, where data serves as a national asset underpinning innovation, efficiency, and public value creation. The strategy outlines a series of initiatives aimed at strengthening Bahrain's data ecosystem, ensuring that data is managed, shared, and utilized responsibly and effectively across all sectors.

A core focus of the strategy is the development of a National Data Governance Framework to ensure interoperability, ethical use, and secure data exchange across government entities. Complementing this, the NDES advances open data initiatives to promote innovation, transparency, and public trust, while maintaining strong privacy and data protection safeguards.

To expand Bahrain's role as a regional hub for data-driven services, the strategy emphasizes the establishment of cross-border data exchange mechanisms, enabling seamless and secure data flows that support international collaboration and digital trade. The NDES also calls for improved data quality, standardization, and integration to enhance operational efficiency and enable greater innovation within both public institutions and the private sector.

Furthermore, the strategy highlights the growing importance of big data analytics and artificial intelligence in shaping evidence-based policymaking and improving service delivery. This reflects Bahrain's broader ambition to lay the groundwork for sustainable and responsible AI adoption, supported by high-quality, interoperable, and ethically managed data.

Finally, trust and cybersecurity are presented as foundational pillars of Bahrain's data ecosystem, ensuring that the country's digital transformation is secure, ethical, and aligned with international standards. Together, these elements position Bahrain to effectively unlock the value of data, drive digital innovation, and prepare for the implementation of its upcoming National Data Sharing Framework in 2026 **(Bahrain Government, 2025)**.

Strategic Procurement Policies for AI Investments

Recognizing the need for responsible procurement, Bahrain has established guidelines for acquiring AI systems and services **(NEA, 2021)** **(NEA, 2024)**. These guidelines emphasize:

- Compliance with Regulations: Ensuring that all AI systems meet ethical and legal standards is paramount.
- Risk Assessment Protocols: Thorough evaluations of potential vendors and their technologies help mitigate risks associated with AI deployment.
- Approval Process: A structured approval mechanism is in place prior to procurement, ensuring alignment with national strategic objectives.

Procurement Process Highlights

- Vendor Evaluation Criteria: A clear framework is used to assess potential vendors based on ethical considerations and technical capabilities.
- Post-Implementation Review: Regular assessments of AI systems after deployment ensure they continue to meet established standards.

Empowering Citizens: Transparency and Access to Information

The PDPL empowers citizens by granting them the right to inquire about the use of AI systems in the public sector **(Personal Data Protection Authority, 2018)**. This legal framework emphasizes:

- Transparency in Data Processing: Individuals must be informed about how their data is collected and used, particularly in automated decision-making.
- Right to Object: Citizens can challenge automated decisions, ensuring that human oversight is maintained.

Enhancing Citizen Engagement

- Public Reporting: Regular reports on data usage and AI system performance are made available to foster trust and accountability.

- Feedback Mechanisms: Channels for citizens to express concerns or provide feedback on AI applications are established to enhance engagement.

Ensuring Fairness: Upholding Due Process

Bahrain's approach to artificial intelligence governance emphasizes fairness, accountability, and respect for rights through a combination of legal, policy, and institutional frameworks.

The ICT Governance Committee (ICTGC), established by resolution of His Highness Shaikh Mohammed bin Mubarak Al Khalifa, Deputy Prime Minister and Chairman of the Supreme Committee for Information and Communication Technology, plays a central role in overseeing digital governance. It directs and monitors government IT investments, ensures cost optimization, approves strategic IT projects, and sets national technology standards and policies. Through this oversight, the ICTGC ensures that AI-related initiatives are aligned with national priorities and implemented with transparency and efficiency **(NEA, 2025)**.

At the legislative level, the **(Personal Data Protection Authority, 2018)** provides safeguards for individuals by regulating how personal information is processed and ensuring that no one is subjected to automated decisions without appropriate safeguards. Citizens also retain the right to appeal such decisions through established legal and administrative processes, guaranteeing that human review remains a safeguard in cases where AI impacts rights or freedoms.

On the policy front, the National AI Policy reinforces these protections by embedding ethical and responsible AI adoption as a national principle, ensuring that accountability, transparency, and due process are applied consistently across sectors **(IGA, 2025)**.

At the regional level, Bahrain's adoption of the GCC AI Ethics Guidelines further anchors its framework in shared Gulf values, emphasizing sustainability, harm prevention, non-discrimination, and respect for human dignity **(GCC, 2023)**.

Together, these mechanisms create a comprehensive system that upholds due process, ensures accountability, and promotes public trust in Bahrain's responsible and ethical adoption of AI. Ethical Guidelines: The GCC AI Ethics Guide provides a framework for ethical AI implementation, emphasizing sustainability and harm prevention **(News of Bahrain, 2024)**.

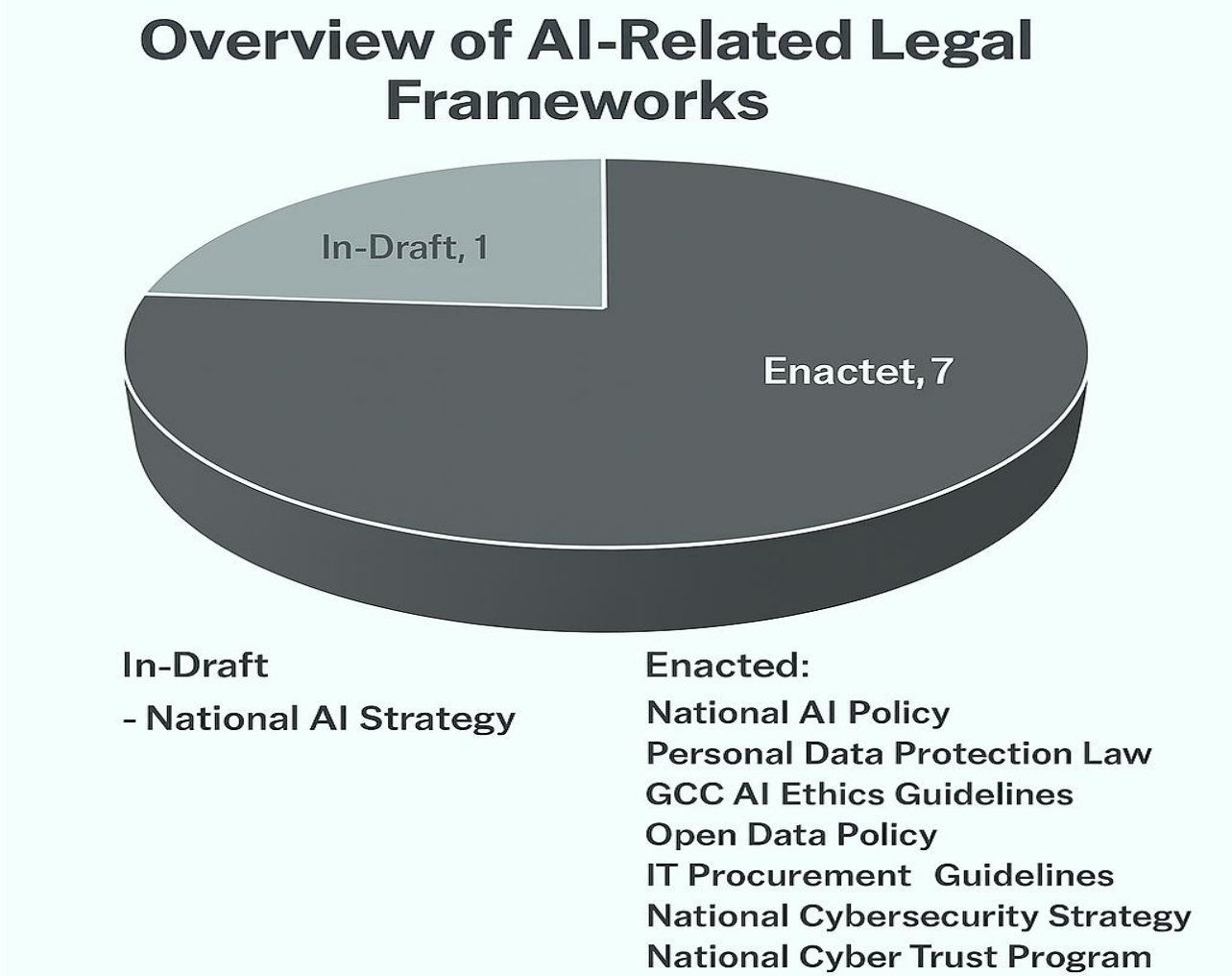

Figure 2: Bahrain's overview in AI-Related Legal Frameworks

Protecting the Digital Realm: Cybersecurity Initiatives

In response to the growing threats posed by misinformation and harmful digital content, Bahrain has instituted a robust legal framework to combat these challenges. Legislative measures are complemented by initiatives aimed at enhancing cybersecurity **(Bahrain.bh, 2025)**, including:

- Cyber Trust Program: This initiative seeks to strengthen information security governance across government entities.
- Cyber Hawks Initiative: A collaborative effort among cybersecurity specialists to address and mitigate cyber threats.

Cybersecurity Framework

- Incident Response Protocols: Established protocols for responding to cybersecurity incidents ensure swift and effective action.
- Public-Private Partnerships: Collaborating with private sector entities enhances overall cybersecurity resilience.

Moreover, Bahrain has achieved a major milestone in the 2024 Global Cybersecurity Index (GCI), issued by the International Telecommunication Union (ITU), a specialized agency of the United Nations.

In this latest edition, Bahrain was ranked in the highest global category, Tier 1, reflecting its world-class cybersecurity posture **(ITU, 2024)**. The Kingdom earned full marks in four out of the five evaluation categories, demonstrating strength in data protection, network security, institutional structures, and collaboration efforts. This performance underscores Bahrain's success in implementing its National Cybersecurity Strategy and maintaining a resilient digital infrastructure.

The achievement also signals Bahrain's preparedness to adopt and scale emerging technologies such as artificial intelligence within a secure and trusted environment. It is a strong indicator that the country is well-positioned to support the safe and ethical integration of AI in alignment with global standards.

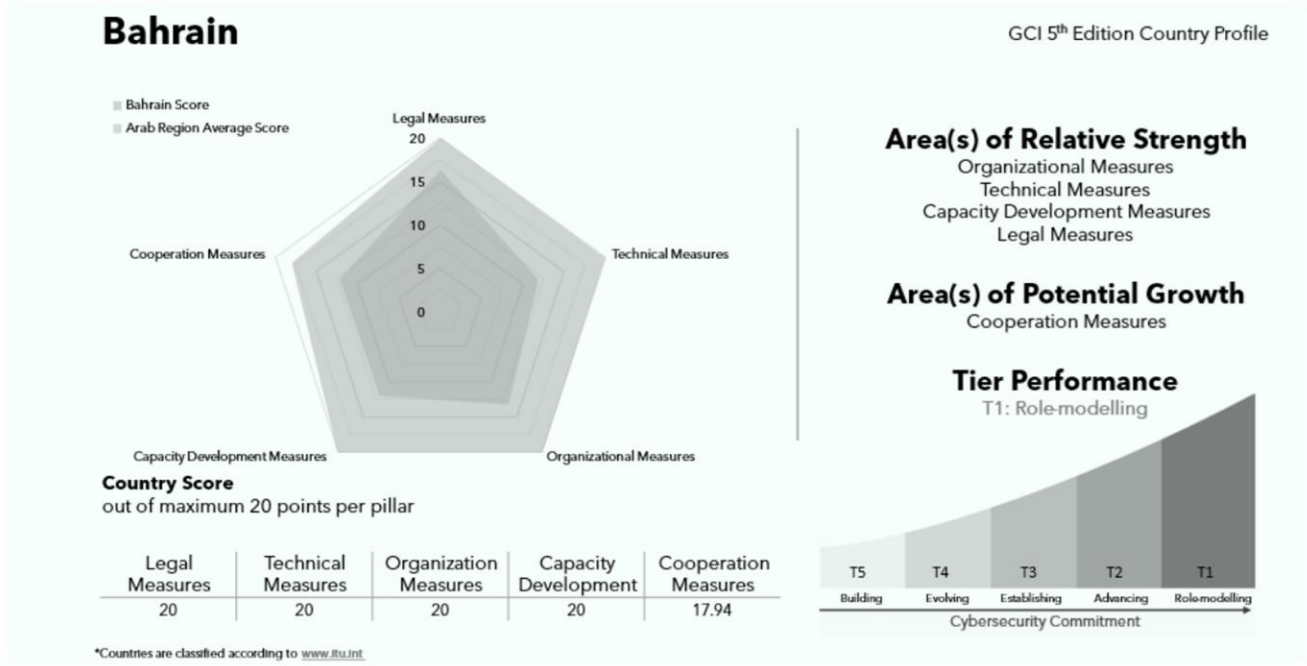

Figure 3: Bahrain's overview in Global Cybersecurity Index

Building Expertise: Investing in Human Capital

Bahrain has launched a series of flagship programs to build national talent in artificial intelligence and related technologies. These initiatives target students, fresh graduates, government employees, and private sector professionals, creating a multi-tiered ecosystem for skills development and innovation.

The National AI Upskilling Program, currently under development, serves as the Kingdom's flagship talent initiative. It aims to provide AI training to more than 50,000 Bahrainis by 2030, covering a wide range of sectors including education, healthcare, finance, logistics, and public services. The program will offer tailored learning pathways from basic AI literacy for students to advanced technical certifications for professionals ensuring inclusiveness and alignment with labor market needs **(Tamkeen, 2025)**.

The Technical Development Program (TTDP), introduced by the Information & eGovernment Authority (iGA) in partnership with the Ministry of Labour, focuses on empowering Bahraini youth with technical university degrees. Targeting job seekers and fresh graduates aged 21 to 30, the program provides intensive on-the-job training in iGA's technical departments, supported by a monthly salary and internationally accredited professional certifications. It directly supports the Economic Recovery Plan and the Fiscal Balance Program under Bahrain's Vision 2030, while reducing reliance on costly external IT contracts.

TTDP has already achieved measurable results. Across its first two cohorts, 143 graduates contributed to the delivery of more than 10 digital projects at iGA, including the "MyGov" application and eKey 2.0. Participants obtained 295 professional certifications, and nearly 100 graduates have secured technical roles across public and private entities. By combining structured training, project-based learning, and certification, TDP develops globally competitive digital professionals capable of driving Bahrain's transformation agenda **(IGA, 2025)**.

Complementing this, in June 2025, the Information & eGovernment Authority (iGA) launched the AI Talent Program as a flagship national initiative to cultivate the next generation of Bahraini artificial intelligence professionals. Announced at the Innovation Lab at the iGA headquarters in Isa Town, the program reflects the Kingdom's strategic commitment to strengthening national competencies and ensuring that Bahrain's workforce is prepared for the accelerating global transformation driven by AI.

Each cohort of the program includes around 14 outstanding ICT students from leading Bahraini universities such as the University of Bahrain and Ahlia University. Participants engage in an intensive six-month training experience that combines academic instruction with hands-on AI development under the mentorship of experts from the iGA's Directorate of Innovation and Advanced Technologies. Through this approach, students design and prototype AI-driven solutions that directly address government challenges and enhance public sector efficiency.

The initiative aligns with the directives of His Excellency General Shaikh Rashid bin Abdullah Al Khalifa, Minister of Interior and Chairman of the Ministerial Committee for Information Technology and Communication (MCICT), and reinforces iGA's ongoing efforts to bridge academia, government, and the private sector through partnerships with institutions such as Amazon Web Services (AWS).

By combining applied learning with innovation-driven collaboration, the AI Talent Program advances Bahrain's Vision 2030 and contributes to the establishment of a knowledge-based, future-ready economy built on homegrown expertise and sustainable digital innovation **(IGA, 2025)**.

Finally, Tamkeen plays a central role in enabling both enterprises and individuals to benefit from the digital economy. Its Enterprise Support Programs (such as Start Your Business, Business Growth, and Overseas Expansion) and Human Capital Programs (including the AI Training Program, Apprenticeship Program, and Global Ready Talent Program) provide funding, training, and wage support. To date, Tamkeen has invested over BHD 2 billion in its initiatives, supporting thousands of enterprises and individuals, with many directly benefiting from AI-related skills development and entrepreneurship opportunities.

Tamkeen has supported specialized AI training programs that strengthen Bahrain's workforce in priority sectors such as financial technology. A flagship initiative is the Applied AI in FinTech Program, which has already delivered tangible results:

- 1,000+ professionals and students trained across the MENA region.
- Participant breakdown: 38% students, 43% junior employees, 23% middle management, and 34% senior management.
- 30+ education and training programs delivered, covering Open Banking, Data Analytics, Entrepreneurship, and Artificial Intelligence.
- Applied Artificial Intelligence Course: 8 weeks (36 hours), capacity of 50 participants per cohort, focusing on data science, machine learning, large language models, fraud detection, and AI in financial services.
- Professional workshops such as *AI for Innovation Impact* and *Design & Systems Thinking* designed for executives and decision-makers.
- Program cost: BHD 1,600-2,000 per participant, underscoring its investment value and scalability.

This program demonstrates how sector-focused training delivered in partnership with Tamkeen equips Bahrain's workforce with advanced skills, supports industry needs, and strengthens the Kingdom's role as a regional hub for AI-driven financial innovation **(Tamkeen, 2025)**.

Together, these programs demonstrate Bahrain's commitment to building AI capacity at scale, while also nurturing deep technical expertise and supporting private sector innovation. This integrated approach ensures that the Kingdom develops both widespread AI literacy and the specialized skills needed to sustain its position as a regional leader in digital transformation **(Tamkeen, 2025)**.

Final Thoughts

Bahrain's new AI legislation marks a significant step forward in establishing a legal framework that balances innovation with accountability. By delineating clear guidelines and penalties, the law aims to protect citizens while positioning Bahrain as a leader in AI governance within the region. As implementation progresses, continued dialogue and educational efforts will be crucial to ensure the law's effectiveness and foster public understanding.

Case Study: Bahrain's Innovation Hub – Transforming the Public Sector

In the heart of Bahrain, a transformative initiative is taking shape: the Innovation Hub, launched by the Information & eGovernment Authority (iGA). This pioneering project is not just about technology; it embodies a vision to cultivate a culture of innovation within the public sector.

The Innovation Hub serves as a central beacon for creativity and experimentation. Here, government entities come together to develop and test Minimum Viable Products (MVPs) — simplified prototypes that allow for real user feedback. This iterative process ensures that ideas are refined and tailored to meet the actual needs of citizens.

With a strong focus on advanced technologies like Artificial Intelligence, blockchain, and augmented reality, the hub encourages government agencies to embrace these tools. By doing so, they enhance their efficiency and effectiveness, ultimately leading to improved services for the public.

Strategically, the Innovation Hub conducts research to identify emerging opportunities in technology. This proactive approach fosters collaboration across different sectors of government, ensuring that innovation becomes a shared priority rather than a solitary endeavor.

The operational framework of the hub is dynamic. It begins with identifying challenges faced by various government sectors, then proposes innovative initiatives through collaborative workshops. These initiatives are rigorously tested and evaluated, with an emphasis on gathering insights that inform future projects. Importantly, the hub also prioritizes skill development, equipping government employees with the necessary expertise to thrive in a digital age.

As the Innovation Hub unfolds, it stands as a cornerstone of Bahrain's drive to modernize its public sector. By leveraging technology and fostering a collaborative spirit, it aims to streamline operations and optimize resources. The goal is clear: to enhance public services and position Bahrain as a leader in governmental innovation, ensuring a brighter future for all its citizens. **(IGA, Innovation Hub, 2025)**

At the national level, according to the Civil Service Bureau Bahrain **(CSB, 2025)**, women currently hold a 15% advantage in overall participation across the civil service, reflecting strong female

representation in public employment. Within higher education, **42% of students enrolled in STEM programs are women**, one of the highest shares in the region. In the broader ICT sector, **around one-third of the workforce is female**, which is significantly higher than the global average. Complementing this progress, Bahrain was ranked **1st globally in female digital skills training and STEM education** in the Meta & Economist Inclusive Internet Index 2022, highlighting its success in creating enabling pathways for women in digital industries **(World Economic Forum, 2022)**.

When it comes to AI-specific roles, the landscape is still emerging. New positions such as **AI Specialist** and **Senior AI Specialist** have been introduced in government, marking the first formal integration of AI job titles. However, comprehensive diversity data for AI-related jobs, including gender, age, and nationality, remains unavailable, highlighting the need for stronger monitoring and reporting mechanisms as the sector develops **(CSB, 2025)**.

At the policy level, Bahrain has taken systemic action. In partnership with the World Economic Forum, Tamkeen launched the **Bahrain Skills and Gender Parity Accelerator**, which in its first cycle mobilized training for **over 54,500 individuals** across multiple programs to close gender gaps and strengthen workforce skills **(Tamkeen, 2025)** .

Frameworks such as the **(IGA, 2025)** and the forthcoming **National AI Strategy** addresses these gaps by embedding inclusivity, fairness, and human-centered design into Bahrain's AI ecosystem. At the Gulf level, the Guiding Manual on the Ethics of Artificial Intelligence Use in Member States of the Gulf Cooperation Council (GCC) **(Government of Bahrain, 2025)** reinforce these commitments, emphasizing non-discrimination, justice, and the protection of human dignity.

In sum, Bahrain's progress is encouraging high female STEM enrollment, leadership in digital skills training, workforce gender parity initiatives, and the introduction of AI-specific roles. Yet continued effort is required to improve representation in advanced AI careers, enhance inclusivity in STEM experiences, and strengthen data systems to monitor progress more effectively.

Building Bridges: Public Engagement, Trust, and AI Awareness

Public engagement and awareness are central to Bahrain's approach to artificial intelligence, ensuring that technology adoption is grounded in trust, transparency, and inclusion. The **(IGA, 2025)**explicitly emphasizes raising awareness, strengthening digital literacy, and promoting the responsible use of AI technologies across government and society.

To bring this vision into practice, **(IGA, 2025)** has conducted a series of workshops and awareness programs for both government employees and the broader public:

- AI Tools for Employee Productivity (April 2025): A workshop designed to train staff across iGA directorates on generative AI and prompt engineering, focusing on streamlining workflows, boosting efficiency, and embedding AI into daily tasks.
- AI Tools for Professional Success: Another internal program aimed at enhancing government employees' ability to leverage AI tools to improve results, save time, and adopt a proactive approach to digital transformation.
- Sectoral Awareness Workshops: As part of the National AI Policy rollout, iGA has organized dedicated sessions to educate ministries and government employees on AI applications in healthcare, education, and public services.
- Introductory Workshops for the eGovernment Excellence Award: iGA has hosted awareness sessions with ministries, agencies, and institutions to explain evaluation criteria and encourage participation, indirectly supporting innovation, digital transformation, and readiness for AI adoption.

Complementing these workshops, Bahrain held its **National AI Workshop** on **9-10 September 2025**, bringing together representatives from ministries, regulators, academia, and the private sector. This event provided a platform to collect perspectives, identify challenges, and prioritize actions for the forthcoming National AI Strategy. A second phase of consultations with domain-specific entities will further deepen this dialogue, ensuring the roadmap reflects sectoral needs and strengthens public trust.

Trust is also reinforced through robust legal and ethical frameworks, including the Personal Data Protection Law, the Open Data Policy, and the GCC AI Ethics Guidelines, which emphasize fairness, transparency, and non-discrimination.

Together, these efforts demonstrate Bahrain's proactive approach to bridging government, industry, academia, and citizens in AI awareness. By combining policy frameworks with training initiatives and open dialogue, Bahrain ensures that AI is not only technologically advanced but also socially accepted and ethically grounded **(Personal Data Protection Authority, 2018)**.

Greening the Future: AI for Environmental Sustainability and a Circular Economy

Bahrain recognizes that AI is a powerful enabler for advancing its sustainability goals and supporting the transition toward a circular economy. In alignment with the Economic Vision 2030 **(Kingdom of Bahrain, 2008)**. In alignment with Bahrain's Nationally Determined Contribution (NDC 2021) submitted to the UNFCCC, and the Kingdom's pledge to achieve net-zero carbon emissions by 2060, AI is being increasingly integrated into environmental and resource-management initiatives **(Kingdom of Bahrain, 2021)**. AI applications in Bahrain are increasingly contributing to the country's sustainability and circular economy objectives. They are being deployed in environmental monitoring

to track carbon emissions, analyze air quality, and predict environmental risks, providing real-time insights to policymakers.

In the agriculture sector, Bahrain has leveraged AI to automatically monitor all palm trees across the Kingdom, producing valuable datasets that assist researchers and investors in supporting food security and providing accurate production estimates. This initiative directly contributes to SDG 2: Zero Hunger, promoting sustainable agriculture and resilience **(Government of Bahrain, 2025)**

Additionally, the Botanical Atlas Project, launched by the Information & eGovernment Authority, uses GIS mapping, satellite imagery, and AI-driven analytics to derive intelligent insights on vegetation cover and land classification. The system supports agricultural planning, water conservation, and food-production strategies, reinforcing Bahrain's commitment to sustainable resource management **(Information and eGovernment Authority, 2023)**

The forthcoming National AI Strategy, positions sustainability as a cross-cutting theme, ensuring that AI adoption contributes not only to economic growth but also to environmental protection. By leveraging AI to reduce environmental footprints, enhance efficiency, and promote circular-economy practices, Bahrain demonstrates that digital transformation can align with environmental responsibility.

Promoting Well-being: AI's Impact on Health, Happiness, and Social Harmony

Bahrain views artificial intelligence as a vital tool for improving health outcomes, enhancing social well-being, and strengthening resilience. The Ministry of Health, in collaboration with the Information & eGovernment Authority (iGA), has already made significant strides in embedding AI within healthcare delivery and research.

A flagship initiative is the introduction of genome sequencing machines supported by AI-powered analytics in national laboratories. These technologies enable more precise genetic testing and contribute to the advancement of personalized medicine, improving diagnostics, treatment planning, and overall patient outcomes.

The Ministry of Health has also integrated AI into public health and crisis management systems. A prominent example is the BeAware Bahrain app, which combines AI and the Internet of Things (IoT) to support epidemic and disaster management. Originally launched during the COVID-19 pandemic, the app has since been expanded to strengthen the Kingdom's capacity in tracking, crisis response, and citizen protection **(Government of Bahrain, 2025)**.

Looking ahead, Bahrain's AI strategy for healthcare will address key priorities such as strengthening medical research, improving supply chain efficiency, and enhancing capabilities in cybersecurity and crisis management. By setting these priorities, the strategy ensures that the healthcare system is

well-prepared to meet future challenges while improving the quality and accessibility of medical services.

The Ministry of Health in the Kingdom of Bahrain continues to advance the goals of Bahrain Economic Vision 2030 by building a competitive, fair, and sustainable health system that enhances quality of life for all. Through strong governance, digital transformation, and preventive health initiatives, the Ministry has modernized policies, strengthened healthcare infrastructure, and aligned services with international standards. Major programs such as the National Genome Project, the I-SEHA electronic health record, and nationwide vaccination and healthy-cities initiatives reflect Bahrain's commitment to innovation and inclusivity in public health. In partnership with the Information & eGovernment Authority (iGA), the Ministry is also embedding artificial intelligence (AI) across healthcare delivery and research, applying it in genome analysis, diagnostics, telemedicine, and crisis management, while promoting social well-being and resilience through data-driven and citizen-centric services. These efforts, alongside sustainability and investment partnerships, position Bahrain as a regional leader in health innovation, contributing directly to the Sustainable Development Goals and ensuring a healthy, equitable future for current and coming generations **(Ministry of Health, 2025)**.

The emphasis on well-being underscores the need for AI to be a force for good, enhancing happiness and promoting social cohesion rather than exacerbating divisions. By fostering a collaborative environment through AI-driven community platforms and services, Bahrain aims to strengthen social bonds and improve overall quality of life for its residents **(Information & eGovernment Authority, 2025)**.

Preserving Heritage: AI's Role in Culture, Identity, and Creative Expression

Bahrain recognizes the importance of ensuring that artificial intelligence is not only a driver of innovation and economic growth but also a tool for preserving cultural identity and heritage.

AI-enabled technologies are being applied to support the digitization of manuscripts, oral traditions, and historical archives, ensuring that Bahrain's cultural memory is safeguarded for future generations. By converting fragile and analog heritage into accessible digital formats, these initiatives promote cultural continuity while expanding public access to Bahrain's historical records.

In parallel, Bahrain is investing in Arabic natural language processing (NLP) and AI-supported translation tools, which help preserve the Arabic language and facilitate greater participation in the global digital economy.

The role of AI also extends into creative industries. Bahrain's emerging digital innovation ecosystem is exploring AI for artistic design, music, and multimedia production. These initiatives support young

entrepreneurs and creators, offering new avenues for cultural expression while positioning Bahrain as a hub for creative innovation in the Gulf.

At the policy level, both the National AI Policy **(IGA, 2025)**and the forthcoming National AI Strategy highlight cultural preservation and creative industries as cross-cutting themes.

Through these initiatives, Bahrain underscores that technological advancement and cultural preservation are not contradictory goals. Instead, AI is being positioned as a bridge between tradition and modernity, enabling innovation while protecting and celebrating the Kingdom's unique heritage.

AI's role in the arts is expanding, with applications that support artists in creating unique works and engaging audiences in novel ways. By fostering an environment where cultural identity can thrive amidst technological change, Bahrain ensures that its heritage is cherished and celebrated **(BNA, 2023)**.

Bahrain's Role in the AI Value Chain

Bahrain should strategically aim to play a multifaceted role in the AI value chain, leveraging its existing strengths and unique position. This necessitates a fundamental appraisal of Bahrain's inherent advantages and prospective opportunities. By nurturing a robust AI research and development ecosystem, the Kingdom can focus its efforts on strategically important sectors aligned with national priorities. Targeted investments in educational programs at all levels, from primary education to advanced research, will cultivate a workforce capable of developing and deploying AI solutions.

Cultivating a forward-thinking regulatory environment is essential, allowing innovation within targeted sectors such as education, healthcare, data governance, and smart cities, while simultaneously safeguarding the rights and privacy of citizens. Establishing an innovative ecosystem which plays as a sandbox environment for AI innovation, to attract companies to test and deploy new solutions within a well-regulated framework, proactively addressing potential ethical and societal ramifications **(Information & eGovernment Authority, 2025)**.

Alignment of Government Strategies with Entrepreneurship, AI, Innovation, and Digitization

Bahrain's National AI Strategy delineates clear pathways for fostering innovation and enhancing entrepreneurial ventures through AI technologies. By attracting significant investments in AI-driven ventures, Bahrain positions itself as a premier destination for innovation, promoting sustainable economic growth.

AI-enabled government services, such as Sijilat for commercial registration and Tawasul for citizen inquiries, enhance service delivery efficiency and support a responsive governance framework

conducive to entrepreneurial activities. Strategic partnerships with leading international technology firms will enhance local capabilities in AI, facilitate knowledge transfer, and spur innovation.

Support for young talent through initiatives like hackathons and innovation competitions inspires creative AI projects, empowering the next generation to develop entrepreneurial skills. Comprehensive training programs that integrate AI principles into educational curricula prepare Bahraini students for future challenges, fostering a skilled workforce adept in AI technologies.

Promoting independent entrepreneurship through government support enables students to pursue ventures in AI, fostering self-reliance and innovation. Establishing a robust ecosystem that nurtures AI startups, including innovation hubs and mentorship programs, enhances collaboration and resource sharing.

By promoting sustainable and ethical AI practices, Bahrain can ensure that innovation aligns with social and environmental goals, building public trust in AI technologies. Monitoring and evaluation frameworks will assess the effectiveness of AI initiatives on entrepreneurship growth, ensuring accountability and facilitating continuous improvement **(IGA, Innovation Hub, 2025)**

Moreover, awareness campaigns will elevate public understanding of AI's transformative potential and ethical implications, fostering responsible engagement and innovation in business practices.

To add, Bahrain has made significant strides in enhancing its digital government ecosystem, as reflected in its performance in the United Nations E-Government Survey over recent years. In the 2024 edition, Bahrain achieved an impressive 18th place globally, a remarkable leap from 54th in 2022, signaling rapid advancement in digital governance and service delivery. Previous rankings include 38th in 2020, 26th in 2018, and 24th in 2016, highlighting Bahrain's long-term commitment to digital transformation.

The 2024 survey notably incorporated new dimensions such as the adoption and integration of emerging technologies like artificial intelligence in public services. Bahrain's improved ranking underscores its proactive efforts in this domain, building on an already strong foundation of user-centric, accessible online government services. The Kingdom's ongoing incorporation of AI tools within the public sector, from automated service delivery to intelligent data analysis, demonstrates its strategic direction toward a more efficient, responsive, and forward-looking government framework **(E-Government Survey, 2024)**. The rankings over the year have been demonstrated as follows:

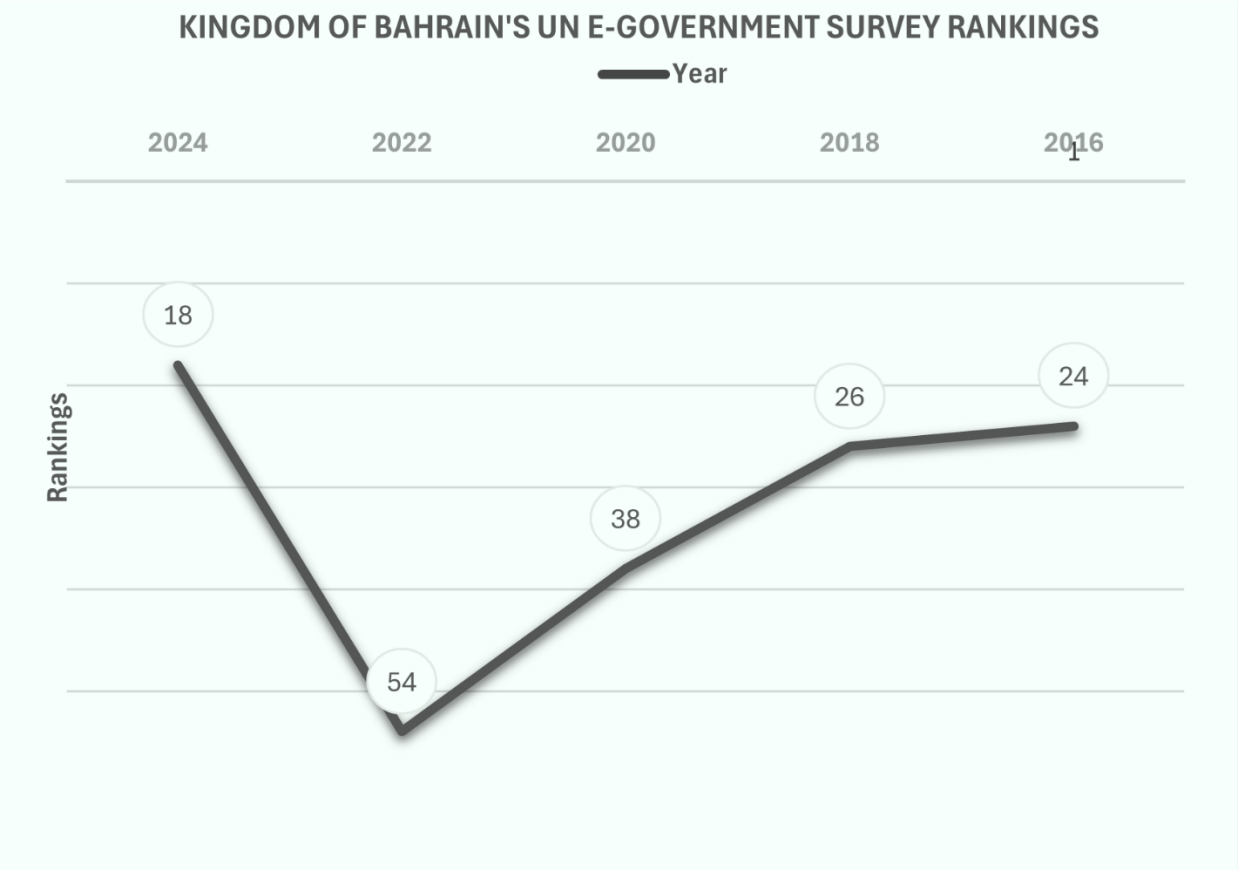

Figure 4: Kingdom of Bahrain's UN e-Government Rankings

V. The Scientific/Educational Dimension: Cultivating AI Talent and Fostering Innovation

Fueling Discovery: Investing in AI Research and Innovation

Bahrain is strategically positioning itself as a regional leader in artificial intelligence (AI) by making substantial investments in research, education, and innovation. These efforts are a key part of Bahrain's national strategy to diversify its economy and establish itself as a knowledge-based society, in line with Bahrain Economic Vision 2030 **(Bahrain Economic Development Board, 2018)**. Institutions such as the Nasser Artificial Intelligence Research and Development Center (NAIRDC) and the Benefit Advanced Artificial Intelligence & Computing Lab, launched through a partnership between the University of Bahrain and the Benefit Company, demonstrate the country's dedication to cultivating home-grown AI innovation **(UOB, 2023) (Benefit Company, 2022)**.

These centers focus on providing AI solutions for sectors like healthcare, finance, logistics, and public services. Their work accelerates Bahrain's transition into Industry 4.0 by supporting AI-based decision-making, automation, and predictive analytics that solve local challenges.

Investing in Tomorrow: R&D Expenditure for AI Advancement

As per **(Zainab, 2025)**, between 2021 and 2025, Bahrain has allocated approximately BHD 4.8 million toward AI-focused research and development across academic and applied settings. This investment spans public universities, government-funded labs, and collaborative projects with the private sector. The trend indicates a consistent annual increase in AI R&D budgets, particularly for projects with real-world applications and societal impact.

Notable funding initiatives include:

- Joint academic-industry projects on AI for smart healthcare.
- AI-driven solutions for financial fraud detection and risk management.
- AI-based systems for traffic and urban energy optimization.

This sustained investment reflects the government's recognition that R&D is a cornerstone for innovation-led economic growth.

Knowledge Frontiers: AI Research Output and Scholarly Contributions

As per **(Zainab, 2025)**, Bahrain's universities and research centers have collectively published over 800 AI-related research papers from 2020 to 2024, with more than 80 researchers actively contributing to AI advancements across 12 higher education institutions. These works span multiple domains:

- Healthcare: AI-assisted diagnostics, predictive health models, and medical imaging.
- Finance: Credit risk modeling, transaction anomaly detection, and robo-advisory tools.
- Smart Cities: Traffic optimization algorithms, predictive maintenance of infrastructure, and citizen-centric AI apps.
- Education: Personalized learning environments and adaptive assessment systems.

This research not only addresses Bahrain's domestic priorities but also contributes to international scientific discourse.

Ethical Innovation: Pioneering Research in Responsible AI Development

Bahrain is setting a precedent in the region by promoting ethical AI development through frameworks and institutional policies. The Bahrain Ethical AI Framework offers principles around transparency, accountability, and fairness, ensuring that AI systems operate without bias and align with human values **(News of Bahrain, 2024)**.

Key ethical initiatives include:

- University of Bahrain drafting policies for responsible use of generative AI in education.
- Ahlia University is establishing a research ethics code that includes AI governance.
- Royal College of Surgeons in Ireland (RCSI) Bahrain integrating ethics into AI applications in medical education and practice.

These initiatives ensure that Bahrain's AI landscape grows within a strong ethical and legal framework.

Nurturing Talent: Cultivating a Skilled AI Workforce

Recognizing that talent is the backbone of innovation, Bahrain is investing heavily in AI-focused education and training. Universities are offering a range of undergraduate and postgraduate programs covering foundational and advanced AI topics. These include machine learning, computer vision, natural language processing, robotics, and AI in cybersecurity.

Collaborations with international institutions provide students with access to cutting-edge AI resources and opportunities for research exchange. Moreover, TVET (Technical and Vocational Education and Training) programs deliver hands-on AI training for students seeking industry-ready skills.

From Lab to Life: Innovation Output, Patents, and AI Startups

Bahrain's AI ecosystem is increasingly entrepreneurial, with a rise in AI patent filings and tech startup activity. The Startup Bahrain platform has become a launchpad for AI-driven ventures. Areas of focus include:

- HealthTech startups building AI diagnostic platforms.
- FinTech solutions using AI for risk modeling and compliance.
- UrbanTech firms develop AI systems for traffic flow and energy monitoring.

These startups are supported through accelerator programs, government grants, and academic incubators, making Bahrain an attractive destination for AI innovation.

Empowering Minds: Education for an AI-Ready Generation

To ensure AI readiness among future generations, Bahrain is integrating AI topics into national education standards. AI literacy is being introduced at early education levels through coding classes, logic training, and AI simulations. By the university level, students have access to:

- Specialized AI degree tracks.
- Capstone projects with industry participation.
- AI labs and internships in collaboration with public and private entities.

This long-term investment in education is central to sustaining Bahrain's AI transformation.

A Vision for Learning: Integrating AI into the National Education Strategy

The National Education Strategy **(Higher Education Council, 2014)** highlights AI as a foundational element of STEM education reform. Schools and universities are now aligning AI teaching with national economic priorities. Institutions such as the British University of Bahrain (BUB) and the University College of Bahrain (UCB) have introduced AI ethics, policy, and innovation management into their course offerings.

These reforms foster critical thinking and ethical awareness in students who will shape the AI landscape of tomorrow.

Building the Foundation: Education Infrastructure for AI Literacy

Beyond curricula, Bahrain is enhancing its AI learning infrastructure through:

- Innovation hubs and tech parks.
- University-affiliated AI centers.
- Public libraries are equipped with AI and robotics tools.

These facilities offer access to AI hardware and software, mentorship, and community events. They also promote cross-disciplinary collaboration among students, educators, entrepreneurs, and policymakers.

Curriculum Revolution: Embedding AI in Educational Content

Universities in Bahrain have overhauled their curricula to reflect AI's growing importance. Course offerings now range from introductory to advanced levels, including:

- Fundamentals of AI

- Deep Learning and Neural Networks
- AI in Healthcare and Business
- Cyber-ethics and AI Policy

These educational innovations ensure that graduates possess both technical skills and ethical foresight.

Achieving Excellence: Educational Attainment in AI-Related Fields

Bahrain's academic institutions are collaborating globally to offer advanced AI training programs. Joint degrees, summer schools, and research fellowships provide students with access to the latest AI tools, practices, and mentorship. The outcomes include higher employability, stronger research output, and greater innovation.

Efforts are also being made to increase AI enrollment and retention rates, particularly among women and underrepresented groups, fostering diversity in the AI workforce.

AI for All: Expanding Public Access to AI Education and Training

As per **(Zainab, 2025)**, Bahrain's higher education sector has emerged as a critical enabler of the national AI ecosystem, providing not only technical expertise but also embedding ethical, legal, and societal perspectives across curricula. Nearly all leading universities in Bahrain now integrate AI into their programs, supported by institutional policies, research funding, and international collaborations.

Scale and Reach

Today, more than 14 higher education institutions in Bahrain deliver AI-related teaching, spanning 50+ distinct courses and modules across undergraduate and postgraduate levels. This includes 8 master's programs and at least 2 doctoral tracks with direct AI and data science focus, ensuring a strong pipeline of advanced skills. Introductory modules also ensure that non-technical students, such as those in business, architecture, finance, and law, gain exposure to AI concepts. Bahrain Polytechnic, for instance, mandates an AI introduction course for all students, while the University of Bahrain integrates AI ethics, law, and cyber-ethics modules reaching hundreds of undergraduates each semester.

Research and Knowledge Creation

The higher education system is also contributing to Bahrain's knowledge economy, with 700+ AI-related research outputs spanning fields such as healthcare, finance, data analytics, cybersecurity, and education. Universities are embedding AI research into core graduate curricula, for example advanced studies in machine learning, natural language processing, deep learning, and AI in healthcare, building critical capacity in emerging domains.

Policies and Governance

At least 10 institutions have already issued or drafted formal AI policies to regulate academic use of generative AI tools, protect data privacy, and uphold academic integrity. These include guidelines for ethical AI usage, plagiarism detection with AI-assisted tools, requirements for student transparency when using AI, and structured faculty training to build AI literacy. Collectively, these frameworks ensure that AI adoption in education is responsible, ethical, and sustainable.

Financial Investments in AI

Universities are also committing tangible resources to AI development:

- Ahlia University invested more than BD 2.19 million (2021–2024) in research, innovation partnerships, and knowledge dissemination.
- Arabian Gulf University committed approximately BD 40,000 in one-off AI-related research grants and training programs, alongside recurring subscriptions worth BD 10,000 per year for integrity tools, plus BD 2,600 annually for AI productivity platforms.
- Kingdom University allocated BD 4,800 for AI in Business Strategy programs.
- RCSI Bahrain received a BD 19,877 grant from Tamkeen in 2024 to develop an AI-powered simulated patient for medical training.
- University College of Bahrain dedicated BD 25,578.62 between 2023 and 2027 for conferences, subscriptions, and AI-related initiatives.
- University of Bahrain funded BD 4,900 for research into AI in healthcare education.

This growing financial footprint reflects the priority that universities are giving to embedding AI into teaching, research, and operations.

Curriculum Breadth

The scope of AI education in Bahrain is both deep and broad:

- **Foundational AI and ML:** search algorithms, knowledge representation, supervised and unsupervised learning, neural networks, reinforcement learning.
- **Applied Domains:** AI in finance and FinTech, healthcare, cybersecurity, education, architecture, and operations management.
- **Ethics and Law:** AI ethics, privacy, intellectual property, and cyber law are integrated across multiple universities.
- **Business and Innovation:** AI-driven business analytics, decision support systems, operations, and marketing.

Together, these developments demonstrate how higher education is laying the groundwork for Bahrain's AI ecosystem, ensuring a steady flow of skilled graduates, producing high-quality research, and embedding governance standards that align with international best practice.

VI. The Economic Dimension: Unleashing AI's Potential for Sustainable Growth

Setting the Stage: An Economic Strategy for AI-Driven Prosperity

Bahrain's National AI Strategy is deeply intertwined with its long-term economic vision, which revolves around transitioning from a traditional resource-based economy to a knowledge-based, diversified economy **(Information & eGovernment Authority, 2025)**. The adoption of AI is central to achieving this transformation. As Bahrain seeks to grow its economy, the application of AI will provide a dual opportunity: to optimize traditional sectors like oil, banking, and logistics, while creating new, innovative industries based on AI, data science, and tech entrepreneurship.

The Information and Communications sector already contributes around 6.6% of Bahrain's GDP as of 2024 , and attracted BD 520.53 million (USD 1.38 billion) in FDI in 2023, representing 3.2% of total inflows, highlighting strong investor confidence in digital and AI-related growth **(MOFNE, 2024).**

Bahrain has committed to integrating AI technologies into its economic framework, enabling it to not only keep pace with global trends but also become a regional leader in AI-driven solutions. The government has outlined a vision to harness AI for sustainable growth by enhancing productivity across key sectors such as healthcare, finance, transportation, and education. The country's Economic Vision 2030 aims to diversify its economy, and AI is seen as an essential tool in achieving this goal by boosting both efficiency and value creation **(Bahrain Economic Development Board, 2018)**.

Key Strategic Focus Areas:

AI in Economic Diversification: Bahrain views AI as a tool to create new industries, reduce dependency on traditional oil revenues, and generate high-value jobs in areas like AI software development, data analytics, and ethical AI governance.

AI-Driven Innovation: By fostering an AI ecosystem, Bahrain is setting itself up as a startup hub in the Middle East. The creation of an innovative ecosystem supported by regulatory and infrastructure incentives will promote AI-driven solutions and encourage local and international investors.

Strengthening the Knowledge Economy: With AI and digital technologies at the core, Bahrain's National AI Strategy aligns with its efforts to develop a knowledge-based economy that thrives on intellectual capital and innovation **(The Fintech Times, 2023)**.

Transforming Work: AI's Impact on Labor Markets and the Future of Jobs

The impact of AI on Bahrain's labor market will be multifaceted. While there is no denying that AI will automate some jobs, particularly in industries like manufacturing, logistics, and customer service, it will simultaneously create new roles and redefine the workforce's skill sets. Bahrain's economic strategy places a high emphasis on reskilling and upskilling initiatives to ensure that its workforce is AI-ready **(Medium, 2022)**.

Reskilling and upskilling programs will be essential to support this transition, ensuring that Bahrain's workforce remains competitive and adaptable. In parallel, major private-sector initiatives are creating large-scale opportunities: for instance, CitiBank's global technology hub in Bahrain, developed in partnership with Tamkeen and the EDB, is expected to create 1,000 coding jobs over the next decade **(BNA, 2025)**. This demonstrates the job-creation potential of AI-linked investments and reinforces the importance of aligning education and workforce development strategies.

Key Impacts of AI on Bahrain's Labor Market:

Job Creation in AI-Related Fields: There will be an increased demand for jobs such as data scientists, AI engineers, machine learning specialists, and ethicists. As Bahrain positions itself as a regional hub for AI, new industries will emerge, particularly in technology, cybersecurity, and digital entrepreneurship.

Automation of Routine Jobs: Sectors like manufacturing, retail, and customer service will see a shift in labor requirements as routine tasks are automated through AI-driven systems. However, this will lead to an emphasis on more advanced skills in management, data analysis, and AI system optimization.

Workforce Re-skilling: As part of Bahrain's strategy, there will be a focus on reskilling programs to equip citizens with the necessary skills to adapt to the changing job market. Government initiatives, in collaboration with local universities and tech institutes, will offer training in digital literacy, AI tools, and problem-solving skills, ensuring a smooth transition to an AI-driven economy.

AI and Remote Work: The AI revolution will also impact remote working dynamics, increasing the efficiency of telework through AI-powered tools like virtual assistants, collaborative AI platforms, and digital task management systems. Bahrain's strategy will likely leverage these developments to enhance the nation's competitiveness in global markets by embracing a more flexible workforce.

Investing in Progress: Intermediate Consumption and AI Spending by Businesses

Businesses in Bahrain, both local and international, are increasingly adopting AI technologies to gain competitive advantage. Investments in AI are seen as critical to improving business efficiency, enhancing customer experience, and optimizing operations **(Startup Bahrain, 2023)**.

How AI Enhances Business Growth:

AI in Business Operations: Bahraini businesses are incorporating AI to streamline processes, reduce costs, and enhance operational efficiency. AI solutions such as automated chatbots, predictive analytics, and AI-driven customer service are helping businesses enhance their value propositions and expand their customer base.

Predictive Analytics and Decision-Making: With AI's capability to process large datasets, businesses in Bahrain are making smarter, data-driven decisions. From market forecasting and demand prediction to inventory management and supply chain optimization, AI helps businesses boost productivity, reduce operational costs, and drive profitability.

Investment in Startups: Bahrain's commitment to fostering innovation is evident in its growing number of AI-driven startups. Government-backed programs like "Startup Bahrain" provide funding and mentorship to new companies in the AI sector, encouraging the development of solutions that address local and regional challenges.

Incentives for AI Adoption: Bahrain is offering incentives for companies to adopt AI technologies, such as tax breaks, grants, and investment in infrastructure. These incentives are designed to encourage businesses to invest in AI research and deployment, making it easier for companies to innovate and scale their operations **(Startup Bahrain, 2023)**.

Driving Growth: AI Investments, Economic Output, and GDP Contribution

Bahrain's National AI Strategy anticipates that AI will play a central role in driving the country's economic output. The deployment of AI technologies is expected to significantly enhance productivity across key sectors, thus contributing to the nation's GDP. According to forecasts, AI could contribute as much as 8.2% to Bahrain's GDP by 2030 **(PWC, 2020)**. This is a remarkable leap, especially given the high value-added industries like finance, healthcare, and manufacturing, where AI applications will improve outcomes and boost efficiencies.

On the public side, Bahrain has made measurable investments in AI research and applied innovation:

- The National Innovation Hub (iGA) supports development of AI-driven Minimum Viable Product (MVP) projects across different government entities.
- The Shaikh Nasser Artificial Intelligence Research and Development Center (NAIRDC) continues to play a vital role in advancing research in high-performance and applied AI computing, supporting national efforts to strengthen Bahrain's AI innovation and research ecosystem.

- Collaborative initiatives such as the Artificial Intelligence Academy (Tamkeen, Microsoft, Bahrain Polytechnic) and the Cloud Innovation Center (Tamkeen, UoB, AWS) continue to strengthen Bahrain's applied AI ecosystem.

Looking ahead, AI is expected to contribute up to 8.2% of Bahrain's GDP by 2030, largely through productivity gains in finance, healthcare, logistics, and manufacturing.

Strategic Economic Outcomes:

Diversification of GDP: By adopting AI in key sectors, Bahrain is aiming to diversify its GDP away from oil dependency. The AI revolution is expected to spur economic activity in technology, services, and new industries that did not exist before, such as data-driven solutions and digital transformation services.

Productivity Gains: AI will lead to significant increases in labor productivity, particularly in sectors like finance, manufacturing, and retail. Automation and AI-enabled decision-making tools will optimize operations, reduce waste, and allow companies to do more with less.

New Markets and Industries: AI is also expected to open new markets for Bahrain. Industries like AI-powered fintech, smart cities, autonomous vehicles, and healthcare tech will contribute significantly to economic growth. These investments are complemented by Bahrain's vibrant innovation ecosystem. As of 2024, the Kingdom hosted over 200 active tech startups, which collectively raised more than USD 100 million between 2020 and 2023. FinTech Bay has become a regional hub, hosting 120+ fintech firms, while the BENEFIT network processed BHD 4.5 billion in e-payments in 2023 double the volume of 2020 **(Tamkeen, 2024)**.

As per **(MOIC, AI Maturity in Ministry of Industry and Commerce, 2025)**, within the wider business landscape, Bahrain had approximately 87,000 active enterprises as of January 2025. While there is no dedicated AI classification under ISIC4, the Information and Communications sector, used as a proxy, accounts for 3.05% of total registered companies, providing an indicative measure of AI-related enterprise activity.

The Economic Dimension: Further Considerations

Strategic Positioning in the AI Value Chain

Bahrain must strategically position itself as both a producer and a consumer of AI technologies within the global AI value chain. This will require continued investment in R&D, talent development, and the creation of a supportive ecosystem that attracts AI innovators from around the world.

AI R&D Ecosystem: Bahrain's focus on AI R&D is essential for the country's long-term competitiveness. Government support for AI research centers and collaboration with international

institutions will enhance Bahrain's role in the global AI landscape, ensuring that it not only imports AI technologies but also contributes to global advancements.

AI Innovation Hubs: By creating AI-focused innovation hubs, incubators, and accelerators, Bahrain will foster an environment conducive to AI startup growth. These hubs will attract entrepreneurs and tech companies to Bahrain, driving innovation and economic expansion.

Regulatory Framework for AI: As Bahrain looks to lead in ethical AI development, it will also need to establish a regulatory framework that encourages innovation while safeguarding privacy, equity, and fairness. The establishment of AI regulations that align with international best practices will ensure that Bahrain attracts global companies while mitigating risks.

These developments are reflected in Bahrain's rising performance in global benchmarks: **(IMD , 2023)** ranked Bahrain 35th globally (up 6 places from 2022) and **(Portulans Institute, 2023)** placed Bahrain 41st worldwide and 4th in the GCC. Most recently, the ITU ICT Development Index 2024 ranked Bahrain 5th globally and 3rd in the Arab world, underscoring its strong digital foundation for AI growth **(ITU, 2024)**.

VII. The Technical and Infrastructural Dimension: Building the Foundation for AI Success

Digital Backbone: Infrastructure, Connectivity, and the Internet of Things

Bahrain's investment in its digital infrastructure has made it one of the most technologically advanced nations in the Gulf region, especially when it comes to supporting AI technologies. The country's high-speed internet infrastructure forms the foundation for all AI systems, enabling reliable, fast, and efficient communication across diverse sectors.

As of early 2025, Bahrain recorded 2.52 million active cellular mobile connections, equivalent to 155 percent of the total population, reflecting the widespread adoption of mobile technology across the Kingdom. While some of these connections are limited to voice and SMS services, the high penetration rate underscores Bahrain's advanced digital infrastructure. There were approximately 1.61 million internet users, representing 99 percent of the population, highlighting near-universal online access. Additionally, 1.19 million social media identities were active in January 2025, accounting for 73.2 percent of the total population. These figures demonstrate Bahrain's strong digital engagement and its progress toward building a fully connected and technologically empowered society **(DataReportal, 2025)**.

This infrastructure is complemented by the nationwide rollout of 5G technology **5G technology, covering more than 95% of the population**, which offers extremely low latency and ultra-fast download speeds, both critical for AI applications that require real-time data processing. Industries

like autonomous vehicles, healthcare diagnostics, and predictive analytics are particularly dependent on this fast, low-latency communication network, which Bahrain has successfully integrated into its national infrastructure **(O'Grady, 2024)**.

Quality and Trust: Adoption of AI Standards for Reliability and Interoperability

Bahrain has actively adopted international standards and certifications to ensure the reliability and trustworthiness of its AI systems. The His Highness Shaikh Nasser Artificial Intelligence Research and Development Centre (NAIRDC) in Bahrain has achieved several key ISO certifications **(BNA, 2024)**, which include:

- ISO 27001:2022 for Information Security Management Systems (ISMS) in AI,
- ISO 23053:2023 for machine learning-based AI systems,
- ISO 23894:2023 for risk management in AI development, and
- ISO 42001:2023 for Artificial Intelligence Management Systems.

Bahrain's adoption of these AI-specific standards means that both government and industry players can trust the quality and security of AI technologies deployed across various sectors. These internationally recognized certifications are a testament to Bahrain's commitment to ensuring that its AI ecosystem is built on a foundation of reliability and interoperability. This is essential for fostering both local and global collaboration, where AI solutions can seamlessly integrate into existing systems and promote innovation in a safe and transparent manner.

Powering Innovation: Computing Resources and Capabilities for Advanced AI

The need for cutting-edge computing resources is paramount in enabling Bahrain's ambition to become a hub for AI innovation. Bahrain has already invested heavily in its computing infrastructure, setting the stage for advanced AI applications that demand immense computational power.

Bahrain hosts more than 10 commercial data centers, equivalent to 1.18 colocation data centers per million people one of the highest rates in the GCC. The AWS Bahrain Cloud Region (launched in 2019) alone represents an estimated USD 200 million investment, offering hyperscale capabilities to enterprises and government **(IGA, 2023)**.

The Kingdom's growing network of data centers is critical in ensuring that AI models can be trained efficiently, large datasets can be processed rapidly, and real-time decision-making can be facilitated. The data center industry in Bahrain has grown steadily, providing the necessary cloud and on-premises computing capabilities needed to support AI-driven applications in various sectors.

Bahrain is also well-positioned to host AI research labs, innovation hubs, and startup incubators, all of which require substantial computing power. The future upgrade of Bahrain's data infrastructure will likely include advanced AI supercomputing clusters and access to edge computing capabilities, which

are key for decentralized data processing, particularly in applications such as smart cities, autonomous vehicles, and healthcare diagnostics **(Yadav, 2024)** **(Grey, 2024)**.

Data-Driven Decisions: Data Quality, Availability, and Statistical Performance

AI systems rely heavily on data, and Bahrain has taken significant strides in improving its data ecosystem to ensure high-quality, accessible, and secure datasets for AI initiatives. The government's initiatives in data governance and data protection provide a robust framework for managing sensitive information while ensuring compliance with international privacy standards.

The Information & eGovernment Authority (iGA) manages over 400+ government datasets on its National Data Portal **(Open Data Portal, 2025)** with metadata standards aligned to UN and ITU guidelines.

In particular, the Cyber Trust Program and other related cybersecurity initiatives are crucial for protecting the integrity and security of the vast amounts of data collected for AI analysis. By providing an environment where data quality is consistently maintained and access to data is well-regulated, Bahrain ensures that AI systems can make accurate, reliable decisions **(ITU, 2024)**.

Bahrain's National AI Strategy places strong emphasis on the quality of data used for AI, whether it's public-sector data for smart governance or private-sector data for innovations in healthcare, education, and finance. Data availability and transparency are core to Bahrain's vision of AI deployment, ensuring that datasets are updated regularly and are representative of the diverse needs of the population **(Information & eGovernment Authority, 2025)**.

The Technical and Infrastructural Dimension: Additional Considerations

Building on the Cloud-First Policy, Bahrain is developing an AI policy for the government, expected to be published in 2025. This policy will address the adoption of AI technologies within the government and will complement the existing cloud policy to ensure that AI initiatives are integrated into Bahrain's broader digital transformation efforts.

Bahrain's participation in international cybersecurity initiatives, including its role in forums like AI Connect II, enables the Kingdom to remain at the forefront of AI governance and cybersecurity. By collaborating with global entities, Bahrain ensures that its AI infrastructure meets the highest international standards and that its AI systems are resilient to emerging threats **(ITU, 2024)**.

VIII. Engagement in the AI Roadmap Landscape: Stakeholder Involvement and Process Development

The journey to building Bahrain's National AI Multi-Stakeholder Roadmap, as documented in this RAM assessment, was a collaborative effort involving a wide array of stakeholders. This initiative sought to ensure that both internal and external entities actively contributed to shaping the AI landscape in Bahrain. This process was marked by a series of workshops, data collection methods, and stakeholder surveys **(IGA, 2024)**. Here's how the engagement process unfolded, including the challenges faced along the way.

Internal Workshop at the Information and eGovernment Authority (iGA)

The first phase of the engagement process kicked off with an internal workshop organized by the Information and eGovernment Authority (iGA) in December 2024. As the body responsible for overseeing the digital transformation and eGovernment services, iGA played a critical role in spearheading the AI initiative. However, this was a new process for iGA, as they had not previously been involved in such an extensive AI strategy development.

The workshop's primary goal was to raise awareness among iGA's internal stakeholders, which included various government ministries and departments, about the importance of AI and how it could impact their operations. This was the first time many participants were introduced to such a broad, multi-faceted approach to AI adoption, and this brought with it a range of challenges.

One of the main difficulties during this phase was ensuring that iGA's stakeholders, many of whom were new to AI and its implications, fully understood the significance of the process. The internal team needed to be convinced of the value of this initiative, particularly given the complex nature of AI technology and the potential for large-scale transformation. Additionally, there was some initial hesitance due to the novelty of the approach, with many unsure about how AI could fit into their departments' daily operations.

However, by providing contextual insights, AI success stories from other countries, and examples of AI's potential to improve public services, iGA succeeded in gaining the internal support needed to move forward. The goal of the workshop was not just to inform, but also to involve iGA's team members in the data collection process, ensuring their direct contribution to shaping the roadmap.

External Stakeholder Workshop: Engaging Government Entities Across Bahrain

The second phase of the process involved engaging external stakeholders, nearly 50 government entities from across Bahrain in January 2025. This was a critical step in ensuring that the AI roadmap was not limited to the internal operations of iGA but also incorporated the needs and perspectives of various government bodies, ministries, and public agencies.

This workshop aimed to raise awareness among the external entities about Bahrain's AI strategy and its potential applications in their respective sectors. Each entity focused on a different aspect of AI, from data governance and AI ethics to public service applications. The workshop created an

opportunity for these entities to engage in open discussions, share concerns, and understand the national goals surrounding AI adoption.

Challenges faced during this phase included coordinating and managing such many participants, each with different levels of knowledge and understanding of AI. With nearly 50 entities involved, aligning all stakeholders to a common vision and ensuring meaningful contributions from each one posed a significant logistical challenge. There was also a need to tailor the discussions and materials to cater to the diverse range of sectors, each with its own unique challenges related to AI.

Nevertheless, the workshop was successful in gathering diverse insights, and it laid the foundation for the next phase of engagement ,customized data collection forms.

Customized Data Collection Forms for Accurate Reporting

Following the workshops, the process moved on to the critical phase of data collection, where two distinct forms were designed to capture data from both internal and external stakeholders. This step was vital to ensure that the data collected was accurate, relevant, and tailored to the specific needs and roles of each participant.

1. Form for iGA: As the key governmental body driving the initiative, iGA required a customized form that focused on data infrastructure, readiness for AI integration, and internal digitalization efforts. Given that this was iGA's first time participating in such an extensive AI process, they faced challenges in adapting to the technical language and specific requirements of the data collection. Many team members were not familiar with the granularity of data needed to assess AI readiness, which posed a challenge in terms of gathering the most relevant insights.

2. Form for External Entities: For the external government entities, the form was customized to gather sector-specific data on their AI needs, challenges, and readiness. Each of the 50 entities involved was given a form that asked questions relevant to their operations—such as the potential for AI in healthcare, public safety, transportation, and education. Here, the challenge was in ensuring that each entity understood the form's requirements and could provide accurate responses. Some ministries had limited familiarity with AI’s potential, which led to delays in form submission and difficulties in accurately assessing the level of AI maturity in each sector.

Despite these challenges, the customized approach proved effective in collecting the right data, allowing the team to proceed to the next stage of the process.

Data Analysis and Survey Completion

Once the data collection forms were completed, the next step was to conduct a thorough data analysis. This phase was crucial to ensure that the collected data accurately represented the diverse needs and capacities of the various stakeholders. Alongside the forms, two surveys were distributed to assess the overall AI readiness of both internal and external entities.

The surveys focused on key areas such as AI infrastructure, policy development, training needs, and ethical considerations. The challenge here was to ensure that the survey questions were clear and relevant to each respondent's role and expertise, as there was a considerable variation in understanding AI across the different participants. Additionally, there was a need to analyze and synthesize responses from both iGA and external stakeholders, which was time-consuming due to the volume of data and the complexity of different answers.

Contributions of Stakeholders and Development of the Report

With the data from the forms and surveys in hand, the next step was to analyze the findings and incorporate them into the development of the AI roadmap. This stage of the process revealed a key challenge: balancing the diverse perspectives and expectations of different stakeholders. For instance, while iGA's focus was on the national infrastructure and regulatory frameworks, external entities had more sector-specific concerns, such as the need for AI-driven public service delivery or data governance policies.

Nevertheless, each contribution was crucial in shaping a well-rounded roadmap that reflected both Bahrain's long-term goals and the immediate needs of its diverse government entities. The final report, which was developed based on the data collected and further research, encapsulated these findings and provided a comprehensive framework for Bahrain's AI future.

Building the AI Roadmap: A Collective Effort

The final AI roadmap represented a collective effort of all stakeholders involved in the process. It drew on insights from both internal and external entities, addressing the challenges faced by various sectors and providing clear guidelines for how Bahrain can move forward in its AI journey. The report was built not only from data analysis but also from the ongoing collaboration between ministries, agencies, and iGA.

In conclusion, while the engagement process was marked by significant challenges—especially as iGA participated for the first time and many external entities faced similar hurdles—the collaborative nature of the project enabled Bahrain to build a robust AI strategy. The process demonstrated the power of stakeholder involvement and paved the way for Bahrain to harness AI in a sustainable, ethical, and impactful manner.

Key Insights: Challenges and Opportunities in Stakeholder-Driven AI Strategy Development

The development of Bahrain's AI roadmap, driven by wide-ranging stakeholder involvement, offered a wealth of insights into the nation's readiness for AI adoption. This multi-layered process, although promising, also came with its share of complexities. As this was the first time the Information and eGovernment Authority (iGA) led a project of this kind, and the first instance of national-level AI engagement for many of the external government entities, the journey was one of learning, capacity-building, and adaptation.

Below is a consolidated overview of the core challenges and corresponding opportunities that arose throughout the roadmap creation process:

Institutional Readiness vs. Strategic Potential

Challenge: Many entities, especially within iGA, were engaging with AI strategy for the first time. There was knowledge gaps related to AI's technical, ethical, and governance dimensions. This slowed initial momentum, especially in interpreting what was required for meaningful contribution.

Opportunity: This created a foundation for institutional learning. It catalyzed internal conversations about digital maturity and helped position iGA as a central coordinator of AI governance role it is now more prepared to build upon.

Multi-Stakeholder Coordination vs. Cross-Sector Engagement

Challenge: Coordinating nearly 50 external government entities, each with different levels of digital maturity, sector-specific goals, and operational capacity, was logistically and administratively demanding. Some entities lacked a clear understanding of AI's relevance to their sector.

Opportunity: This same diversity became an asset. It allowed for a rich exchange of insights across sectors like healthcare, education, transportation, and public safety. The process helped break silos and promoted a whole-of-government approach to AI.

Technical Literacy vs. Capacity Building

Challenge: Limited AI awareness and literacy among many stakeholders resulted in inconsistent data submissions, delays in form completion, and the need for ongoing clarification.

Opportunity: These gaps highlighted the urgent need for targeted capacity-building programs, which can now be addressed in follow-up actions of the roadmap. It also created space for designing future training initiatives tailored to the specific needs of different ministries and agencies.

Customization Complexity vs. Data Relevance

Challenge: Developing customized data collection forms for both iGA and each external entity required significant time and effort, especially to ensure contextual relevance and clarity.

Opportunity: This customization process yielded sector-specific insights that are far more actionable than generic surveys. The tailored forms improved data relevance and allowed the final report to reflect each sector's unique AI potential and barriers.

IX. Framing Bahrain's AI Future: Strategic Priorities and Actionable Guidance

- ✓ **Develop a National AI Data Infrastructure & Framework**
  Establish a centralized and comprehensive data collection, management, and governance framework to support AI development and continuous monitoring. This framework will be implemented through the National Data Sharing Framework, which acts as the core governance mechanism for Bahrain's National Data Sharing Platform. It will define the policies, standards, and processes that ensure interoperability, security, and data quality across academic, governmental, and private sector sources. By providing a structured and trusted foundation, the framework will enable evidence-based policymaking, foster innovation, and strengthen public trust in data-driven initiatives.
- ✓ **Finalize and Adopt the National AI Strategy**
  Endorse and implement a comprehensive National AI Strategy that articulates Bahrain's long-term vision for artificial intelligence. The strategy will define clear pillars, measurable objectives, and a phased implementation roadmap, ensuring coordinated national efforts that drive innovation, strengthen competitiveness, and deliver sustainable economic and social impact.
- ✓ **Strengthen Inclusive STEM Education**
  Bolster national efforts to advance STEM education, with a specific focus on equity and inclusion. Initiatives should target underrepresented groups: especially women, youth from rural areas, and people with disabilities through scholarships, mentorship programs, and partnerships with community organizations.
- ✓ **Launch a National AI Awareness Campaign**
  Design and roll out innovative public engagement campaigns that demystify AI and foster critical dialogue. These should use accessible platforms such as social media, TV, podcasts, and community events to raise awareness of AI's societal and environmental implications and empower citizens with digital literacy skills.
- ✓ **Facilitate Cross-sectoral and Interdisciplinary Collaboration**
  Promote a collaborative ecosystem that bridges gaps between engineers, ethicists, policymakers, social scientists, and environmental experts. This will encourage holistic approaches to AI that consider not only technical feasibility but also long-term societal outcomes.
- ✓ **Promote AI Entrepreneurship and Innovation**
  Position Bahrain as a regional hub for AI startups and private-sector investment, encouraging innovation and commercialization of AI solutions.
- ✓ **Invest in Purpose-driven Ethical AI Research**
  Provide sustained funding for AI research that emphasizes ethical, societal, and ecological impacts. Research should address themes such as bias in algorithms, the societal impact of automation, and climate-related risks of AI technologies, aligning innovation with long-term human and environmental welfare.

X. Future of AI in Bahrain

The future of AI in Bahrain presents a transformative opportunity for the nation. As Bahrain embraces digital innovation, AI is poised to play a critical role in driving economic growth, enhancing public services, and improving quality of life.

- **Strategic Initiatives**

Bahrain's government is committed to fostering an AI-friendly environment through strategic initiatives. This includes investments in infrastructure, talent development, and regulatory frameworks that support innovation while ensuring ethical practices.

- **Workshops on AI**

In April, the Director of Innovation and Advanced Technologies hosted a series of workshops focused on the Future of Work through AI and the Future of Governance. These workshops aimed at:

  - **Educate Stakeholders:** Participants included government officials, industry leaders, and academia, fostering collaboration to discuss the implications of AI on the workforce and governance.
  - **Explore AI Applications:** Discussions centered on how AI can enhance productivity, streamline government processes, and improve public service delivery.
  - **Encourage Strategic Thinking:** The workshops provided a platform for generating ideas on integrating AI into Bahrain's economic and governance frameworks, preparing for a rapidly changing landscape.

- **Economic Impact**

AI has the potential to significantly boost Bahrain's economy by enhancing productivity across various sectors, including finance, healthcare, and tourism. By leveraging AI technologies, businesses can optimize operations, improve customer experience, and create new revenue streams.

- **Social Considerations**

The integration of AI into everyday life raises important social considerations. Ensuring inclusivity and addressing concerns around job displacement are crucial. Public engagement and education will be key to building trust and understanding AI's benefits and challenges.

- **Ethical and Regulatory Framework**

Establishing a robust ethical and regulatory framework is vital for guiding AI development. Bahrain must balance innovation with the protection of citizens' rights, focusing on data privacy, accountability, and transparency in AI systems.

- **Conclusion**

The future of AI in Bahrain is bright, with the potential to enhance economic resilience and societal well-being. By fostering collaboration among government, industry, and academia alongside initiatives like the recent workshops Bahrain can position itself as a regional leader in AI innovation, driving sustainable growth and improving the quality of life for its citizens.

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