

Using Artificial Intelligence to Enhance Business Incubator Governance: Global Lessons for Arab Business Incubators

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Abstract

Although artificial Intelligence (AI) can change the way incubators govern their organization, many Arab business incubators continue to find governance gaps in their practices such as limited decision-making based on data, misallocated resources, and/or limited engagement with stakeholders. We examine these situations through the lens of three well-known incubators using AI as their management strategy: NVIDIA Inception, Digital Catapult, and ACE Startup Incubator. With an experience-based qualitative approach, we glean knowledge from the experiences of these organizations by uncovering how AI could close governance gaps, and increase innovation in incubators.

We learn that using AI has allowed a strategic decision-making framework, reinforced relational governance, and aided with tailoring incubator services for startups. This analysis revealed that a digital leadership culture and organizational readiness are also critical elements of any proposed AI solution. Moreover, incubators must develop data infrastructure, discover ethics that accurately bridge AI and partnerships, and instill ongoing learning into its incubatee structure to maximize data utilization while guarding against bias and exclusion.

From a Arab perspective, our implications indicate that if incubators invested toward AI capabilities and potential leader identity development, as well stakeholder investment and involvement, they could bridge governance gaps and support more entrepreneurial appetite. With specific recommendations for policy and practice, incubators should consider the strategic value of AI as an intervention to build resilient, competitive, and inclusive entrepreneurial ecosystems in the Arab world.

Keywords: *Artificial Intelligence; Business Incubator Governance; Innovation; Arab World.*

Jel Codes: G34; M15; O32; O33

1. Introduction

Business incubators are indispensable for promoting entrepreneurship, innovation, and economic diversification, especially in emerging markets. Business incubators in the Arab world are hampered by governance gaps, which include a lack of strategic guidance, insufficient stakeholder engagement, administrative inefficiencies, and a lack of innovation systems in the region (Yasin et al., 2021). These difficulties will prevent incubators from responding adequately to the needs of the startups they support as well as the ability to further develop innovative ventures and economic development objectives of the nation. Identifying ways to address these governance gaps is critical for Arab incubators to be able to fulfill their potential in a rapidly evolving global economy.

Artificial intelligence (AI) has disrupted traditional management, however, now AI has also been deployed in innovation. AI in the context of incubators, is the use of advanced computational systems such as machine learning, natural language processing, and predictive analytics for automating decision-making, optimizing resource management, improving the assessment of performance, and personalizing assistance to startup companies (Sklavos et al, 2024). In addition, AI can enable incubators to address traditional limitations by driving governance from data, maximizing transparency, and supporting more responsive and agile organizational structures (Haefner et al., 2021). For instance, AI based tools can refine the selection of high potential startups, assess value-added relationships to investors and mentors in real time, and learn entrepreneurs into promising ventures.

This study aims to address how AI can potentially lead to improved governance in business incubators with a global lens to best prepare the incubators in the Arab region. This research places an emphasis on the experiences of three prominent organizations: NVIDIA Inception, Digital Catapult, and ACE Startup Incubator. These organizations have deployed AI and seen success in business incubator governance, through this study we seek to identify: (i) Best practices that they discovered, and (ii) challenges they faced along the way, and (ii) impact AI has had on incubator effectiveness. Through these case studies the goal of this study is to provide actionable strategies for adapting the governing processes to the context of Arab countries, for student and staff use in incubation support.

The aims of this article are threefold as it combines an analysis of governance challenges facing Arab business incubators which will inform the role of AI to address these challenges, as well as a comparative analysis of global best practices. The first objective is to characterize the governance gaps for Arab incubators; the second objective will describe the governance potential of AI, and the third will spotlight lessons learned from context-based policy and practical recommendation for stakeholders in the Arab world. Overall, this research highlights the importance of bridging global practices of innovation and startups to meet local needs, and offers a potential roadmap for incubators to leverage AI as a tool and potentially aid in their sustainability to grow and improved global competitiveness.

Methodologically, the research is qualitative in nature using a descriptive case-based study. A case-based approach was selected in order capture detail and provide context-rich information for studies engaging with AI as an important precondition (Yasin et al., 2021). The three examples from NVIDIA Inception, Digital Catapult, and ACE Startup Incubator were selected based on their established leadership of AI-based governance in relation to other incubator settings as well as their relevance as precedents to potentially be adapted in the Arab region. By drawing on the

insights from these organizations the study hopes to horizon scan lessons learned about adaptable infrastructures for improved incubator performance.

2. Literature Review: The Nexus of AI, Governance, and Incubation

2.1 Current State of Business Incubator Governance

Business incubators are essential in building entrepreneurship, providing startups with resources, mentorship, and access to networks (Bruneel et al., 2020; Medekhel & Dadene, 2020). Incubator governance refers to the framework and processes to organize decision-making, resource allocation, and accountability (Mian et al., 2022). Traditional governance models are Technology Transfer Offices (TTOs), corporate incubators, and university-affiliated incubators. The structures and objectives of these models vary. TTOs primarily focus on the commercialization of academic research, corporate incubators focus on innovation alignment or approval of innovation with corporate strategy, and university-based incubators prioritize educational and research missions (Siegel & Wright, 2019).

Incubators' key performance indicators (KPIs) tend to be focused on measuring, actual performance of incubated company, startup survival, funding raised, job creation, and commercialization (Albort-Morant & Ribeiro-Soriano, 2021). In recent studies the authors have suggested that governance models have become more dynamic due to the rapidly changing innovation landscape when considering how digital technologies and globalization are affecting entrepreneurial ecosystems (Guerrero et al., 2021). Governance effectiveness has become increasingly linked to developing new models linking digital tools, collaboration, stakeholder engagement, transparency, and accountability.

The governance of incubators and the adoption of artificial intelligence (AI) by emerging technologies are likely to become a trending and evolving topic of a more dynamic and transformative ensemble within a set incubator. AI provides more data-driven decision-making and faster management practices, but also introduces new risks surrounding data privacy, ethics, and staff technical skills (Kraus et al., 2021).

2.2 The Role of AI in Organizational Governance and Decision-Making

AI technologies are increasingly being applied to organizational governance for purposes of risk evaluation, predictive analytics, and process automation (Dwivedi et al., 2021). In business incubators, AI solutions may enable analysis of big data to forecast early stage market trends, assess venture readiness, and facilitate resource allocation (Jarrahi, 2018). AI augmented predictive analytics provide incubators with the ability to predict incubated venture performance, predict risky iterations, and proactively provide the support services needed to manage and modify risk projections (Brock & von Wangenheim, 2019).

Process automation mitigates unnecessary human resource involvement in administrative processes including the application review and tracking processes, as well as the provision of reporting to stakeholders; freeing up capacity for venture support services. Additionally, AI as a technology has the potential for more objective and transparent decision making by limiting human biases when assigning value to incubated ventures and their respective distributions of capital (Shrestha et al., 2019).

While AI technologies offer opportunities for improvement, there are also challenges related to governance frameworks for responsible data practices, and the ethical guidelines and value judgments that decision makers make when assessing and modifying goals and involvement (Morley et al., 2021). Organizational digital literacy and management of organizational change become necessary resources of investment to ensure successful AI adoption, continual development of relevant indicators of technological improvement to support the objectives of the organization (Haenlein & Kaplan, 2021).

2.3 The Incubation Landscape in the Arab World: A Contextual Analysis

The substantial increase in business incubators has corresponded with public policy reforms designed to expand diversity within the economy and drive innovation. While this increase is promising, it is important to recognize that the region has its own set of challenges, which stem from limited funding support, regulatory barriers, and an undercurrent of talent flight as skilled workers leave the region (Aminova et al., 2020). Many of the Arab countries experience champion a regulatory environment laden with bureaucratic challenges and absent guidelines for investing in start-ups that inhibit the potential of the incubation process (El Ebrashi, 2021).

Cultural factors such as risk appetite and informal entrepreneurship experience play a limiting role to a more diverse incubation participation. Additionally, the lack of educated mentors or industrious experts limits incubators ability to provide optimal support for early-stage entrepreneurs. Despite these challenges, there appears to be an emerging confidence that can be offered by using digital technologies to augment some of the challenges by broadening accessibility, enterprise responsiveness, and global connectivity.

The general advancements in policy reform and funding to improve digital infrastructure is a good starting point, but introducing AI into governance of the incubator process will require adjustments to meet the socio-economic and regulatory context (Aminova et al., 2020).

3. Global Case Studies

This section evaluates how leading global incubators harness artificial intelligence (AI) to bolster governance, resource allocation, and impact measurement and what can be learnt from their experiences that may be useful for Arab business incubators.

3.1 Global Lesson 1: NVIDIA Inception – AI for Ecosystem & Portfolio Management

NVIDIA Inception is an international accelerator program meant to support startups who are engaged in artificial intelligence (AI), data science, and high-performance computing. The program offers startups access to state-of-the-art technology, mentorship, and a comprehensive ecosystem, with the goal of expediting innovation and market development (NVIDIA, n.d.). A prominent component of NVIDIA Inception's governance and operating framework is using AI and machine learning (ML) as a facilitative means to personalize and facilitate the startup journey and using it as an example of the most developed AI incubator management in the market.

AI/ML in Startup Onboarding

AI technologies increasingly facilitate the onboarding process for startups. The use of machine learning models in NVIDIA Inception enables application screening, startup profile analysis and appending with the resource and mentor(s) that best suits their needs - all while reducing human bias and allowing for quicker identification of high-potential startups to determine a more diverse and innovative portfolio (Brown, 2024). AI chat bots and virtual assistants also enhance the onboarding experience, providing rapid responses to questions and guiding applicants through the process, which improves engagement and retention rate (Brown, 2024).

Performance Tracking and Predictive Analytics

Upon integration into the NVIDIA Inception program, AI-based dashboards and analytics tools are utilized to monitor entrepreneurial key performance indicators (KPIs) such as milestones in product development, funding raised, and market traction. Based on large datasets including social media data, team composition, and funding track record, machine-learning models can also be trained to make predictions regarding the success of startups (Bidgoli et al. 2024). The predictive analytics model would allow for preemptive support from the program, allowing the team to identify startups that perhaps need additional resources or intervention, thereby enhancing performance across the portfolio.

Resource Matching and Ecosystem Collaboration

Allocation of resources is optimized by artificial intelligence-enabled recommendation systems that can analyze the startup ecosystem's needs while taking into account the program-wide assets that can be utilized for the benefit of each startup. Techniques are used to recommend technical resources, funding opportunities and partners from other programs to provide customized support to each startup, thus optimizing resource use (Lutfiani et al., 2025). In addition to maximizing the usage of resources, this approach engenders collaboration among the ecosystem players by partnering the startups with relevant service providers and investors, thereby improving overall productivity and success of the incubator ecosystem.

Personalized Mentorship at Scale

Custom mentorship is a central pillar of NVIDIA Inception's value. AI systems investigate founders' backgrounds, business challenges, and learning styles in order to match startups with mentors whose expertise best matches their needs (Mankar, 2025). Adaptive learning systems and performance analytics further personalize the mentorship experience to relevant and actionable guidance. Sentiment analysis and feedback mechanisms provide mentors with insights on the effectiveness of their content and areas needing improvement, all within an inclusive and adaptive mentorship environment (Mankar, 2025).

Implications for Business Incubator Governance

NVIDIA Inception's integration of AI and ML under onboarding, performance tracking, resource matching, and mentorship shows how digital technologies may provide incubator governance with efficiency, objective use of resources, and scalability. Furthermore, these practices provide implications for Arab business incubators seeking to achieve more transparency, inclusivity, and startup success through AI-institutional management.

3.2 Global Lesson 2: Digital Catapult – AI for Program Design & Impact Measurement

Digital Catapult is the UK's innovation agency for advanced digital technology and is a key player in driving the uptake of artificial intelligence (AI), the Internet of Things (IoT), and immersive technologies in startups and scaleups (Digital Catapult, n.d.). Digital Catapult's aim is to drive economic growth and regional productivity through digital innovation, particularly through the use of AI and data analytics to design programmes, identify technology gaps, and measure impact.

AI for Identifying Technology Gaps

AI led data analytics is a powerful tool for Digital Catapult to systematically map the UK's technology landscape and identify trends and innovation gaps. By aggregating and analyzing large volumes of data from industry, academia, and government, AI models can highlight where technological capabilities are absent or market opportunities rarely explored (Holovanenko & Rusinov, 2025). In addition, this type of evidence based approach allows Digital Catapult to devise programmes that make a difference to specific needs/interventions in the innovation ecosystem while ensuring that both resources are credible and businesses are supported in the most effective impact area.

Validating Program Efficacy

Utilizing AI within program evaluation processes provides Digital Catapult the opportunity to thoroughly evaluate the effectiveness of its experiments evaluating interventions. AI-based tools such as large language models (LLM) and advanced analytics tools can provide real-time insights into program data to enable continuous monitoring and rapid cycle-and-feedback loops (Onome-Irikefe & Okuleyu, 2025). These systems can identify trends, gauge of participant's engagement, and develop results against pre-determined measures. Furthermore, data can support evidence-based decision-making and to be used to improve programs iteratively. AI in program evaluation can also enhance precision and support the planning of a strategic manner by providing dynamic risk assessments and scenario modeling capabilities.

Measuring Regional Economic Impact

A primary aim of Digital Catapult is to evidence its contribution to regional economic growth. AI and digital tools are used to measure the effects of digital innovation on productivity, jobs and investment at the regional level (Tranos et al., 2020). Using geolocated data and econometric models, Digital Catapult can track the long term impacts of digital adoption and produce credible evidence for policymakers and stakeholders. Research that shows when firms adopt digital technologies early and with the support of organizations like Digital Catapult, there are considerable and persistent increases in productivity and competitiveness at the regional level (Tranos et al., 2020).

Strategic and Technical Approaches

The efficacy of Digital Catapult's AI-led governance is anchored in a strategic methodology of digital transformation, which advocates for a continual evolution and refinement of operational business strategy in respect to technology (Holovanenko & Rusinov, 2025). Evaluation of AI platforms involves technical assessment methods, such as accuracy, recall, and processing times, while strategic measures concentrate on long-run economic and social implications.

Implications for Arab Business Incubators

Digital Catapult's experience shows how AI and data analytics can be incorporated into the governance of an incubator. Similarly, Arab business incubators can utilize these strategies to understand local technology shortfalls, gauge program effectiveness, and understand the economic impact, while increasing transparency, accountability, and alignment with regional development priorities.

3.3 Global Lesson 3: ACE Startup Incubator (AISI) – Startup Selection and Resource Allocation, Objectivity and Efficiency of Governance

to facilitate the support of entrepreneurial ventures through the application of artificial intelligence (AI) and analytics to aid both the selection of ventures and the allocation of resources in an objective and efficient manner. The varied and changing nature of the startup ecosystem requires incubators to adopt a more complex and dynamic governance model. The AISI's insights into how to improve incubator governance can inform the future development of incubators who seek to maximize their governance model, and ultimately their outcomes.

Data-Driven Startup Selection

AISI applies cutting-edge AI models to assess high volumes of applicant data, including business plans, team backgrounds, market potential, and video pitches. With innovations in AI and other data sources, data-driven selection of entrepreneurial ventures can mitigate human bias and increase the transparency of the selection process. Current research is suggesting that through directly measuring video pitches, AI can determine the likely entrepreneurial success using a direct evaluation of verbal and non-verbal communication, what is referred to as a rational-based selection (Giuggioli et al., 2024). By supplementing the review and assessment of potential candidates, AISI can quickly assess the greatest chances of success to allocate limited resources to promising startup candidates.

Tailored Resource Allocation

Once startup ventures are selected, AISI uses AI and machine learning in their process for matching startups to the most relevant available resources including, but not limited to, mentorship, funding or grants opportunities and technical or other support. By accessing predictive analytics and a real-time data integration approach, AISI can customize the allocation of potential resources, depending on the real-time development of each startup and their performance (Alam & Pradhan, 2025). This ensures that the incubator does not rely on, or use valuable resources unnecessarily. Additionally, this approach ultimately supports the startups to determine and receive appropriate resources in a more timely manner. Evidence is showing that

frameworks driven by AI improve resource allocation and decision-making in incubators supporting technology-based ventures (Alam & Pradhan, 2025; Rawat et al., 2024).

Objectivity and efficiency in governance

AI in governance has improved objectivity and efficiency. It can provide a data-driven decision support system which gives a more realistic ability to monitor performance, measure risk, and project forward-looking outcomes (Biagi & Russo, 2022). This can also obtain the ability to automate ongoing processes, improve reporting, and support compliance or auditing processes leaving human resources free to deal with higher-level processes. Ultimately the use of big data can have a positive effect on diverse organizations by promoting a culture of continuous improvement; whereby, decisions are made on the basis of numerous sources of data (Rawat et al., 2024).

Impact and implications

More specifically, AISI has revealed how AI has restructured governance for incubating business startups. AISI has created a new business incubator governance model, one based on data-driven selection for ventures combined with a more efficient approach to resource allocation. Thoughtfully adopting this type of model and IT structure, business incubators in the Arab world can overcome previous challenges of subjectivity or lack of resources, creating a healthier business incubating environment resulting in more resilient and innovative entrepreneurial outcomes.

4. Enhancing Governance in Arab Incubators: AI-Driven Frameworks

Artificial Intelligence (AI) technologies are rapidly changing the governance of business incubators worldwide. AI provides Arab incubators with model frameworks that can be implemented to facilitate better strategic decision making, operational efficiency, and accountability to stakeholders. This discussion refers to the best practices and research noted in previous discussions to illustrate how AI can be introduced systematically in Arab incubators, with reference to the other questions/categorization set forth for Arab incubators.

4.1 AI for Strategic Decision-Making and Risk Mitigation

Artificial Intelligence (AI) with automation from machine learning can change the way incubators, investors and startups evaluate potential of startups and mitigate risk. Predictive models that are developed to compile and analyze huge amounts of market, team profiles or other relevant variables have provided incubators with a way to make decisions based on data, and are able to automate the initial flag process.

Predictive Models for Startup Success

With new advances, machine learning has produced accurate predictive models that predict startup success with varying predictive features. These features can include things like founder experience, team size, previous funding, social media experience, industry characteristics, to predict the probability the startup will survive and grow (Kim et al., 2023; Shi et al., 2023). Ensemble approaches to combine algorithms like Random Forest, XGBoost, and Support Vector Machines has produced over 90% accuracy on predictive outcomes of a startup's likelihood of either a success or failure (Shi et al., 2023). Feature importance analyses have identified the effects of factors like entrepreneurial team size, product differentiation, and media exposure to be more important than others (Kim et al., 2023).

Automated Risk Flagging

AI housed on platforms are able to continuously monitor the operational/financial data of startups which can flag risks of either performance decline, declines in the market, or misallocation of resources. AI systems that engage with a variety of forms of machine learning can evaluate and assess a stream of data and provide real time feedback or anomaly detection (Ahmed et al., 2025). Even further, sophisticated models, Gated Recurrent Unit with Shuffle Attention Mechanism

(SAM-GRU) have allowed for improved accuracy and timeliness to consider risk (Gujarathi et al., 2024).

Provide Internal/External Data

Modern predictive models often developed output that does not rely solely on internal metrics. Some of the predictive or decision making frameworks do include the external points surrounding the trends of an industry, the competition, or market (Kim et al., 2023). In consideration of both internal and external data frameworks, incubators are able to adapt behaviour to changing environments or identify startups that present anomalies and most likely for long-term success.

Implications for Arab Business Incubators

Finally, with ease of strategic decision making mechanisms by both adoption of AI predictive models or risk flagging systems, it might ease the decisions for design and implementation of the Arab business incubators. This would positively impact reduction of human bias, increased transparency, and improved measuring of resource allocation. With balance of internal and external data comprehensive guidelines, incubators would be taking measures to identify most promising successful ventures reduced risk in order to benefit community for entrepreneurship progress.

4.2 AI for Operational Efficiency and Resource Allocation

Artificial intelligence (AI) is swiftly changing how business incubators function by automating mundane tasks, improving resource allocation, and improving feedback. These benefits are particularly pertinent for Arab business incubators who seek to emulate global business incubator leaders such as NVIDIA Inception, Digital Catapult, and ACE Startup Incubator.

Automating Reporting

AI-embedded automation can create efficiencies regarding the reporting and analysis of businesses incubated, and translates to reducing human effort and errors. Generative AI models, in particular natural language-processing (NLP) generative models, pull the information needed from various data sources, generating findings from the information but also in relevant, and actionable reports of information. Not only does this result in improvements of timeliness of reporting, but also increases confidence in quality and consistency of information for decision making (Modak, 2025). Empirical evidence found in studies shows that AI-determined automation leads to quicker decision making, reduced operational costs, and overall higher productivity for the organization (Andayani et al., 2024). Incubators incur the same advantage of an automated reporting system by availing managers and stakeholders a timely and consistent reporting (at times near real-time), of performance, finances, and progress of the ventures which provides better, and even quicker governance.

Improving Matching Between Mentors and Startups

Matching any startup with the appropriate mentors or partners is a difficult multi-criteria process. AI can efficiently intelligently improve this process much better, faster and more accurately to any traditional matching indicated or suggested. Machine learning processes, containing approaches with explicit data (related to industries, stage of development, past performance) and implicit stated preferences can provide a best pairing recommendation (Abudaqa et al., 2024). From there AI-based learning systems can put learning from prior pairings or historical outcomes, through time to provide best pairings of higher impact (Abudaqa et al., 2024). Studies that included surveys found that startups were prepared to use the AI-based service when perceived levels of trust would be high in regards to ranking value (accuracy, support, user experience) (Abudaqa et al., 2024). In either case, a novel matching system provides greater opportunities for the startup, is turns builds better, and more robust formal working relationships enter and amongst mentors and partners in the incubated ecosystem.

Natural Language Processing in Processing Feedback

NLP (natural language processing) provides methods for analyzing qualitative feedback obtained from startups, mentors and stakeholders more consistently. NLP methods such as sentiment analyze, and subject modeling, improve processing considerable volume of nuanced text data to report on updates, insights or trends (Bauer et al., 2023). For example, an AI-type platform could assess the own reviews and ratings for all startups and provide mentors some analysis to the feedback effectiveness on support, engagement and assistance (Mankar, 2025). Moreover, beyond feedback, NLP provides incubators a means to proactively customize their service to support the continuum of a new venture. Ultimately, NLP does provide one more input to incubators for simply developing responsive process, but also smarter on -going ways to consider potential opportunities for improvement in process, services, or developing new programming.

Through automation in reporting, and feedback analysis from interviews, and optimizing pairing of startups with mentors through AI, business incubators will create greater efficiencies and allocate their resources faster and easier. Collectively this encourages efficiencies, a better way to manage data through decision-making, firms are more easily allocate their resources, and create incentives to the Next Generation Entrepreneurial Environment—it is a great learning process for Arab incubators and aspiring impacts that anchors governance and opportunities for impacts.

4.3 AI for Transparency and Stakeholder Accountability

The union of artificial intelligence (AI) technology and blockchain technology, is shaping the transparency and accountability of business incubator governance. These technologies can provide a more robust response to ensure that funders, government entities and startups trust the integrity of performance data and decision making processes for incubators including NVIDIA Inception, Digital Catapult, and ACE Startup Incubator, to name a few.

Performance ledgers enabled by Blockchain Technology

Blockchain boasts a decentralized, immutable ledger system that allows real-time recording and sharing of performance data in a secure and tamper-proof manner, to the extent that all transactions and key performance indicators are publicly logged and accountable in real-time. This enables collaborative governance and accountability while significantly reducing the likelihood of fraud, human errors and misreporting in the audited accounts (Adewale et al., 2022; Han et al., 2023). Coupled with the smart contract component, which automates compliance checks and reporting, real-time auditing will successively incentivise collaborative accountability across stakeholder groups (Adewale et al., 2022; Omisola et al., 2023). Blockchain technology may provide a complete transaction record of funding disbursements, milestone achievements, and resource allocations in business incubators, which may be publicly available to stakeholders and the broader ecosystem in real time (Han et al., 2023).

Data-Verified AI and Automated Auditing

The data stored in block-chain transactions may be analysed and synthesised by AI algorithms to detect anomalies, verify transactions and provide additional learning and insights for stakeholders (Renuka et al., 2024; Martinez, 2024). The use of machine learning to verify performance metrics will continuously improve and expand at the incubator level as performance indicators are automated so that the AI only leverages verified data for reporting or decision making (Renuka et al., 2024). The combined component of AI algorithms and blockchain systems will accelerate the audit process and provide a robust assessment for incubators measured by a matrix which is credible, relevant and accountability driven (Martinez et al., 2024).

Aiding in Stakeholder Accountability

AI and blockchain technology promotes and assists already entwined sub-systems to thrive, driving behaviours and encouraging multi-stakeholder participation. As a multi-stakeholder system funders, governments and startups have access to real-time data, that is built on consensus

regardless of their external and internal profession, thus eliminating asymmetry in information and purposed data (Liu et al., 2024). Governments and public funders equally subscribe to this transparency that may require quantified evidence to support claims, impact to their funding decisions, endorsement of their incubator and may intuitively see evidence of decentralised model-based and socially impact-based performance. AI may also use analytics to consider predictive modelling to generate insights or even early warning signs (Renuka et al., 2024; Martinez et al., 2024).

Challenges in Implementation

Despite the potential benefits there are still considerable complexities to override, largely integration between systems, scalability and regulatory systems (Adewale et al., 2022). Incubators needing to build these capabilities will invest in techno-logical infrastructure and cross-sector collaboration to realise the multi-faceted benefits AI-blockchain offers for transparency and accountability.

5. Challenges and Ethical Considerations

The use of artificial intelligence (AI) in incubators for businesses has the potential to transform industries but is also riddled with challenges and ethical considerations, especially in the Arab region. This section will build on some global experience from the NVIDIA Inception, Digital Catapult, and ACE Startup Incubator cases to explore some of the key obstacles to AI adoption as well as the ethical considerations that need to frame AI use in Arab business incubators.

5.1 Key Barriers to Adoption in the Arab Region

AI adoption in incubators for businesses offers exciting prospects for innovation and competitiveness across the Arab region. That said, several ingrained barriers to AI adoption especially around data availability/quality, availability of technical talent, and cost of implementation remain critical obstacles to effective or widespread adoption of this transformative technology.

Data Availability and Quality

The availability and quality of pertinent data is an important first barrier for AI adoption into incubators for businesses in the Arab region. AI systems require functioning with large, diverse, and high quality data and many incubators and under-served small/medium enterprises (SME's), lack the institutional infrastructure in place for adequate data collection, storage, and sharing (Oldemeyer et al., 2024; Bedda et al., 2025). Data is often siloed, records are often disjointed, and established measures and standards are often absent thus hindering reliable AI model development. In Egypt, for example, startups faced infrastructural barriers and lack of access to data, which inhibited the capacity of incubators to deploy a myriad of AI solutions (Bedda et al., 2025). Additionally, much of the documented data may be unstructured or incomplete data that reduce the accuracy and usability of the AI informed insights (Sánchez et al., 2025).

Lack of Technical Talent

Another key barrier is the lack of technical talent in incubator teams. Implementing AI requires some level of sophistication but the region in the Arab world is in need of data scientists, machine learning specialists, and software engineers, who are difficult to find (Bedda et al., 2025). Moreover, most incubators are working off of lean budgets and may not be in a position to attract or retain experts, especially when competing with technology companies and international organizations. The absence of technical talent not only contributes to the sluggish uptake of AI, but it may complicate an organization's ability to develop or maintain acceptable quality systems which do present a full value of the AI (Oldemeyer et al., 2024; Bedda et al., 2025). Recurring competitors of non-expert talent, along with access to robust training programs are also mentioned

in the literature as framed to the systemic challenges to entrepreneurship ecosystem in the Arab region (Bedda et al., 2025).

Cost of Implementation

A further major challenge is going to be a cost of implementation. The development, deployment, and ongoing maintenance of AI systems will always at least include the upfront costs of hardware, software and human resources (Oldemeyer et al., 2024). For many incubators particularly in the developing economic states these costs may prove prohibitive at best. And, in addition to that set of costs, incubators face continued operational expenses to manage ongoing updates to connected systems, or to manage security systems from cyber-attacks in addition to keeping up with ever changing regulations. Some commentators believe that cost may reduce as a barrier for mid-sized companies of certain Gulf states due to packages from the governments (Badghish & Soomro, 2024), but in close, cost perhaps remains the single most significant limitation for adoption for all Startup's and incubators in almost all countries in the Arab region (Sánchez et al., 2025).

Organizational and Cultural Barriers

Beyond the formal limits of technical barriers or financing barriers, organizational culture and resistance to change will also present barriers to the adoption of AI. Incubator staff and stakeholders may feel a discomfort with the technology and could fear replacement of their human role of less control over their quality of decision making (Oldemeyer et al., 2024). Also, uncertainty of reliability and transparency of the new systems and AI models may become a sub-component of poorly established trust of the technology. Some organizational barriers walls could be removed by establishing and maintaining clearly defined strategies, and initiating support policies, and maintaining a clear routed over view of AI in order to support current and future evidence of its benefits (Bedda et al., 2025).

In order for the AI adoption of new business incubators in the Arab world to take hold likely require some open discussion and call to action around data quality, the absence of technical and skilled talent, and the cost of implementation. Incubator leaders and policymakers should learn to prioritize investment into data quality, trained capacity, and consider allowing policy regulated structure's to nest the conditions of positively disruptive change agents the potential of AI could become.

5.2 Ethical Governance of AI in Incubation

The application of artificial intelligence (AI) to govern business incubators demand an established ethical framework to address major concerns; mainly of concern are biases in selection algorithms, data privacy, and accountability; all are important to ensure, wherever possible, fair, transparent, and responsible use of AI in Arab business incubators.

Bias in Selection Algorithms (Fairness)

Algorithmic bias occurs when AI systems trained on historical, and/or non-representative data tend to replicate or enhance social inequality. In business incubators, social inequality may firmly establish bias into the selection process when certain groups and/or types of business ventures are disadvantageously selected (Bahangulu & Owusu-Berko, 2025). Biased selection may arise at the selection stage as trained AI models may favour founders or sectors from previous cohorts of incubators (not adequately representing diversity), conflicting with incubator objectives of inclusion and diversity (Chen, 2023).

The fight against biased selection approach is multi-dimensional; first, the proposal for fairness-aware machine learning models, sourcing data from multiple cohorts of training data (non-biased), then following the needed direction on an algorithmic audit process to document level of biases (Bahangulu & Owusu-Berko, 2025); furthermore, including a variety of community stakeholders in training datasets and model builds can also assist in highlighting hidden biases for

reporting mechanisms to inform change (Chen, 2023). Also suggested is an external oversight body pending audit and certification (Chen, 2023).

Data Privacy

AI-based incubator governance often involves processing personal and business data that includes sensitive information, which then raises serious concerns about privacy (Reddy et al., 2024). Startups and stakeholders blissfully relinquish their data in exchange for amazing innovation experience; however, risk of breach can escalate quickly—data security, unauthorized access to, or misuse those data, ultimately leads to mistrust in the incubation process (Reddy et al., 2024). While organizations need to comply with data protection regulations (namely, the General Data Protection Regulation (GDPR), reputable organizations also have some technical resolution.

On the other side to assure privacy, organizations could adopt appropriate, privacy-preserving measures (including anonymizing, encrypted, and federated learning) to protect individuals, their organizations, and their data in a method which allows AI to analyze data without compromising prior mentioned peoples' privacy needs to analysis organization (Reddy et al., 2024). Additional guidelines would also need to lay similar user friendly opportunities to group privacy, trust and transparent data governance procedures that all describe group user options and provide ongoing privacy specific impact assessments that contribute to a confident organization (both at the individual and stakeholder levels) of meeting legal obligations (Bahangulu Owusu-Berko, 2025)

Accountability

Accountability in AI issues refers, simply, to the ability to, trace, explain, and justify anecdotal or algorithmic decisions made. Most AI systems are not built for full understanding, which references Part 1; AI systems are often black boxes—it is the common understanding—there aren't hard, long justified reasons related to action initiated by previous actions done. Without a valid reason for algorithmic decisions, transferrable bargaining requires accountability or justify—assuming the stakes are high when it comes to denying or excluding businesses, most notably tech businesses, or even thought of __vs__.

Accountability is more than providing layer or layers of assessability; organizations will need to flow explainable AI (XAI) that functionally (and typically) mean providing validation types of explanations for decisions (Akinrinola et al., 2024). When combined with ethical AI governance committees and regular ethical audits and lines of responsibility, can provide validity and multiple hands in the need for accountability (Akinrinola et al., 2024). Both order position the organization to qualify both technically and managerially for a level of ethical responsibility.

We can say that Ethical Governance of AI in business incubators had a number of key feature components, and should consider a multifaceted approach to combat bias, safeguard privacy and ensure accountability; further stating that implementing fairness aware, robust, privacy enabling and transparent governance is not only appropriate but warranted if Arab business incubators aim to skew an awareness of ethical standard and accountability from purchasing still in business incubators would value them and therefore exist with, AI.

6. Conclusion

Artificial Intelligence (AI) is undergoing a rapid evolution in its transformative capabilities of business incubator governance with novel opportunities for efficiency, transparency, and strategic agility. From the experiences of leading global incubators such as NVIDIA Inception, Digital Catapult, and ACE Startup Incubator this article has presented the opportunities offered by AI in supporting decision making, improving efficiencies, and stimulating innovation to incubators. In order to reap those opportunities in terms of benefits and value in the Arab region, unique

challenges must be addressed, and governance frameworks that are appropriate to the context have to be developed.

AI enabled governance allows incubators to access and utilize large quantities of data, automate repetitive and routine tasks, and configure real-time recommendations around data to provide organizations with enhanced insights for strategic decision making in order to improve competitiveness and operational effectiveness. Despite the advantages of AI, the challenges to implementing AI are not negligible. In addition to the challenges faced in other regional contexts, the Arab context poses challenges around data specifications, shortage of talent, and cost of implementation with respect to AI technologies. In addition, ethical considerations such as algorithmic bias, principles of data privacy, and accountability must be addressed in order to ensure that AI is deployed responsibly and inclusively. The importance of having a strong governance framework, which includes engagement of all stakeholders, and continual updates of governance structures to account for shifts in technology and regulation is captured in the experiences of the leading global incubators.

For incubators wishing to remain relevant and effective in a business environment of increasingly rapid change, governance approaches that create positive improvement through AI will be beneficial. AI enhances evidence based decision making, improves transparency, and improves how incubators can align their strategies with a larger notion of economic and social purpose. In the Arab region, the entrepreneurship opportunities created by AI, addresses the calls for economic diversification and sophisticated sustainable forms for economies in the region, and positions the region more broadly as a global leader in responsible innovation.

Policy Directions and Practical Recommendations

1. Invest in data systems in Arab business incubators: there needs to be some standardized high quality systems developed for data collection and management that enables the effective use of AI.
2. Develop talent in AI: "genuine partnerships" (e.g., business incubators, universities, and the private sector) need to be developed to localize expertise on AI topics as well as data sciences and digital governance.
3. Reinforce ethical principles for AI: existing, clear guidelines for fairness, transparency and accountability would be useful for incubators with the potential and/or current application of AI.
4. Improve stakeholder input: there should be an increase in participation from entrepreneurs, private investors, and civil society members in the design and oversight of possible AI governance frameworks applied to incubators.
5. Support/ align incubators' regulation: regulations that facilitate the use of AI need to align locally, cognizance of local culture and ethics with international standards.
6. Allow access to funding: to do so supportive funding and restrictions should occur at the incubator level when proposing potentially restrictive innovative AI approaches in low resource settings.
7. Support a model for lifelong learning: Consumers of AI technology developments in the business incubation should be promoted to learn and conform continuously AI governance dilemmas.
8. Monitoring and evaluating impact: develop an environment of regularly reviewing the implications of AI on incubators with respect to its impact, inclusiveness and ethical accountability.

By achieving the policies and recommendations outlined above, Arab business incubators can achieve the transformative benefits of AI and /or AI generated data positioned in responsible, inclusive, and sustainable governance achievements.

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