*Knowledge and Decision Systems with Applications*

www.kadsa.org
eISSN: 3079-6318

# Artificial Intelligence and Strategic Decision-Making for Sustainable Governance

Mohamed Ibrahim Hassan Farag [1,2,*]

[1] Department of Business Administration, Military College of Management Sciences, Helwan University, Helwan, Egypt.
[2] Department of Political Science, Faculty of Economics and Political Science, Cairo University, Giza, Egypt.

**ARTICLE INFO**

***Article history:***
Received 20 February 2026
Received in revised form 29 March 2026
Accepted 2 April 2026
Available online 7 April 2026

***Keywords:***
Artificial Intelligence; Strategic Decision-Making; Sustainable Governance; Ethical Governance.

**ABSTRACT**

The increasing use of artificial intelligence (AI) in global governance systems could influence how sustainable strategies are developed by governments and other organizations; however, issues related to accountability, ethical alignment, and inclusivity remain challenges for AI analytical precision and prediction capabilities. This study addresses this question about how AI can be systematically integrated into strategic decision-making processes that enhance transparency, adaptability, and long-term sustainability through the development of a theoretical framework connecting artificial intelligence-driven analysis with structures in ethics and institutions to support sustainable governance via data-based evidence from multidisciplinary literature on AI management, sustainability studies, and governance theory using conceptual analytical methods for synthesizing ideas. The main findings are that good AI governance needs clear accountability mechanisms, open data ecosystem transparency, and the inclusion of sustainability metrics within decision algorithms; however, when governed responsibly, artificial intelligence can shift decisions to strategy instead of administration so institutions can maintain innovation while achieving balance between equity and long-term societal value.

## 1. Introduction

AI is likely to be one of the most powerful change agents that governments, corporations, and institutions now have to contend with. Governments are using AI-based analytics and decision-support tools to enable a more agile, transparent, and long-term sustainable delivery of services that is being driven by a shift from strategic decision-making processes that were more intuitive and historic to algorithmic processes that are more data-driven, faster, and at a scale that is pushing the frontiers of governance leadership, accountability, and sustainability.

Governments are using AI-based analytics and decision-support tools to enable a more agile, transparent, and long-term sustainable delivery of services that is being driven by a shift from strategic decision-making processes that were more intuitive and historic to algorithmic processes that are more data-driven, faster, and at a scale that is pushing the frontiers of governance leadership, accountability, and sustainability.

* *Corresponding author.*
*E-mail address: mohamed_ibrahim2020@feps.edu.eg*

https://doi.org/10.59543/aspp4925

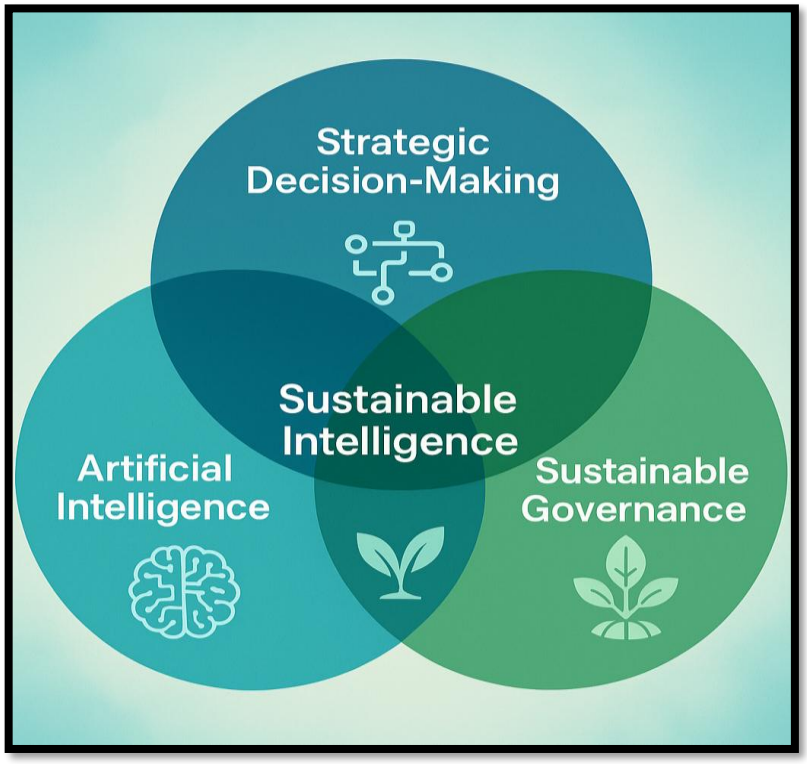


**Fig. 1.** Intersection of Artificial Intelligence, Strategic Decision-Making, and Sustainable Governance

This results in the question of what a more comprehensive understanding of how artificial intelligence affects corporate strategic decision-making as an element of sustainability-governance looks like, which is an area of inquiry to be explored, and this research specifically addresses the intersection of these three areas of inquiry: AI (artificial intelligence), strategic decision-making and sustainability in order to construct a conceptual framework for responsive and future-ready governance.

### *1.1 Literature Review*

In terms of technology development, while CDM was once seen as an advanced niche area that only a few organizations could apply with any efficacy in government or business contexts, it has become increasingly considered more of a change-enabling strategic imperative for how organizations go about making decisions and governing their actions. Several authors have suggested that AI systems improve the quality of strategic choices because they combine data analytics, machine learning, and predictive modeling to facilitate anticipation [1], dynamic insights with real-time processing capabilities to sharpen strategic foresight in volatile environments [2] and as an integral component of SDM to enhance the analytical capacity of both the system itself and how well it manages uncertainty [3].

Indeed, strategic decision-making was characterized as leader behavior and resource allocation under uncertainty and complexity [4]. While there are numerous connections to intuition, reasoning, and experiences associated with classical SDM models, recent research on AI presents a potential solution to the underlying logic at the foundational level to algorithmic logic and predictive assessment within the decision-making cycle [5] that allows politicians and corporate leaders to identify effective and enduring data-driven strategies [6]. These trends have led to the emergence of a new paradigm of decision-making, referred to as sustainable governance, which aims to balance

economic efficiency with social equity and environmental stewardship, and ensures inter-generational fairness, responsibility, and institutional legitimacy [7]. In particular, AI is used to track live sustainability indicators, inform data-driven allocation of resources, and enhance the transparency of public management [8], including the implementation of machine learning models to measure environmental performance, social impact or SDGs and ESG compliance [9], which can help to promote sustainable and responsible governance. Nevertheless, there are also ethical considerations of AI governance [10, 11], including the risk that an AI system will amplify existing biases and the lack of accountability or transparency in decision-making. Hence, robust oversight processes and human oversight must be employed alongside smart technologies to enable sustainable governance [12].

In conclusion, while there is a wealth of literature on AI and strategic management as well as SDM and sustainability and governance frameworks, comparatively little has been written in a way that interweaves the three dimensions into a cohesive theoretical model. The future of governance will depend on the feasibility of embedding AI into the strategic decision-making process in a manner that upholds ethical values and advocates for sustainability. This is the space where the current project intervenes, and the future of governance is proposed to conceptualize a governance model where AI can be an innovative but responsible force of strategic sustainability.

### *1.2 Research Problem and Questions*

The article is titled as "Embedding AI in strategic decision-making and its implications". The main point is that as artificial intelligence becomes more integrated into the organization and government's architecture to inform and aid strategic choices, it can produce chances and issues that are both novel and distinct in magnitude and character. As individuals in positions of authority increasingly employ algorithmic models and analytics to improve resource use, foresee potential risks, and plan for the future, the impact of these technologies on the principles and practices of sustainable governance is urgent and complicated. The main difficulty is to ensure that the deployment of technology in decision-making not only improves effectiveness and results but also preserves openness, responsibility, and long-term viability.

Although the issue of AI in governance has attracted much attention from the research and policy community in recent years, there is still no consensus so far on how to operationalize the use of AI in governance, i.e. how to practically include AI in strategic decision-making in a way that is also compatible with sustainability principles, with most approaches either focusing on the technical optimization of the AI tool itself or the ethical underpinnings of its use. The problem is not only structural but also normative: AI is not just another technology but a technology that redefines the very nature of decision-making, responsibility, and legitimacy in governance. This means that the main fragmentation exists not in AI governance as an end in itself but in AI integration into the decision-making of organizations and public policies, which, in turn, weakens the capacity of organizations and governments to operationalize AI as a responsible strategic instrument to achieve sustainability goals (the UN Sustainable Development Goals or SDGs and the ESG metrics in particular) [13].

From this central problem, several research questions emerge to guide the present study:

I. How does artificial intelligence transform the structure and process of strategic decision-making in governance systems?
II. In what ways can AI-based tools be integrated to enhance sustainability performance and accountability?

III. What governance principles and institutional safeguards are necessary to ensure ethical and transparent use of AI in high-level strategic decisions?
IV. How can decision-makers balance the benefits of algorithmic efficiency with the need for human judgment, legitimacy, and inclusiveness?
V. To what extent can AI serve as a sustainable governance mechanism rather than a purely technical or economic optimization instrument?

These questions collectively aim to explore how AI can evolve from a technological innovation into a cornerstone of sustainable governance; an enabler of decisions that are not only faster and smarter but also fairer, more transparent, and future-oriented.

### *1.3 Research Objectives*

In this way, this paper can be outlined as follows. On the one hand, we will develop this theoretical architecture of AI being embedded into strategic decision-making processes systematically, and it could, on the one hand, improve the quality, transparency, and long-term account-ability of strategic decisions, and it will be on this basis of the theory-driven exploration of core concepts. On the other hand, the article can be practice-oriented research and analysis of using AI to improve decision-making, and the exploration will be enriched on this basis by empirical case studies.

On the one hand, the paper will propose a theoretical framework between AI, strategic decision-making and sustainable governance, and in this way, it will discuss how the technical endowment, institutional setting, and governance values jointly interact with the policy result and strategic effectiveness and how AI could be operated in the strategic decision-making to make the classical decision cycle shifts from a human-intensive-orientation to an algorithm-augmented-based one.

On the other hand, and as a result, the paper could also reflect on the extent to which AI can be the precision, flexibility, and foreseeing of strategic decisions as it could improve some functions of predictive analytics, scenario simulation, and pattern recognition of AI, which will enable strategic decision-makers to both predict environmental, economic, and social risks in advance and identify long-term potential opportunities.

The third goal is to identify limitations and ethical challenges of the application of AI in government (algorithmic bias, data protection, lack of transparency, and the threat to undermine accountability), which would need to be overcome in order for us to use it legitimately and fairly.

Finally, the study will outline some general principles and strategic suggestions for the responsible implementation of AI in governance contexts, including human oversight, institutional safeguards, and ongoing assessment, so that AI is not only an instrument of operational efficiency but also an enabler of good governance, with the goal of making theoretical and practical contributions to the emerging scholarship on responsible digital transformation in decision-making systems.

### *1.4 Research Importance*

This article is relevant because the intersection of the AI revolution and strategic management and sustainable governance is a new and growing area that will need to be resolved sooner rather than later to understand the long-term evolution of AI-based systems and their impact on institutional accountability and normative sustainability, and this study is both academic, practical, and socially important. From the knowledge development perspective, this research integrates three fields that have grown in isolation in the past: AI and innovation, strategic decision theory, and sustainable governance. Each of these areas has been the subject of abundant literature, but to our

knowledge, no study has developed a systematic framework to describe how AI can help generate superior decisions that are ethically legitimate and supportive of sustainability. This study thus contributes to the theory of AI governance and, more broadly, to the study of digital transformation.

This study presents a blueprint for the integration of intelligent systems in governance architectures for responsible, ethical and transparent governance. It has immediate and directly actionable implications for institutional design, as the structures of governance consider ways to deploy AI for greater planning, transparency and long-term resilience in a way that is accountable and engages with the public. From an interpersonal perspective, the results of this study demonstrate that design decisions made about AI systems may influence not only their sustainability but also their effect on environmental (planet), social (people), or economic (profit) dimensions, as defined by the UN SDGs, and on just, equitable, and public trust-building governance models with the objective of creating a governance system that balances technological development and human values to achieve sustainable outcomes.

### *1.5 Research Methodology*

A theoretical framework that explains the linkages between AI, strategic decision-making, and sustainable governance will be developed using a conceptual and analytical approach, rather than an empirical testing approach, to synthesize and analyze the existing literature, drawing on both academic and policy-oriented sources, to identify patterns, relationships, and principles that can help explain how AI can act as a strategic enabler for sustainable and accountable governance.

The paper mainly relies on secondary information published in peer-reviewed academic journals, books, institutional reports, and international policy documents, which were identified with an attempt to balance the technological, managerial, and ethical approaches across the three main thematic areas of the paper: artificial intelligence (AI) and digital transformation (DT), strategic decision-making and management theory, and sustainability and governance frameworks. The literature is then subject to thematic synthesis to identify recurring concepts (e.g. transparency, accountability, predictive intelligence, and human oversight) that can inform the development of the proposed conceptual model.

This methodological orientation, which prioritizes theoretical integration rather than empirical measurement, enables the synthesis of insights from different disciplines, such as information systems, strategic management, and public administration, to describe how AI may reshape the logic of decision-making, support long-term planning, and interface with institutional norms of responsibility and sustainability, resulting in a conceptual framework that can guide future empirical research and policy development in AI-enabled sustainable governance.

### *1.6 Scope and Limitations*

This study aims to bridge the conceptual/theoretical gaps and make possible links between the themes of AI, decision-making, and sustainability in governance and provide an avenue to integrate the AI tools in the context of governance to improve the quality of decisions, provide better and higher levels of accountability, and achieve sustainability in governance, with an emphasis on the strategic/institutional level of AI deployment (i.e. at the point where strategy and leadership, ethics and sustainability/governance meet) rather than on the functional or tactical level of deployment and application to ensure the relevance of the resulting guidelines and framework to decision-makers and policy-makers at the organization and governance level and academics who are focused on strategic decision frameworks and paradigms.

Such constraints include that as an exploratory work it does not engage in empirical testing or analysis by way of quantitative data nor case-based validation but only serves as a conceptual study providing theoretical basis for future empirical investigations; being secondary data study; and subject to quick pace at which AI technologies evolve, governance models are developed. Despite the limitations above, this study provides a fruitful point of discussion for the purpose of conceptualizing how data-driven processes can be combined with human values, organizational ethics and strategic sustainability. The delimitations, together with the research parameters, help to articulate that the value-adding aspect of this work is Theorizing and model building; the latter of which is a prerequisite for the development of EBM for responsible and sustainable AI-based decision making.

## 2. Artificial Intelligence as a Strategic Engine

Despite the limitations above, this study provides a fruitful point of discussion for the purpose of conceptualizing how data-driven processes can be combined with human values, organizational ethics and strategic sustainability. The delimitations, together with the research parameters, help to articulate that the value-adding aspect of this work is Theorizing and model building; the latter of which is a prerequisite for the development of EBM for responsible and sustainable AI-based decision making.

### *2.1 Data-Driven Strategic Intelligence*

The data of contemporary strategy is being converted to strategic intelligence: with machine learning, deep learning, and natural language processing (NLP) technologies, AI is being developed to ingest the large, unstructured data sources that characterize modern strategy, whether financial and environmental indicators, social media, or supply-chain metrics, to detect patterns and anomalies that can inform evidence-based strategy and decision-making.

The distinction between intuition and insight transforms the focus of leadership from what to why it is and what will likely be [14]. For example, AI-enhanced analytics may be used in commercial applications to track markets, predict consumer behavior, and detect operational inefficiencies; in public governance, AI could monitor environmental conditions, plan infrastructure development, and develop policy based on real-time social and economic data, so decision-makers could analyze policy impacts in real time and dynamically adjust to stay on target, thereby offering an evidence-based, adaptive, and accountable framework for strategic decision-making [15].

**Table 1**
Comparative Overview of AI Functions Across Governance Domains

| Governance Domain | AI Function | Purpose | Expected Strategic Outcome |
|---|---|---|---|
| **Public Sector** | Predictive analytics for policy planning | Forecasts trends in public needs, infrastructure demand, and environmental impact | Evidence-based policymaking and improved service delivery |
| **Corporate Governance** | Intelligent performance monitoring | Tracks operational efficiency and sustainability KPIs in real time | Enhanced accountability and transparent decision-making |
| **Hybrid / PPP Models** | Resource optimization algorithms | Allocates shared resources between public and private entities | Cost efficiency and reduced duplication of services |

| | | | |
|---|---|---|---|
| **Smart Urban Governance** | IoT-enabled data integration | Collects urban data to inform smart city management and climate actions | Sustainable city planning and adaptive urban policies |
| **Global Governance Networks** | AI-driven scenario simulation | Models cross-border policy impacts and sustainability trade-offs | Coordinated responses to global risks and crises |

*2.2 Predictive Analytics and Scenario Foresight*

The most promising application of AI in strategy may be in predictive analytics, which use statistical algorithms and neural networks to model historical and real-time data and predict future events. With high uncertainty (economic volatility, climate change, public health), AI helps institutions model multiple scenarios, predict outcomes, and plan contingencies; predictive models allow business leaders to anticipate supply-chain disruptions, market demand, and investment risk and governments to assess the long-term impact of environmental policy, urbanization, and energy use. The added layer of strategic preparedness that AI offers, with the conversion of uncertainty to a probabilistic prediction, can help institutions navigate the trade-offs between long-term sustainability and innovation [16].

*2.3 Human–AI Collaboration in Strategic Decision-Making*

Note that while AI enhances analytical precision, it cannot substitute for human judgment, ethical considerations, and contextual nuance; therefore, human leaders working with AI (augmented intelligence, where the human is interpreting the results in a social, ethical, and political context) can be the best way of achieving AI-enabled strategic decision-making, where the computational strength of AI is maximized and human fallibility is minimized.

In reality, this partnership frequently manifests itself as decision-support dashboards, intelligent advisors, and governance systems that allow humans to review, refine, and validate AI recommendations by subject matter experts, thus making AI-assisted decisions more credible, holding humans accountable for the final decisions and ensuring that they align with ethical standards and values, and changing the role of the decision-maker from that of an expert to one of a critical assessor of AI-generated recommendations and synthesizer of AI-generated recommendations with their experience, institutional knowledge, and ethical judgment [17].

*2.4 Strategic Agility and Organisational Learning*

Another area where AI can contribute directly to strategic agility is in its ability to provide real-time feedback and create an environment in which learning and adjustments can be made in real time. The self-improving decision environment that machine-learning loops create in improving the accuracy of AI systems over time can, in principle, allow an organization to find early signals of change, try new strategies, and make decisions without waiting for perfect information, enabling learn-by-doing governance and policy experimentation. For example, AI-based monitoring and evaluation systems could be used to adjust resource allocation to more effective urban sustainability programs in real time as their effectiveness is demonstrated, or firms could use adaptive AI systems that continually update their risk assessments, pricing models, and logistics plans in real time based on changing market conditions. In the long term, as organizations and institutions become better at making decisions, they may themselves become, to some extent, systems that can strategically adapt and evolve, another characteristic of sustainable governance [18].

### *2.5 Ethical and Governance Considerations*

New AI capabilities can increase strategic capacity and present fundamental ethical and governance challenges that need to be recognized for their risks as well (loss of transparency, concealing bias, erosion of accountability, and the production of decisions that are efficient but not socially equitable or environmentally just). Therefore, a suitable framework for governing use of AI is a strategic imperative rather than a regulatory nicety and key features of good governance should ensure that ethics are baked into processes for explainability and fairness as well as human oversight in decision-making, with recommendations from AI that can be interpreted or contested by humans such that humans remain accountable [19].

## 3. Integrating Artificial Intelligence into Sustainable Governance

AI can also be integrated into sustainability as a way to improve decision-making through precision to aid in more efficient and effective policymaking that incorporates data, ethics, and strategic long-term thinking based on impact, risk, and optimization. This section considers how AI improves the foundations of governance, the practices of governance, the design of policy, the transparency functions of governance, and institutional preparedness.

### *3.1 Principles of Sustainable Governance*

In addition, the practice of the principles of sustainable governance (transparency, accountability, participation, equity, long-term stewardship) can be applied to AI, so that the decisions made today do not limit the ability of future generations to meet their needs, and AI-supported data platforms open up new possibilities for citizens with access to sustainability information and feedback loops [20] to make such governance anticipatory, predictive, and adaptive, all of which provide additional support for the development of an evidence-based model of ethical governance.

**Table 2**
Core Principles of Sustainable Governance Enhanced by Artificial Intelligence

| Governance Principle | Traditional Mechanism | AI-Enabled Mechanism | Added Value |
|---|---|---|---|
| **Transparency** | Public disclosure and periodic reports | Real-time data dashboards, open-access analytics | Continuous public insight into institutional performance |
| **Accountability** | Manual audits and bureaucratic supervision | Automated tracking, predictive auditing, and digital compliance tools | Immediate traceability of actions and reduced corruption risk |
| **Participation** | Community meetings and representative surveys | AI-driven civic engagement platforms and sentiment analysis | Broader, faster inclusion of citizen feedback in policy cycles |
| **Equity** | Equal-opportunity policies and demographic quotas | Bias-detection algorithms ensuring fairness in decisions | More equitable outcomes across gender, class, and region |
| **Stewardship** | Long-term policy reviews and resource assessments | | |

### *3.2 AI Applications for Sustainability Monitoring*

AI's analytical power can help institutions to monitor sustainability performance more effectively across all the dimensions. In the environmental dimension, machine learning models are used to identify and monitor pollution, optimize energy use, and predict natural disasters. All of these allow governments and companies to take pre-emptive action before damage is done. For example, AI-based satellite systems monitor illegal deforestation, oil spill detection, climate-related migration and other environmental changes. In the social dimension, tools based on AI can evaluate the impact of welfare programs and find disparities in the allocation of services. In the economic dimension, AI can be used to manage circular economy programs and strategies by learning patterns of waste and improving resource efficiency. Linking all of these domains with integrated data systems, AI can provide a system to monitor the progress in achieving the SDGs in real-time, allowing policymakers to transition from periodic reporting to real-time management of sustainability issues [21].

### *3.3 Data-Driven Policy Design and Decision Support*

Policy design has traditionally been based on human expertise and backward-looking evidence, but AI can enable forward-looking evidence-based policymaking by allowing different policy options to be tested using historical records and real-time data, for example simulating the impacts of different levels of investment or technology adoption on emissions, employment and growth of GDP to make trade-offs between short-term and long-term sustainability outcomes. AI can also help estimate the secondary impacts of policy decisions (e.g. social displacement or environmental degradation) in advance, to help policymakers better prioritize interventions and more clearly explain public spending [22].

### *3.4 Enhancing Transparency and Public Accountability*

Sustainable governance is further reinforced by transparency, supported by AI in forms of automated data analysis, public dashboards for near real-time tracking of institutional performance by citizens, investors, and oversight bodies, as well as AI-based platforms for public disclosure of information about greenhouse gas emissions, urban development projects, or social investment outcomes. AI can also be used to strengthen accountability, through fraud detection and compliance auditing to identify anomalies in financial transactions, procurement processes, and regulatory reporting, preventing corruption and promoting integrity in public administration. XAI models also ensure that automated decisions remain interpretable so that stakeholders can question and verify outcomes, rendering governance both more transparent and more accountable - and therefore more publicly trusted and democratically legitimate [23].

### *3.5 Institutional Readiness and Ethical Integration*

Effective adoption of AI for sustainable governance should be ethical and prepared for institutional readiness to adoption, which means having the right cultural, capability, and infrastructure readiness. More specifically, institutional preparedness for adoption has three main but interrelated aspects: infrastructure readiness is the availability of secure and reliable digital infrastructure, including the data collected, stored, and processed; capability readiness is training and education of decision-makers, analysts, and policymakers to understand available AI tools, outputs and outputs, and how to act on them in an ethical and timely manner; cultural readiness is organizational values that prioritize open, inclusive, and accountable decision-making enabled by AI. At the same time, the use of AI in governance needs to be guided by ethical frameworks and international guidelines such as the European Union AI Act and UNESCO AI ethics recommendations

for its responsible implementation. Finally, technological progress must be accompanied by moral progress and be in line with societal values, and AI should be used to make a better, more just system of governance [24].

## 4. Challenges, Risks, and Ethical Dimensions of Artificial Intelligence in Governance

The efficiency, foresight, and scalability of embedded AI in governance systems imply a new tradeoff (sometimes making or even influencing decisions) between innovation and accountability that offers efficiency, foresight, and scalability, but also risks algorithmic bias, lack of human oversight, data privacy breaches, the potential for increasing inequality and digital exclusion, and undefined ethical frameworks regarding the governance of AI in five general areas: Algorithmic Bias; Accountability Gaps; Data Privacy; Increasing or Deepening Inequality (or Digital Exclusion); Ethical Guidelines on Governing AI.

### *4.1 Algorithmic Bias and Fairness*

If the data used to train AI systems contain societal or institutional biases, the output will reproduce those disparities. Moreover, biased algorithms can reinforce existing inequalities and influence policy decisions about welfare, hiring, lending, and access to public services in ways that favor historically advantaged groups and disadvantage minorities or vulnerable populations. This is contrary to the principles of justice and equality in sustainable governance. This requires that institutions operationalize algorithmic fairness at each stage of the AI workflow, from data collection through model validation, to ensure that datasets are balanced and representative, that bias audits are conducted regularly, that interdisciplinary experts examine potential discriminatory impacts and that transparency in reporting and open-source auditing of algorithms is established so that algorithmic decisions can be held accountable to the public. In other words, fairness in AI governance will require not only technical precision in operationalizing fairness at each stage of the AI workflow but also a commitment to the values of equality [25].

### *4.2 Accountability and the Governance Gap*

Rapid AI take-up in governance has ushered in an accountability conundrum: If a decision (action) harms, who should be held to account? Algorithmic governance cannot be attributed to a single institution and human decision-makers in the traditional sense, as the conclusion of an AI-supported system is an interactional outcome of all system components. These include data scientists, developers, data processors, policymakers, institutional participants, and the technology they work with; the "governance gap" of AI obscures clear attribution of accountability, blurring public trust, transparency, and clarity of processes in cases of appeal or scrutiny.

Hence, attribution of accountability for AI requires complex oversight structures. Such safeguards could include 'development and design documentation, a clear human decider, an audit trail of all possible automated options and suggested moves'. The introduction of Explainable AI (XAI) frameworks may aid in transparency of the algorithm itself. In any case, the legitimacy of, and due process in, AI systems should always be 'dependent on human authority, and responsibility for decisions or actions taken with machine assistance, should always lie with a human being' [26].

### *4.3 Data Privacy and Cybersecurity Risks*

While such data enables extremely precise predictive models for deployment, these are also at risk of privacy and security violations with attendant ethical and legal implications (for example, AI processing of data relating to the health, education, work or financial conditions of citizens) which

can also translate to a loss of public trust as well as human rights abuses that compromise stable governance.

Addressing these risks will necessitate strong data governance mechanisms grounded in principles of transparency, consent and proportionality, in which governments have well-defined policies on the collection, retention, sharing, and deletion of personal data and citizens have agency over their personal data, in which strong encryption standards and cybersecurity protocols, and independent oversight mechanisms are in place to ensure data integrity, and in which the ethical stewardship of data is a social compact between citizens and the state, in which the right to privacy and dignity is never traded for the sake of efficiency [27].

### *4.4 Socioeconomic Inequality and the Digital Divide*

While AI is a global phenomenon, it is not distributed equally, and the infrastructure, talent, and computational resources of the advanced economies and large technology corporations give them an advantage over digital capacity in developing countries, which leads to a new global digital divide in which technological supremacy translates into policy and economic power. These gaps are exacerbated domestically, as the digital divide within countries reflects or intensifies the urban-rural or skilled-unskilled divide. In fact, SDG 10 (Reducing Inequalities) is dependent on digital technologies, education, and governance participation, and AI systems that ignore these social inequities run the risk of perpetuating, or even widening, them and leading to discrimination and social stratification [28]. It needs international cooperation and investments in digital infrastructure and capacity building, including technology access in the developing world, to create data ecosystems and train AI experts in order to share best practices; otherwise, AI will only be the new form of divide, instead of a tool that can help further the global development agenda.

### *4.5 Ethical Frameworks and Sustainable Governance*

This must be no different with respect to how we govern AI over the long-term: it must be governed ethically too. This includes the issues of fairness and accountability, transparency and privacy, as well as human control. These five pillars can help ensure we build a solid foundation to ensure technology doesn't stand in for ethical thinking with technological prowess.

Value alignment, the design of AI systems to align with human well-being, environmental responsibility, and intergenerational equity, is the cornerstone of sustainable governance (e.g., see calls for AI sustainability ethics, which combines social justice and long-term governance stability into the lifecycle of intelligent systems [29]), and institutionalizing ethical review boards, cross-sector partnerships, and continuous monitoring by governments is necessary to ensure that AI does not undermine, but rather strengthens, the pursuit of sustainable development.

**Table 3**
Summary of Challenges and Mitigation Strategies in AI-Driven Governance

| Challenge | Description | Impact on Governance | Mitigation Strategy |
|---|---|---|---|
| **Algorithmic Bias** | AI systems may inherit or amplify existing social and demographic biases from training data. | Undermines fairness and leads to discriminatory decision outcomes. | Use diverse training datasets, conduct regular bias audits, and apply fairness metrics. |
| **Data Privacy and Security** | Sensitive data collected for governance purposes may be misused or breached. | Erodes citizen trust and violates legal data protection frameworks. | Enforce strict data governance laws, anonymize datasets, and implement end-to-end encryption. |
| **Accountability Gaps** | Ambiguity in determining who is responsible for AI-based decisions. | Weakens institutional legitimacy and public trust. | Define clear accountability chains and maintain human oversight in final decision stages. |
| **Ethical and Legal Uncertainty** | Rapid AI evolution outpaces regulatory and ethical frameworks. | Creates governance inconsistency and compliance risks. | Establish adaptive ethical frameworks and continuous legal review committees. |
| **Digital Divide** | Unequal access to AI technologies between regions or social groups. | Exacerbates inequality and limits inclusive development. | Promote AI literacy programs and equitable digital infrastructure investments. |
| **Technical Complexity** | Limited understanding of AI systems among policymakers and public administrators. | Leads to poor adoption or misinterpretation of AI recommendations. | Provide capacity-building workshops and interdisciplinary policy training. |

## 5. Conceptual Framework: AI–SDM–Sustainability Integration Model

This article discusses the concept of Artificial Intelligence (AI), Strategic Decision-Making (SDM) and Sustainable Governance as a new model to reorient contemporary institutions and to redefine progress. The aim is to introduce a conceptual framework for AI, SDM and Sustainable Governance. This proposed framework combines the three models as a robust approach to support ethical, transparent and future-oriented decision-making, while also considering AI as an enabler of the SDM that could reorient how we understand the interpretative value of data, the design of policies and the attainment of sustainability goals by using intelligent systems to improve strategic planning, institutional responsibility and governance for the social good in the long-term.

Three assumptions lie at the core of such a model: 1) that humans still do better than AI for analysis or forecasting but may rely on AI; 2) strategic decisions with an AI component should be values based and socially responsible, which means they must consider social impact as well as financial benefits in their decision making process); and (3) governance needs to incorporate iterative feedback between data, policy, and outcomes so learning remains adaptive. The components of this model are described below along with how it works.

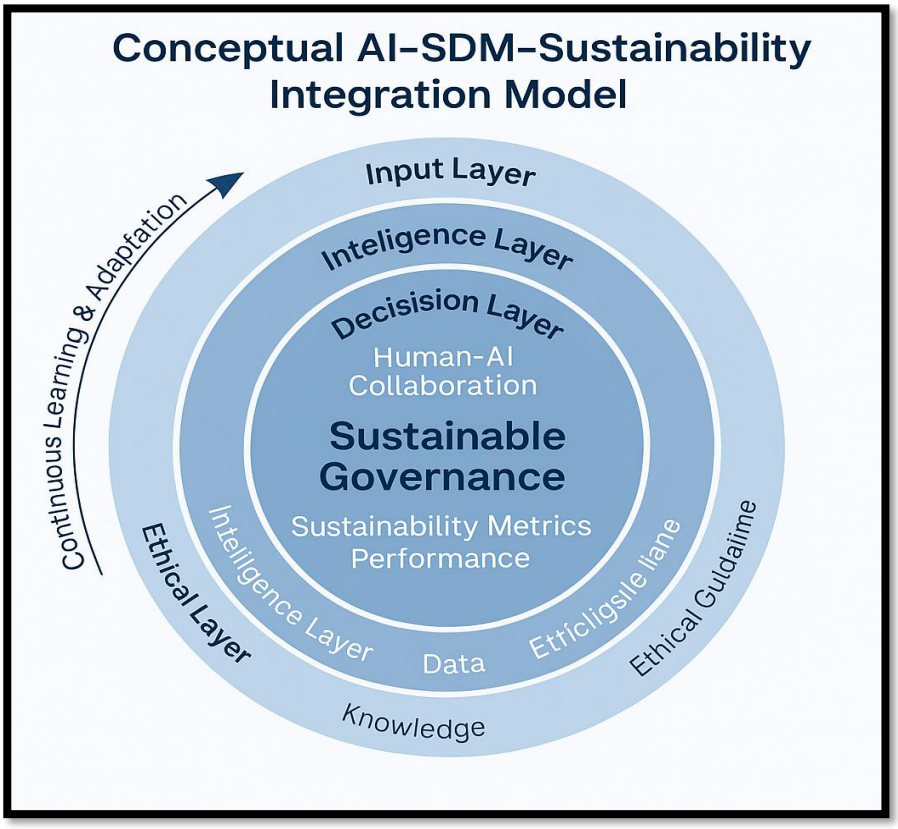


**Fig. 2.** Conceptual AI–SDM–Sustainability Integration Model

*5.1 Framework Components*

The proposed integration framework consists of four interconnected layers: input, intelligence, decision, and outcome.

*I.* ***Input Layer:***

Multisource data related to sustainability, such as environmental metrics, social indicators, economic performance data, and institutional records, are gathered and organized in this layer; the quality, diversity, and integrity of these inputs have a direct impact on the quality, fairness, and integrity of the subsequent decisions, so data governance policies are important at this stage for transparency, inclusiveness, and protection of personal and sensitive information.

***II. Intelligence Layer:***

The analytical core takes in the data, identifies patterns, models scenarios, and produces insights to guide operational efficiency and sustainability planning, while the intelligence layer translates the raw data into structured knowledge that is usable for operational efficiency and long-term sustainability planning. Explainability tools embedded in the intelligence layer make the model outputs comprehensible to non-technical stakeholders and put AI under human supervision.

***III. Decision Layer:***

A human "judgment layer" is the tier of people that "meld" system-level analytics with "individual morality, institutional norms, and societal values" to review, interpret, and ethically justify recommendations from AI systems before enacting policy decisions that should be both fact-based and fair.

***IV. Outcome Layer:***

The last layer is the use of governance actions (policy reforms, resource allocation, performance monitoring) including ongoing monitoring systems to track outputs and whether they are contributing to sustainability goals; and feedback that loops back to the input stage to close the learning and adaptive management loop.

This four-layer structure provides a closed-loop model of governance to ensure that the AI insights are refined by human judgment and ethical reflection and that the process is iterative and accountable [30].

**Table 4**
Components and Functions of the AI–SDM–Sustainability Framework

| Framework Layer | Primary Function | Key Tools / Methods | Ethical Safeguard | Expected Impact |
|---|---|---|---|---|
| **Input Layer** | Collects and filters relevant data and ethical parameters before analysis | Data integration systems, cloud repositories, metadata classification | Transparency in data sources and informed consent protocols | Reliable and unbiased foundation for decision-making |
| **Intelligence Layer** | Processes data using AI algorithms to identify patterns and predictive trends | Machine learning, neural networks, natural language processing | Algorithmic fairness checks and bias detection | Accurate insights for sustainable policy formulation |
| **Decision Layer** | Facilitates strategic human–AI collaboration for policy evaluation and option selection | Decision support systems, scenario modeling, optimization tools | Human oversight and explainable AI (XAI) | Balanced, ethical, and evidence-based governance decisions |
| **Outcome Layer** | Implements and monitors the results of strategic decisions | Performance dashboards, KPI tracking, sustainability audits | Accountability reporting and adaptive management | Improved policy effectiveness and public trust |
| **Feedback Loop** | Continuously evaluates system performance and feeds learning back into input stage | Continuous monitoring tools, data analytics dashboards | Regular ethical review and corrective learning | Adaptive and resilient governance framework |

*5.2 Guiding Principles*

The five core principles are listed below and a model founded on the previous will include them as its baseline of ethical and institutional standards to which it must adhere:

***I.Transparency:***

Decision-making must be replicable and visible. Open-data portals and channels of public dissemination guarantee that the operations of AI-augmented governance can be understood and accepted.

***II.Fairness:***

Represented data must be just, as otherwise the injustice will be translated into an AI's decision, and those responsible for the AI's development will have ignored concerns for the common good of humanity in the production of datasets.

***III.Accountability:***

The necessity of human governance oversight, and the institutions which bear both responsibility and legal agency to deal with any issues concerning AI outcomes are of utmost priority.

***IV.Resilience:***

The most successful governance will be the model which has processes in place to be attentive to and, most importantly, adaptive to both shifts in technology and in socio-technical relations.

***I. Sustainability Alignment:***

In an AI-assisted world, all decisions must also be subjected to a sustainability analysis, in particular in alignment with the SDGs (all, but those which overlap with sustainability, fairness, and resilience such as SDG 9: Industry, Innovation, and Infrastructure and SDG 16: Peace, Justice, and Strong Institutions.

In short, the goals of upholding five pillars of human values in government processes—transparency, fairness, accountability, sustainability, and resilience—provide adequate overarching frameworks through which to conduct ethical and sustainable AI-driven governance [31].

*5.3 The Feedback Loop and Learning Cycle*

A key feedback loop of this AI–SDM–Sustainability Integration Model is that the information about the results of policy decisions provide new data to flow back into the system for AI analysis of the impact of the decision and to identify new risks or opportunities, keeping governance processes dynamic and allowing learning from successes and failures. In practice, this loop means that the system supports the evolution of policy over time: if a sustainability intervention has unintended consequences, AI will signal that the baseline has deviated from the expected one as early as possible, and inefficiencies can be corrected before they snowball, promoting institutional learning, resilience, and a culture of evidence-based change over time [32].

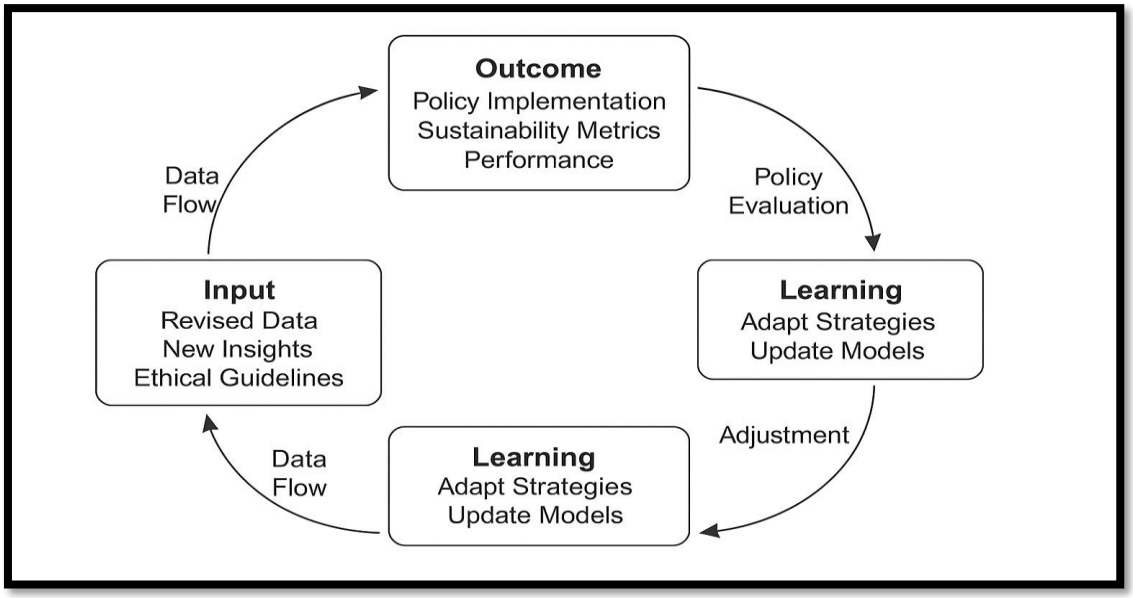


**Fig. 3.** Feedback Loop of Adaptive Learning in Sustainable Governance

*5.4 Implications for Policy and Practice*

As such, this framework has significant value and relevance for a wide audience. It offers a road map for public administrators to systematize the responsible adoption of AI in public administrations by combining the integration of AI in policy cycles, the effective governance of AI to ensure ethical compliance and public oversight; it provides a template for business leaders to combine and leverage the alignment of sustainability strategies with data intelligence; it offers an example of evidence that

governance of AI is, by definition, an interdisciplinary undertaking (linking together technology, management, and ethics) to scholars and researchers; and ultimately, it is a call to action to practitioners that the benefits that AI has in improving governance structures and processes rely not only on the presence of the right enabling infrastructure, but also on an organizational culture of transparency, collaboration, and learning.

## 6. Results, Discussion, and Conclusion

AI in human-driven strategic decision-making with awareness of human oversight and ethical implications can serve as an agent of change in enabling long-term sustainable governance of amalgamated tech-intelligence and human guardrails with ethical accountability toward boosting institutional transparency, resilience, and long-term adaptability. The next section includes a concise overview of the key conceptual takeaways from the proposed model, along with comments on the broader theoretical and practical relevance of its main components and a short conclusion on the major lessons learned and directions for future work. Also, some the adopted model can be integrated with recent artificial intelligence models [33, 34 ,35] to elevate the outcome efficiency.

### *6.1 Conceptual Findings*

Findings show that AI improves the quality of strategic governance decisions by strengthening the three pillars of sustainability: predictability, institutional responsibility, and adaptive capacity.

Predictability for this foresight, decision makers in organizations and governments can be more proactive than reactive, more evidence-based than risk-averse (for example, because an economic contraction, social fragmentation, or environmental degradation is anticipated), and so can face less uncertainty about the future when making long-term plans.

AI can record, audit, and visualize the decision-making process, something that has never been possible before, which increases institutional responsibility and bolsters public trust in governance systems that can be proven and audited, thus enhancing performance evaluation. Finally, adaptive capacity is the most notable influence that AI has on strategic governance since the constant stream of data being input into the system provides governance institutions with the information necessary to evaluate the effectiveness of their decisions and change policy midstream so that governance can become a feedback system learning to adapt to a social, environmental, and economic milieu. In other words, the above findings imply that the quality and sustainability of decision-making can be improved through the use of AI if applied in a way that is consistent with both human values and institutional accountability.

### *6.2 Discussion*

The risk is also the opportunity. AI can augment human decision-making with more data, more pattern recognition, and more prediction to the process, but also erode existing structures of legitimacy, authority, and accountability. If and when it becomes a necessary and inevitable component of the global sustainability agenda (which it will likely be only if more transparent, inclusive, and effective institutions capable of solving social and environmental problems are put in place in ways that do not create or compound new inequalities, biases, and distrust), calibrating automated and human judgment, technological efficiency and expertise, ethical deliberation, contextual understanding, and social sensitivity to produce new and even more creative and responsible forms of governance will be a substantial challenge. In other words: For leaders and policymakers, the question is not if but how to govern AI.

*6.3 Conclusion*

This paper makes the case that AIs in strategic decision-making can already be one step in the direction of such governance as it can help governments and organizations plan, do, learn in a more open, data-driven, and anticipatory way, and to use AI as augmenting not an automating technology. The model is a reminder that sustainable governance in the digital age is about technology AND human innovation (values such as equity, inclusion, integrity, etc.) and that it can help inform empirical work and practice: for academics, to keep on researching pathways to make AI a bridge between efficiency and equity, and to help our institutions become intelligent in data, purpose and humanity; for policymakers, to help design rules and guidelines for AI; for organizations, to advance learning and accountability cultures.

## 7. Policy Recommendations and Future Research Directions

Guided by the theory development process used in this study and its findings, several policy implications (for policy-making), recommendations (for institutional leaders) and suggestions for researchers who would like to govern sustainably by using AI, as well as for future research, are offered.

*7.1 Policy Recommendations*

***I.Establish Ethical and Legal Frameworks for AI Governance***

Governments can create national and institutional policies on ethics principles such as ethics compliance, transparency and human oversight throughout all stages of AI implementation and legal frameworks for data use, algorithmic accountability and explainability to ensure rights of citizens and protect public trust. In governments, ministries, companies and research institutes, institutional ethical review boards could be set up to evaluate impact of AI-driven decisions on society.

***II.Promote Inclusive and Participatory AI Systems***

Governance for sustainable development must ensure AI technologies are a force for good for all. We need to close digital divides between countries, communities and social groups, using open-data, digital literacy and inclusive technology transfer. We can improve legitimacy and trust by involving the public in AI policy design and decision-making for example, through consultations, transparency portals and feedback mechanisms.

***III.Integrate Sustainability Indicators into AI Decision Models***

The same is true of the AI decision-making models that governments and the private sector use to make strategic plans. Sustainability benchmarks, environment, social, and governance (ESG) metrics, must be programmed into the algorithm for AI-influenced decisions, subjecting them to the SDGs. AI systems should be constructed to test every policy and major investment decision for long-term social and ecological costs and benefits, so that sustainability is a real, operational principle of governance, and not just a slogan.

***IV.Strengthen Institutional Capacity and Data Infrastructure***

Institutional capacities must be strong so that AI is a long-term investment, rather than a short-term experiment. Investments in digital infrastructure, data management systems, and professional training can be reinforced with continuous education for decision-makers and analysts on data literacy, AI ethics, and model validation in order to mitigate potential misapplication and misinterpretation of results. Data-sharing networks can be developed across agencies and sectors to facilitate coordination and avoid duplication of efforts.

***V.Foster Global Cooperation for Responsible AI Development***

Although geography is not a limit for challenges such as bias or inequality in terms of issues that AI governance faces today, international cooperation on AI governance presents opportunities like establishing common ethical standards, conducting collaborative research that respects differences but also advances shared objectives across national borders, and building cross-border data protection mechanisms to harmonize policies while accounting for the cultural and social diversity of different regions and promoting fairness, mutual learning, and responsible innovation.

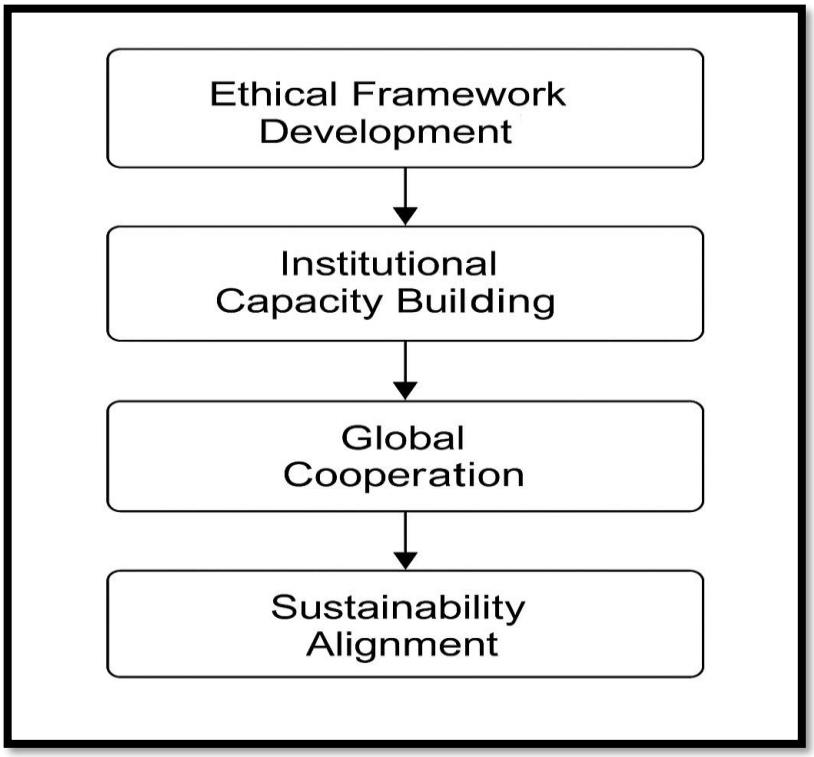


**Fig. 4.** Policy Implementation Roadmap for Responsible AI Governance

*7.2 Future Research Directions*

Acknowledging that this article provides a conceptual design and that empirical exploration is essential in the proposed AI model, several potential avenues for future research present themselves, including:

***I. Empirical Case Studies:***

Case studies of AI applications to specific governance domains, such as environmental monitoring, fiscal management, or urban planning, could provide empirical evidence of how the conceptual model functions under real-world conditions and constraints and how it performs across national contexts.

***II. Quantitative Measurement Frameworks:***

Key performance indicators (KPIs) to measure the effectiveness and progress made towards sustainable governance through AI should be established to provide quantitative and qualitative measurements of transparency, fairness and other adaptive learning metrics for monitoring and reporting progress and accountability.

***III. Ethical and Psychological Dimensions:***

Examining the human dimensions of AI integration, such as decision-makers' perceptions, trust in AI systems, and their Behavioural responses to AI-driven insights, is necessary. Investigating how

cognitive biases or organizational culture can affect the adoption and ethical use of AI can provide valuable information.

***IV. AI and Public Participation:***

Exploring the potential of AI to enhance citizen engagement and participatory policymaking, for example, by studying how AI tools (e.g., natural language processing or digital platforms) can be used to capture and integrate citizens' perspectives and preferences in sustainability-related decision-making, is another example.

***V. Cross-Sectoral Integration:***

Another is to investigate the capacity of AI systems to integrate across sectors (e.g., energy, health, education, transport) to address the cross-sectoral governance challenges of sustainability and to design a more coherent and adaptive governance system.

**Table 5**
Future Research Directions and Potential Methodologies

| Research Area | Objective | Suggested Methodology | Expected Contribution |
|---|---|---|---|
| **Empirical Validation of the Conceptual Framework** | Empirical Application Tests the AI–SDM–Sustainability framework using case studies in real-world governance settings. | Mixed-methods research that includes surveys, interviews, and case studies with public sector organizations. | Provides an opportunity to empirically validate the framework and to make adjustments based on the observed real-world applications. |
| **AI Ethics and Accountability Studies** | Examine the implementation of ethical frameworks and accountability mechanisms in AI-driven decision-making. | Qualitative analysis using policy reviews and expert interviews. | Establishes standards for responsible and transparent AI governance. |
| **Impact of AI on Institutional Performance** | Measure how AI adoption influences efficiency, transparency, and long-term sustainability outcomes. | Quantitative research using regression analysis and performance metrics. | Quantifies the relationship between AI maturity and governance outcomes. |
| **Cross-Sectoral Integration Models** | Explore collaboration mechanisms between public, private, and hybrid governance entities using AI. | Comparative case study method across multiple sectors and countries. | Develops transferable governance models and cross-sector policy insights. |
| **Citizen Participation and Digital Inclusion** | Investigate how AI tools can enhance civic engagement and equitable access to digital governance. | Experimental or participatory design methods using AI-enabled engagement platforms. | Promotes inclusivity and strengthens trust in AI-based public decision systems. |

*7.3 Concluding Note*

Thus, this new AI era constitutes an alternate model of governance that can shift the paradigm of strategic thinking societies engage in if we approach it with the right values and principles and use it responsibly, ethically, and inclusively. In other words, these guidelines and recommendations simply echo sustainability and conscience as our shared purpose in the age of change. The relationship between innovation and responsibility will define whether AI is just an instrument that propels the common good or whether it just amplifies those inequalities as that digital shift in governance takes place in countries around the world. But ultimately, sustainable governance is not only about how much technology we can harness to our will but also how much human intelligence

we can channel through conscience, purpose, and society's commitment to work together for the common good of all.

**Author Contributions**

*Mohamed Ibrahim Hassan Farag*: Conceptualization and development of the theoretical framework; methodology design; data curation through information search and interpretation; investigation including literature review, analysis of results, and discussion; resource management through the collection and organization of materials used in the study; analytical model design; validation through proofreading and verification of the analysis; visualization through the preparation of tables, figures, and graphical elements to ensure clarity and consistency with the main body of the article; writing – original draft preparation; writing – review and editing to improve structure, language accuracy, coherence, and compliance with journal standards.

**Funding**

The author received *no financial support* from any public, commercial, or non-profit funding agency for the research, authorship, or publication of this article.

**Data Availability Statement**

This study is *theoretical in nature*. All materials and information used in the paper were obtained from *publicly available academic sources*, including books, peer-reviewed journal articles, and open-access research publications.

**Conflicts of Interest**

The author declares *no conflicts of interest* related to this study.

**Acknowledgements**

The author would like to acknowledge the valuable contributions of scholars whose *open-access research and theoretical works* provided an important foundation for this study. The analytical perspectives and conceptual models presented in this article were developed by the author to construct an integrated theoretical framework guiding the discussion.

**Reference**

[1] Le, D. C. K., Quach, S., & Thaichon, P. (2022). Introduction to artificial intelligence (AI). *Artificial Intelligence for Marketing Management. England, UK: Routledge*. https://doi.org/10.4324/9781003280392-2

[2] Davenport, T. H., & Mittal, N. (2023). *All-in on AI: How smart companies win big with artificial intelligence*. Harvard Business Press. https://doi.org/10.1080/15228053.2023.2228675

[3] Shrestha, Y. R., Ben-Menahem, S. M., & Von Krogh, G. (2019). Organizational decision-making structures in the age of artificial intelligence. *California management review*, *61*(4), 66-83. https://doi.org/10.1177/0008125619862257

[4] Eisenhardt, K. M., & Zbaracki, M. J. (1992). Strategic decision making. *Strategic management journal*, *13*(S2), 17-37. https://doi.org/10.1002/smj.4250130904

[5] Cockburn, I. M., Henderson, R., & Stern, S. (2022). The Impact of Artificial Intelligence on Innovation. In *The Impact of Artificial Intelligence on Innovation: Cockburn, Iain M.| uHenderson, Rebecca M.| uStern, Scott*. [SI]: SSRN. https://www.nber.org/system/files/chapters/c14006/revisions/c14006.rev0.pdf

[6] McAfee, A., & Brynjolfsson, E. (2017). *Machine, platform, crowd: Harnessing our digital future*. WW Norton & Company. https://www.mintur.gob.es/Publicaciones/Publicacionesperiodicas/EconomiaIndustrial/RevistaEconomiaIndustrial/409/SEGUNDA%20CR%C3%8DTICA%20DE%20LIBROS.pdf

[7] Biermann, F., & Gupta, A. (2011). Accountability and legitimacy in earth system governance: A research framework. *Ecological economics*, *70*(11), 1856-1864. https://doi.org/10.1016/j.ecolecon.2011.04.008
[8] Wirtz, B. W., Weyerer, J. C., & Geyer, C. (2019). Artificial intelligence and the public sector—applications and challenges. *International Journal of Public Administration*, *42*(7), 596-615. https://doi.org/10.1080/01900692.2018.1498103
[9] GULIYEVA, N. (2023). Understanding the Effects of Remarketing on the Consumer Behaviour of Gen Z and Gen Y: A Paradigm Shift in Digital Marketing. *KONFERENCIJŲ DARBAI*, 115. https://www.vdu.lt/cris/bitstreams/76651604-4938-4ecd-8486-11b0a527ff77/download#page=115
[10] Jobin, A., Ienca, M., & Vayena, E. (2019). The global landscape of AI ethics guidelines. *Nature machine intelligence*, *1*(9), 389-399. https://doi.org/10.1038/s42256-019-0088-2
[11] Roberts, H., Cowls, J., Hine, E., Mazzi, F., Tsamados, A., Taddeo, M., & Floridi, L. (2021). Achieving a 'Good AI Society': Comparing the Aims and Progress of the EU and the US. *Science and engineering ethics*, *27*(6), 68. https://doi.org/10.1007/s11948-021-00340-7
[12] Taeihagh, A. (2021). Governance of artificial intelligence. *Policy and society*, *40*(2), 137-157. https://doi.org/10.1080/14494035.2021.1928377
[13] Farag, M. I. H. (2026). Sustainability-Driven Business Excellence: Integrating ESG Principles for Long-Term Competitiveness. In A. Sedky (Ed.), *Developing an Architecture of Future-Ready Business Excellence* (pp. 215-260). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3373-6172-7.ch007
[14] Farag, M. I. H. (2025). Transformational Leadership in the Era of Digital Transformation. *Journal of Advanced Research in Leadership*, *4*(2), 55–72. https://doi.org/10.33422/jarl.v4i2.1269
[15] Davenport, T. H., & Mittal, N. (2023). *All-in on AI: How smart companies win big with artificial intelligence*. Harvard Business Press.
[16] Brynjolfsson, E., Rock, D., & Syverson, C. (2021). The productivity J-curve: How intangibles complement general purpose technologies. *American Economic Journal: Macroeconomics*, *13*(1), 333-372. https://doi.org/10.1257/mac.20180386
[17] Shrestha, Y. R., Ben-Menahem, S. M., & von Krogh, G. (2021). Organizational decision-making structures in the age of AI. *California Management Review*, *63*(3), 46-68.
[18] Teece, D. J. (2018). Business models and dynamic capabilities. *Long range planning*, *51*(1), 40-49. https://doi.org/10.1016/j.lrp.2017.06.007
[19] Jobin, A., Ienca, M., & Vayena, E. (2019). The global landscape of AI ethics guidelines. *Nature machine intelligence*, *1*(9), 389-399. https://doi.org/10.1038/s42256-019-0088-2
[20] Meadowcroft, J. (2013). Who is in charge here? Governance for sustainable development in a complex world. In *Governance for sustainable development* (pp. 107-122). Routledge.
[21] Vinuesa, R., Azizpour, H., Leite, I., Balaam, M., Dignum, V., Domisch, S., ... & Fuso Nerini, F. (2020). The role of artificial intelligence in achieving the Sustainable Development Goals. *Nature communications*, *11*(1), 233. https://doi.org/10.1038/s41467-019-14108-y
[22] Hilty, L. M., & Aebischer, B. (2014). ICT for sustainability: An emerging research field. *ICT innovations for Sustainability*, 3-36. https://doi.org/10.1007/978-3-319-09228-7_1
[23] Zuiderwijk, A., & Janssen, M. (2014). Open data policies, their implementation and impact: A framework for comparison. *Government information quarterly*, *31*(1), 17-29. https://doi.org/10.1016/j.giq.2013.04.003
[24] Floridi, L., Cowls, J., Beltrametti, M., Chatila, R., Chazerand, P., Dignum, V., ... & Vayena, E. (2018). AI4People—An ethical framework for a good AI society: Opportunities, risks, principles, and recommendations. *Minds and machines*, *28*(4), 689-707. https://doi.org/10.1007/s11023-018-9482-5
[25] Barocas, S., Hardt, M., & Narayanan, A. (2023). *Fairness and machine learning: Limitations and opportunities*. MIT press. https://www.myecole.it/biblio/wp-content/uploads/2020/11/2020-Fairness-book.pdf
[26] Floridi, L. (2021). Establishing the rules for building trustworthy AI. In *Ethics, governance, and policies in artificial intelligence* (pp. 41-45). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-030-81907-1_4
[27] Farag, M. I. H. (2025). *Critical Success Factors (CSFs) Affecting the Sustainable Development Goals (SDGs)* (Doctoral dissertation, Doctoral dissertation, Helwan University, Egypt). https://doi.org/10.13140/RG.2.2.25061.72166
[28] Farag, M. I. H. (2025). Bridging Inequality: Contemporary Challenges to Achieve Sustainable Development Goals Across and Within Nations. *International Journal of Sustainable Development Goals*, *1*, 333–352. https://doi.org/10.59543/ijsdg.v1i.16131

[29] Farag, M. I. H. (2025). The Role of SWOT Analysis in Enhancing Business Growth and Long-Term Management Sustainability. *Management Science Advances*, *2*(1), 304-329. https://doi.org/10.31181/msa21202528

[30] George, G., Haas, M. R., & Pentland, A. (2014). Big data and management. *Academy of management Journal*, *57*(2), 321-326. https://doi.org/10.5465/amj.2014.4002

[31] Farag, M. I. H. (2025). Sustainability as a Management Strategy: Integrating Environmental, Social, and Governance Practices into Business Administration. *Management Science Advances*, 1-25. https://doi.org/10.31181/msa31202630

[32] Wirtz, B. W., & Müller, W. M. (2019). An integrated artificial intelligence framework for public management. *Public Management Review*, *21*(7), 1076-1100. https://doi.org/10.1080/14719037.2018.1549268

[33] Kayıran, H. F. (2026). Thermo-Elastic Analysis of an Axisymmetric Layered Cylinder under Constant Thermal Loading with Artificial Intelligence-Based Validation. *Intelligent Systems Research and Applications Journal*, *2*, 76-89. https://doi.org/10.59543/0x8ky937

[34] Yaseen Mushtaq, Wajid Ali, Usman Ghani, Rahim Ullah Khan, & Amal Kumar Adak. (2025). Advancing Aviation Safety and Sustainable Infrastructure: High-Accuracy Detection and Classification of Foreign Object Debris Using Deep Learning Models. *International Journal of Sustainable Development Goals*, *1*, 82-98. https://doi.org/10.59543/ijsdg.v1i.14279

[35] Rahim Ullah, Muhammad Saeed, Wajid Ali, Junaid Nazar, & Fakhra Nazar. (2025). A Cooperative Heterogeneous Multi-Agent System Leveraging Deep Reinforcement Learning. *Knowledge and Decision Systems With Applications*, *1*, 112-124. https://doi.org/10.59543/kadsa.v1i.13931