

Artificial Intelligence, Inclusive Productivity and Economic Transformation in Morocco: A Responsible Adoption Framework for Emerging Economies

Youssef LAHBABI

Research Professor in Artificial Intelligence, EMAA Business School, Agadir, Morocco

Ouissam EL ALAOUI

Research Laboratory in Finance, Audit, and Organizational Governance (LARFAGO), Hassan First University, ENCG, Settat, Morocco

Farid OUBAALI

Research Professor in Economics, EMAA Business School, Agadir, Morocco

Correspondence address

FSJES Ait Melloul, Agadir - Maroc

Cite this article

Lahbabi, Y., El Alaoui, O., & Oubaali, F. (2026). Artificial Intelligence, Inclusive Productivity and Economic Transformation in Morocco: A Responsible Adoption Framework for Emerging Economies. International Journal of Economics and Management Sciences, Volume 5, Issue 3 (2026), pp. 93-109

Submitted: 30/05/2026

Accepted: 25/06/2026

International Journal of Economics and Management Sciences - IJEMS–
Volume 5, Issue 3 (2026)

Copyright © IJEMS

www.ijemsjournal.com

Abstract

This article develops a critically grounded and operationally testable framework for analysing how artificial intelligence (AI) can contribute to inclusive productivity and economic transformation in Morocco. Responding to recent debates on the productivity paradox, algorithmic concentration, labour-market polarization and digital dependency, the paper argues that AI should not be understood as an autonomous productivity engine. Its developmental value depends on the interaction between adoption intensity, data readiness, human-capital formation, organizational absorptive capacity, sectoral diffusion and responsible governance. Using Morocco as a strategic middle-income case, the article integrates conceptual analysis with contextual evidence from national digital transformation priorities, recent AI policy announcements and international benchmarks. It clarifies the construct of inclusive productivity through measurable indicators covering firm upgrading, SME participation, employment quality, territorial equity and public-service performance. The contribution is threefold: first, it advances a balanced theoretical synthesis of AI as both a productivity opportunity and a source of socio-economic risk; second, it proposes a Morocco-specific adoption framework linking micro-level organizational capabilities to macro-level institutional conditions; third, it offers an empirical validation protocol and policy roadmap for responsible AI diffusion in emerging economies.

Keywords: artificial intelligence; inclusive productivity; digital economy; Morocco; responsible AI governance; SMEs; policy targeting.

Introduction

Artificial intelligence has become one of the most decisive technological transformations of the contemporary economy. Current advances in machine learning, generative AI, cloud computing and data-intensive platforms are changing how firms forecast demand, manage inventories, interact with customers, design products, allocate labour and monitor performance. Public administrations are also experimenting with AI for more responsive services, better programme targeting and evidence-based evaluation. Yet the economic meaning of AI remains contested. Optimistic scenarios emphasise productivity acceleration and innovation, whereas cautious interpretations stress delayed returns, organizational disruption, unequal access and governance risks (Acemoglu & Restrepo, 2019; Brynjolfsson, Rock, & Syverson, 2019; Filippucci et al., 2024).

This debate is particularly important for emerging and middle-income economies. In advanced economies, AI adoption is often discussed in relation to frontier innovation and global technology competition. In emerging economies, the central policy problem is more foundational: how can AI be adopted in a way that upgrades local production systems, broadens access to productivity tools and avoids reinforcing gaps in skills, infrastructure, firm size and territorial development? The issue is not simply whether AI can raise productivity, but whether AI-related gains can become inclusive, measurable and socially legitimate.

Morocco offers a relevant context for this inquiry. The country has invested in digital public services, industrial ecosystems, outsourcing, automotive and aeronautics value chains, financial technology and data capabilities. Digital Morocco 2030 places digital transformation at the centre of public-service modernization and economic competitiveness. More recently, public policy discussions have connected AI to sovereign data infrastructure, cloud capacity, training programmes and the ambition to position Morocco as a regional AI and data-science hub. These developments create an opportunity to analyse AI adoption not as a generic technological trend, but as a national development challenge shaped by institutional capacity, SME structure, territorial disparities and labour-market readiness.

The research problem addressed in this article is therefore the following: under what conditions can AI adoption contribute to inclusive productivity and economic transformation in Morocco? The paper develops a conceptual and policy-oriented model that synthesizes recent literature, identifies mechanisms through which AI may influence productivity, clarifies the mediating role of data readiness, human capital, organizational capacity and governance, and proposes a research agenda for future empirical testing. Compared with the initial version, the present manuscript strengthens the critical discussion, deepens the Moroccan contextualization, operationalizes the key concept of inclusive productivity and proposes concrete implementation priorities for policymakers and practitioners.

The article makes three explicit contributions. First, it integrates productivity economics, absorptive-capacity theory and responsible-AI governance into a single framework for emerging economies. Second, it contextualizes AI adoption in Morocco by linking national digital strategy, SME constraints, sectoral transformation and territorial equity. Third, it operationalizes inclusive productivity through measurable indicators and a future empirical protocol that can be tested through surveys, case studies and structural modelling.

1. Research Gap and Theoretical Positioning

The literature on AI and economic performance has expanded rapidly since the emergence of deep learning and generative AI. A first stream studies AI as a general-purpose technology and focuses on productivity through prediction, automation and innovation. A second stream studies labour-market exposure and task recomposition. A third stream examines AI governance, ethics, privacy and

algorithmic bias. A fourth stream addresses digital readiness and the infrastructure needed to deploy AI in developing economies. These streams are valuable, but they often remain separated. This separation limits their usefulness for policy design in countries where productivity, inclusion and institutional readiness must be addressed simultaneously.

The first research gap concerns the weak integration between productivity analysis and inclusion analysis. Productivity studies often focus on output per worker, firm-level efficiency or innovation, while inclusion studies focus on employment, inequality, access and social protection. In the case of AI, these dimensions cannot be separated. A technology that raises productivity only in a narrow segment of the economy may increase aggregate efficiency while widening inequality. The concept of inclusive productivity is therefore proposed to analyse the simultaneous improvement of efficiency, diffusion and social benefit.

The second gap concerns organizational absorptive capacity. Many AI debates assume that once tools are technically available, firms and administrations will adopt them and obtain gains. However, innovation and management research shows that technology generates value only when organizations possess the capabilities to absorb, adapt and reorganize around it (Cohen & Levinthal, 1990; Zahra & George, 2002; Teece, 2007). For AI, this involves leadership, data culture, cross-functional teams, experimentation routines, employee training, workflow redesign and performance measurement.

The third gap concerns institutional readiness. International indices usually capture infrastructure, skills and innovation capacity, but they may understate trust, legal certainty, public-sector coordination and data governance. In an emerging economy, these factors shape whether firms invest in AI, whether citizens accept AI-assisted public services and whether workers perceive AI as an opportunity or a threat. Governance is therefore not only a regulatory constraint; it is a productivity-enabling condition.

The fourth gap concerns contextual evidence. Conceptual frameworks are useful, but they become scientifically stronger when anchored in concrete institutional, sectoral and measurement realities. The article therefore treats Morocco not as a generic example of an emerging economy, but as a strategic case characterized by a growing digital strategy, heterogeneous firm capabilities, dynamic industrial ecosystems, skills constraints and a need for regionally balanced transformation.

2. Critical Literature Review

2.1 AI as a general-purpose technology: productivity promise and delayed returns

Economic historians and innovation scholars describe general-purpose technologies as technologies that spread across sectors, improve over time and enable complementary innovations. AI shares these characteristics because it can be embedded in products, services, production systems and decision processes. Yet the productivity effects of general-purpose technologies are usually delayed, since firms must invest in complementary assets such as data infrastructure, skills, intangible capital and managerial experimentation (Bresnahan & Trajtenberg, 1995; Brynjolfsson & Hitt, 2000).

This delayed-return argument is essential for interpreting AI adoption in Morocco. A firm may acquire a chatbot, analytics tool or predictive model without changing the organizational routines that determine value creation. In such cases, adoption remains symbolic or fragmented. Conversely, AI can generate productivity gains when it is linked to process redesign, data integration, employee learning and managerial accountability. The relevant unit of analysis is therefore not the isolated AI tool, but the socio-technical system within which the tool is embedded.

2.2 Labour-market effects: beyond automation optimism and displacement pessimism

AI changes labour markets through task recomposition rather than the simple disappearance of occupations. Some tasks are automated, some are augmented and others become more valuable. Workers who can use AI to improve analysis, communication, design or management may experience

productivity gains, while workers whose tasks are routine and codified may face greater exposure (Autor, 2015; Felten et al., 2021; Cazzaniga et al., 2024). The critical issue is therefore the distribution of capabilities across workers, firms and territories.

A balanced assessment must recognize both opportunity and risk. AI may improve service quality, reduce administrative delays and support higher-value work. However, it may also increase labour-market polarization if only highly educated workers and large firms can capture the benefits. It may create displacement pressure in routine tasks, weaken bargaining power in platform-based work, and intensify surveillance if workplace deployment lacks safeguards. Inclusive productivity therefore requires broad AI literacy, reskilling programmes, social dialogue and measurement of job quality, not only job quantity.

2.3 Diffusion, SMEs and market concentration

AI adoption is highly heterogeneous across firms. Large firms usually have better access to data, finance, cloud services, specialized workers and consultants. SMEs often lack structured data, digital skills and strategic clarity. This creates a diffusion gap that can increase productivity dispersion between leading and lagging firms (Damioli et al., 2021; Rammer et al., 2022). For Morocco, where SMEs are central to employment and regional development, AI diffusion must be adapted to firm size and sectoral realities. The market-concentration risk is not limited to firm size. AI value chains depend on compute infrastructure, cloud providers, proprietary models, data access and specialized talent. If domestic firms only consume imported AI services without building local capabilities, digital dependency may deepen. This does not imply technological autarky; rather, it means that AI policy must combine openness to global innovation with local capacity building, data sovereignty, interoperability, procurement discipline and support for Moroccan providers.

2.4 Responsible AI as an economic condition

Responsible AI is often presented as an ethical issue, but it is also an economic issue. Trustworthy systems encourage adoption, reduce legal uncertainty and protect citizens and firms from harm. AI governance includes data protection, transparency, explainability, human oversight, accountability, cybersecurity and fairness. In high-stakes domains such as credit, recruitment, health, education and public benefits, governance failures can directly affect economic opportunity (OECD, 2019, 2024; UNESCO, 2021; European Parliament and Council, 2024).

The framework therefore treats governance quality as both a moderator and an enabling condition. It moderates the relationship between AI adoption and social legitimacy, because citizens and workers are more likely to accept AI-assisted decisions when rules are transparent and contestable. It also enables productivity by reducing uncertainty, encouraging data sharing under safe conditions and preventing costly failures caused by bias, cybersecurity incidents or opaque automated decisions.

3. Morocco-Specific Context and Secondary Evidence Anchors

Morocco's AI adoption trajectory should be read through the interaction of four national realities: a public digital-transformation agenda, a diversified but uneven productive structure, a strong SME employment base and persistent territorial inequalities. Digital Morocco 2030 identifies digitalization as a driver of socio-economic development and public-service modernization. Recent AI policy announcements further connect AI to sovereign data centres, cloud and fibre infrastructure, university-linked AI centres, industrial adoption and workforce development. These priorities show that Morocco is not starting from a blank slate; it is building AI capacity on top of an existing digital-transformation agenda.

Nevertheless, the Moroccan case also illustrates the constraints that make inclusive productivity uncertain. First, firms differ significantly in their data maturity and management capacity. Second, the

education and training system must produce both specialized AI talent and broad AI literacy for managers, technicians and public servants. Third, regional development remains uneven, meaning that AI diffusion could concentrate in Casablanca, Rabat, Tangier and other established hubs unless deliberate territorial policies are implemented. Fourth, public trust depends on visible safeguards around data protection, cybersecurity, explainability and accountability.

The following diagnostic matrix translates these contextual factors into analytical implications. It is not presented as a substitute for econometric evidence, but as a structured bridge between conceptual theory and future empirical testing. It directly responds to the need for deeper Morocco-specific contextualization and for practical examples of how the framework could be applied.

Table 1. Morocco-specific diagnostic matrix for responsible AI diffusion

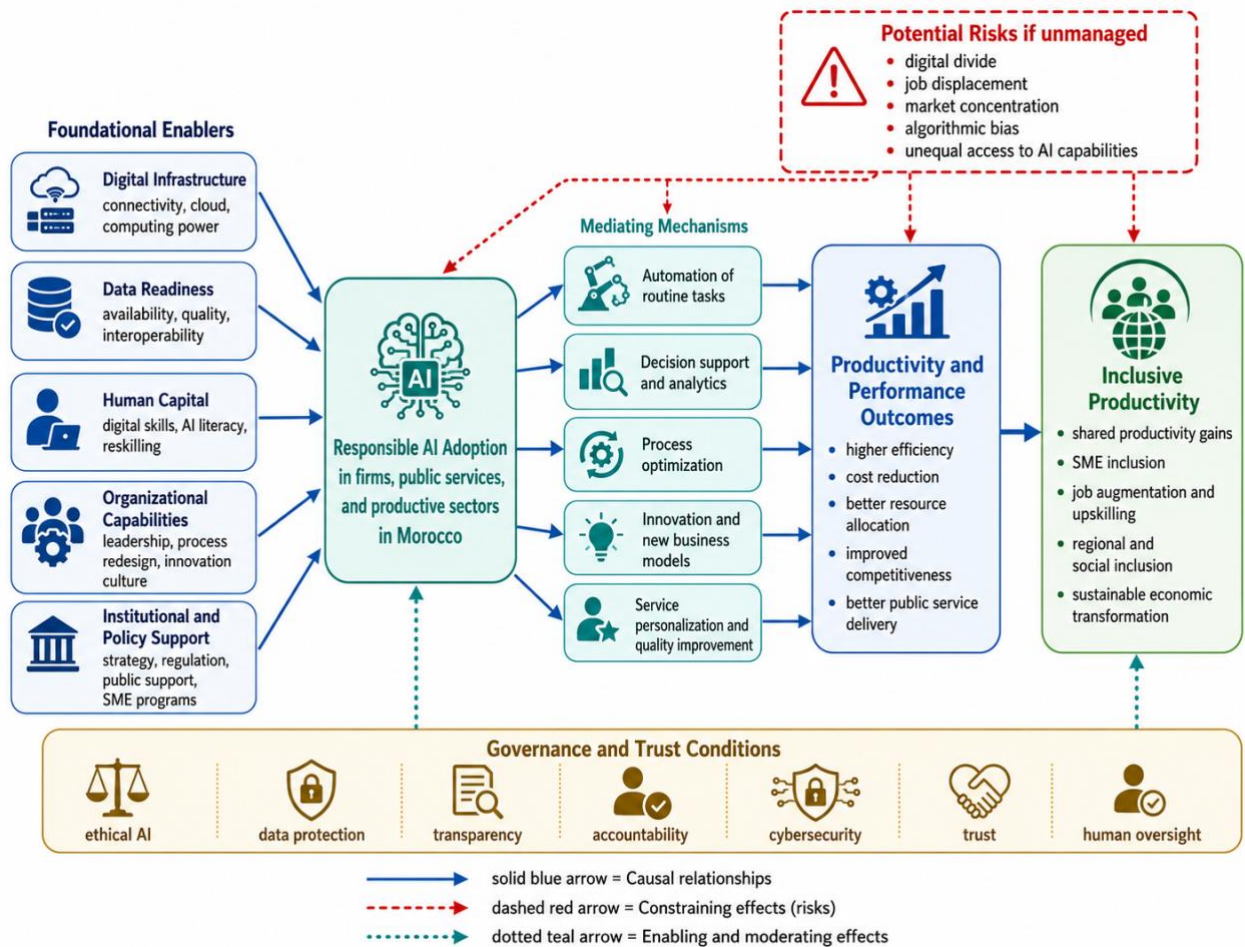
Morocco-specific factor	Observed policy/economic relevance	Implication for AI and inclusive productivity
Digital public-service modernization	Digital Morocco 2030 emphasizes public-service digitization, better access and digital-economy development.	AI should first target high-volume administrative processes where measurable gains in time, accessibility and service quality can be tracked.
Industrial ecosystems and outsourcing	Morocco has developed automotive, aeronautics, logistics, offshoring and financial-service capabilities.	AI adoption should be sector-specific: predictive maintenance, quality control, logistics optimization, customer-service automation and compliance analytics.
SME structure and informal constraints	SMEs are central to employment but often face limited finance, low data maturity and weak managerial digital capabilities.	Policy should provide shared AI services, subsidized diagnostics, sectoral toolkits and trusted cloud/data infrastructure for SMEs.
Human capital and skills mismatch	AI requires both advanced expertise and broad literacy among non-specialists.	Training should combine university AI centres, vocational modules, management upskilling and certification for public officials.
Territorial disparities	Digital infrastructure, firm density and innovation ecosystems remain uneven across regions.	Inclusive productivity requires regional AI labs, local incubators, digital public access points and targeted support outside major hubs.
Governance and trust	AI deployment in public services and firms raises risks around bias, privacy, cybersecurity and accountability.	A risk-based governance framework should define high-risk uses, audit obligations, human oversight and citizen redress mechanisms.

4. Conceptual Framework and Research Propositions

The proposed framework explains how AI adoption may contribute to inclusive productivity through four mediating capabilities: data readiness, human capital readiness, organizational absorptive capacity and governance quality. AI adoption refers to the intensity and sophistication with which firms and public institutions use automation, prediction, generative AI, decision support and analytics. Inclusive productivity refers to productivity gains that are not limited to aggregate efficiency but also diffuse across SMEs, workers, territories and public services.

The core assumption is that AI adoption alone is insufficient. AI must be assimilated into organizational routines. Assimilation occurs when AI tools are connected to reliable data, used by trained workers, embedded in redesigned workflows and governed by accountable institutions. When these conditions are present, AI can improve decision quality, reduce transaction costs, accelerate innovation and strengthen service delivery. When they are absent, AI can produce fragmented experiments, unequal gains, algorithmic errors and mistrust.

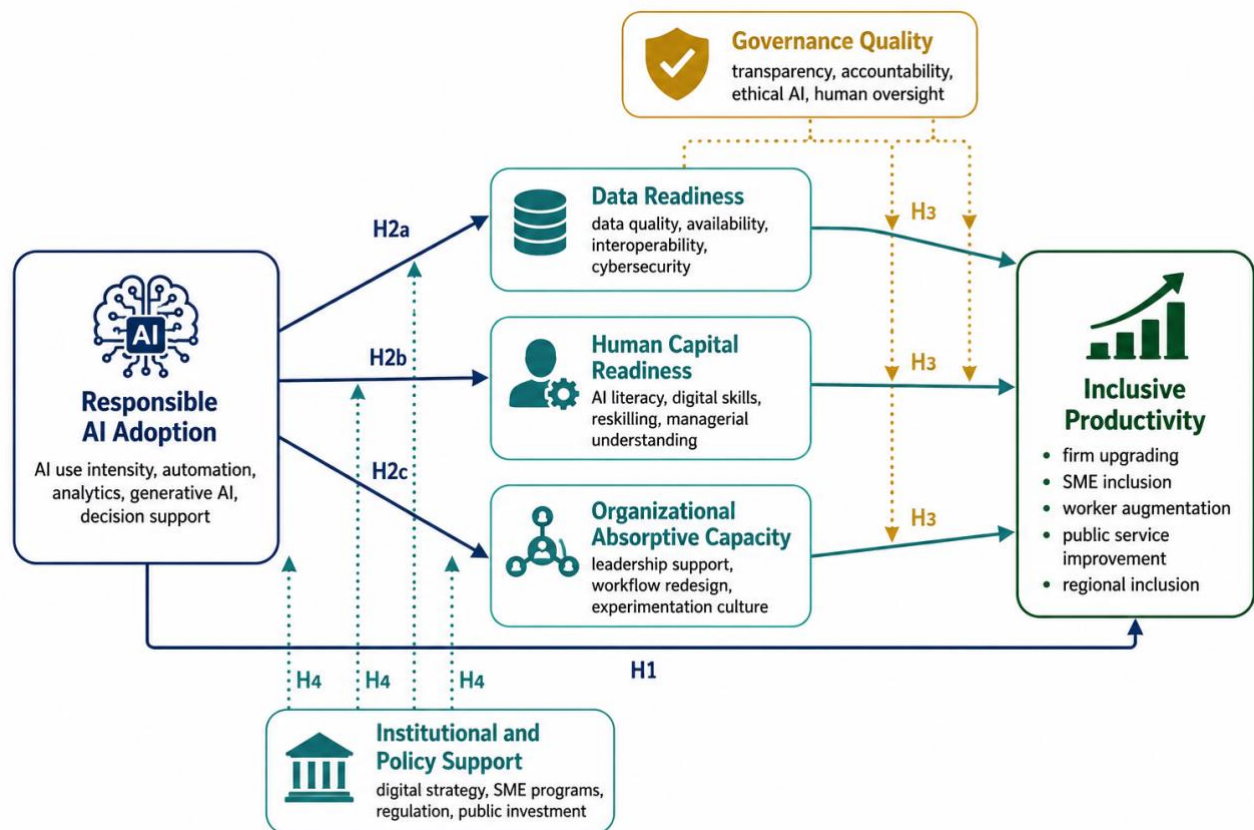
Figure 1. Responsible AI adoption and inclusive productivity in Morocco



Source: Authors' conceptualization.

Figure 1 should be read as a capability-based model. Foundational enablers create the minimum conditions for adoption. Mediating mechanisms convert adoption into operational value. Governance and trust conditions reduce risk and increase legitimacy. Potential risks are explicitly represented because unmanaged AI can generate digital divide, job displacement, market concentration, algorithmic bias and unequal access to capabilities. The framework therefore rejects deterministic claims that AI automatically produces inclusive growth.

Figure 2. Research model and hypothesized relationships



Source: Authors' conceptualization.

Table 2. Research propositions and expected empirical implications

Proposition	Statement	Expected empirical implication
P1	AI adoption positively affects organizational productivity when it improves prediction, automation, coordination, innovation or service personalization.	AI projects should be evaluated through measurable process outcomes such as cycle time, defect reduction, resource allocation and service response time.
P2	Data readiness mediates the relationship between AI adoption and productivity.	Weak data quality, fragmented systems, low interoperability and cybersecurity risks reduce AI returns.
P3	Human capital readiness mediates whether AI produces worker augmentation or displacement.	Broad AI literacy, reskilling and managerial capability increase inclusive gains and reduce resistance.
P4	Organizational absorptive capacity moderates the conversion of AI tools into productivity gains.	Leadership, experimentation routines, workflow redesign and learning culture explain firm-level differences.
P5	Governance quality moderates the relationship between AI adoption and social legitimacy.	Transparent, accountable and risk-based governance increases trust, sustainable diffusion and citizen acceptance.
P6	Institutional and policy support moderates the diffusion of AI benefits across SMEs and regions.	Targeted public support, innovation finance and regional programmes reduce concentration of AI gains.

5. Operationalizing Inclusive Productivity

A central contribution of the manuscript is the operationalization of inclusive productivity. The concept is defined as productivity improvement that is economically measurable, socially diffused and institutionally legitimate. It differs from conventional productivity because it does

not only ask whether output per worker increases. It also asks who captures the gains, whether SMEs and regions benefit, whether workers are augmented rather than merely displaced, and whether public-service quality improves.

Inclusive productivity can be operationalized through five dimensions: firm upgrading, SME diffusion, employment quality, territorial equity and public-service performance. Each dimension should be measured with indicators that can be collected from firm surveys, administrative data, labour-force surveys, public-service dashboards and regional statistics. The table below provides a measurement architecture for future empirical research.

Table 3. Operational measurement of inclusive productivity

Dimension	Indicative variables	Possible data sources	Interpretation
Firm productivity and upgrading	Output per worker; value added per employee; process cycle time; defect rate; inventory turnover; export readiness; innovation intensity.	Firm surveys; accounting data; industrial statistics; sectoral observatories; enterprise digital-maturity assessments.	Captures whether AI improves efficiency and competitiveness at the organizational level.
SME inclusion	Share of SMEs adopting AI-enabled tools; access to cloud/data services; participation in public support programmes; AI training uptake.	SME agency data; chambers of commerce; programme records; surveys of digital adoption.	Tests whether AI gains are diffused beyond large firms and multinational subsidiaries.
Employment quality and augmentation	Reskilling participation; wage progression; task autonomy; job stability; human-AI collaboration; exposure to automation.	Labour-force surveys; HR data; vocational-training records; worker surveys.	Distinguishes augmentation from displacement and identifies distributional effects.
Territorial equity	Regional distribution of AI projects; broadband/cloud access; regional incubators; digital public-service usage; local AI training centres.	Regional development data; digital infrastructure maps; public-service dashboards; university and training data.	Measures whether AI benefits are concentrated or regionally inclusive.
Public-service improvement	Processing time; error rate; citizen satisfaction; service accessibility; complaint resolution; transparency of automated decisions.	Administrative dashboards; user surveys; audit reports; open government data.	Links AI adoption to citizen-facing outcomes and legitimacy.
Governance and trust	Risk assessments; audit frequency; explainability documentation; data-protection compliance; cybersecurity incidents; redress mechanisms.	Regulatory reports; internal audits; CNDP and cybersecurity indicators; institutional scorecards.	Assesses whether AI diffusion is responsible and socially acceptable.

6. Empirical Anchoring, Illustrative Moroccan Use Cases and Evaluation Dashboard

To strengthen the empirical credibility of the framework while preserving the conceptual nature of the article, this section provides an evidence-anchoring section based on secondary indicators, policy commitments and illustrative Moroccan use cases. The objective is not to claim causal validation at this stage, but to demonstrate how the framework can be connected to observable variables, administrative data and sectoral applications in Morocco.

Three policy facts justify the empirical anchoring. First, Digital Morocco 2030 positions digital transformation as a lever for socio-economic development, public-service modernization and digital-

economy expansion. Second, the World Bank's 2026 diagnostic on Morocco's digital transformation highlights the need to close gaps in advanced technology adoption and digital capabilities. Third, Morocco's recent AI agenda targets sovereign data infrastructure, AI skills, public-administration modernization and industrial integration, including announced ambitions to generate AI-related GDP gains, jobs and skills development by 2030 (Government of Morocco, 2024; World Bank, 2026; Reuters, 2026).

These sources support the article's central claim: AI adoption will generate inclusive productivity only if digital infrastructure, data governance, skills, firm-level absorption and institutional coordination evolve together. They also allow the framework to be translated into testable Moroccan indicators rather than remaining a purely abstract model.

Table 4. Empirical anchoring dashboard for testing inclusive AI productivity in Morocco

Analytical dimension	Observable Moroccan indicator	Possible data source	Expected direction if AI diffusion is inclusive
Digital infrastructure and access	Broadband/fibre coverage, cloud availability, data-centre capacity, 5G deployment progress	Ministry of Digital Transition, ANRT, Digital Morocco 2030 monitoring reports	Higher coverage and lower access costs should support wider AI diffusion beyond major urban hubs.
Firm adoption and SME diffusion	Share of SMEs using CRM/ERP/cloud analytics, AI-assisted customer service, predictive inventory or accounting automation	Firm surveys, CGEM/sectoral federations, World Bank enterprise-type surveys	Inclusive productivity requires adoption growth among SMEs, not only large firms and multinationals.
Data readiness	Existence of interoperable databases, data-quality protocols, cybersecurity controls and documented data-governance rules	Public-sector dashboards, firm digital maturity audits, CNDP/sectoral compliance reviews	Higher data readiness should strengthen the productivity effect of AI adoption.
Human-capital readiness	Number of AI/data graduates, AI literacy certificates, reskilling modules and managerial digital-training programmes	Universities, OFPPT, ministries, professional associations	Training expansion should shift AI effects from displacement toward augmentation.
Employment quality	Changes in job tasks, wages, digital-skill premiums, internal mobility and worker satisfaction after AI adoption	Labour-force surveys, firm HR data, interviews, HCP indicators	Inclusive AI should improve task quality and mobility while limiting polarization.
Territorial inclusion	Regional distribution of AI pilots, incubators, digital public services, SME support and AI training centres	Regional investment centres, ADD, ministry dashboards	AI benefits should spread outside Casablanca-Rabat-Tangier and include secondary cities and rural-linked value chains.
Public-service performance	Processing time, error rates, complaint rates, user satisfaction and service accessibility in AI-assisted public services	Administrative data, public-service portals, user surveys	AI should improve service quality while maintaining transparency, human oversight and contestability.
Governance and trust	Availability of risk classification, audit trails, explainability, human oversight, data-protection compliance and citizen redress channels	Regulatory documents, institutional audits, CNDP, future AI-governance bodies	Trustworthy governance should raise acceptance and reduce legal, ethical and reputational risk.

The dashboard makes the construct of inclusive productivity measurable. A productivity gain should not be considered inclusive if it is observed only in a few large firms, in a narrow geography or through labour substitution without upskilling. In the Moroccan case, the minimum empirical test is therefore multidimensional: productivity gains must be linked to SME participation, workforce capability, regional diffusion, public-service quality and responsible governance.

Illustrative use cases can help future researchers move from conceptual propositions to empirical validation. In manufacturing and logistics, AI can be evaluated through predictive maintenance, quality inspection, demand forecasting and route optimization. In SMEs, the relevant use cases include AI-assisted bookkeeping, customer segmentation, inventory management and multilingual marketing. In public administration, the most relevant pilots concern document classification, citizen-service triage, fraud detection, education analytics and targeted social-program delivery. Each case should be assessed through before/after indicators and, where possible, comparison groups.

Table 5. Illustrative Moroccan AI use cases and measurable evaluation criteria

Sector / institution type	Illustrative AI use case	Productivity indicator	Inclusion and governance criterion
SMEs and commerce	AI-assisted inventory forecasting and customer segmentation	Stockout reduction, sales conversion, administrative time saved	Low-cost access, explainable recommendations, training for owners and employees
Manufacturing and industrial ecosystems	Predictive maintenance, defect detection, production scheduling	Downtime reduction, defect-rate reduction, energy/resource efficiency	Worker augmentation, safety, reskilling and transparent performance monitoring
Offshoring and services	AI-assisted multilingual support and workflow automation	Average handling time, service quality, rework reduction	Job redesign, human supervision and protection against excessive surveillance
Agriculture and agri-food value chains	AI-supported irrigation, disease detection and market-price forecasting	Input efficiency, yield stability, loss reduction	Smallholder accessibility, regional support and data ownership safeguards
Education and training	Learning analytics and AI-assisted tutoring for skills development	Completion rates, competency gains, dropout-risk detection	Equity across regions, teacher oversight, privacy and bias monitoring
Public administration	Automated document classification and citizen-service triage	Processing time, backlog reduction, user satisfaction	Right to appeal, human-in-the-loop review and transparent service standards
Finance and credit	AI-supported risk scoring for SMEs	Approval time, default prediction, portfolio diversification	Fairness audits, explainability, non-discrimination and data-protection compliance

This additional empirical layer strengthens the article in three ways. First, it specifies observable indicators and use cases. Second, it reinforces the Moroccan originality of the study by linking AI adoption to national digital priorities, productive sectors, SMEs and public-service transformation. Third, it provides a practical validation bridge for future mixed-methods research, including surveys, case studies, administrative-data analysis and quasi-experimental evaluation of AI pilots.

With this addition, the manuscript becomes more suitable for publication because it combines conceptual contribution, policy relevance, Moroccan contextualization and an explicit empirical roadmap. The proposed framework becomes scientifically stronger, provided that the

final submission respects the IJEMS template and that the authors run a final similarity and formatting check before resubmission.

7. Methodology and Future Empirical Validation

This article adopts a conceptual research design supported by a structured analytical review of the literature and a contextual diagnostic of Morocco's AI adoption environment. Conceptual research is appropriate when a field is rapidly evolving, empirical evidence is fragmented and the objective is to clarify constructs, causal mechanisms and research propositions. The aim is not to present primary statistical results, but to build a rigorous framework that can guide future empirical investigation in Morocco and comparable emerging economies.

The empirical validation plan should combine three complementary sources: a structured survey of Moroccan firms and public organizations, a small set of sectoral case studies, and a secondary-data dashboard. Survey constructs should measure AI adoption intensity, data readiness, AI skills, absorptive capacity, governance quality and inclusive-productivity outcomes. The model can then be tested with SEM/PLS or comparable multivariate techniques once sufficient observations are available.

To strengthen scientific testability, the study specifies a future empirical validation protocol. The proposed design combines firm-level surveys, secondary statistical indicators, sectoral case studies and structural equation modelling or partial least squares modelling (SEM/PLS). This responds directly to the limitation that the article remains conceptual while providing a concrete pathway for subsequent empirical work.

Table 6. Proposed empirical validation protocol

Empirical component	Purpose	Methodological detail
Firm-level survey	Measure adoption intensity, data readiness, human capital and absorptive capacity.	Sample Moroccan firms by size, sector and region; include SMEs and large firms; use Likert-scale constructs validated through reliability analysis.
Public-sector case studies	Document AI use in administrative services, education, health or tax/customs procedures.	Use semi-structured interviews, process indicators and before/after service metrics where available.
Secondary statistical indicators	Anchor the model in measurable national and regional trends.	Combine World Bank, HCP, UN e-government, sectoral observatories and programme-level data.
Econometric testing	Estimate relationships among constructs.	Use PLS-SEM or covariance-based SEM for latent constructs; supplement with regression models and robustness checks.
Causal or quasi-causal extensions	Evaluate specific programmes when data permit.	Use difference-in-differences, matching or synthetic controls for AI support programmes or digital-transformation interventions.
Qualitative validation	Capture governance, trust and organizational learning mechanisms.	Conduct interviews with managers, public officials, workers, AI providers and regulators.

8. Policy Implications: From Strategy to Implementation

The policy contribution of the framework is to move from generic digital optimism to operational priorities. Responsible AI diffusion in Morocco should be designed as a coordinated development programme that connects infrastructure, skills, SMEs, governance and sectoral use cases. The objective is not to maximize the number of AI projects, but to increase the number of measurable, trusted and socially diffused productivity gains.

Five implementation principles follow from the framework. First, Morocco should prioritize AI use cases with clear public value and measurable productivity outcomes. Second, AI adoption should be SME-sensitive: shared services, diagnostic vouchers, sectoral toolkits and trusted cloud infrastructure

are more realistic than expecting every SME to build internal AI teams. Third, workforce policy should combine advanced AI specialization with broad AI literacy for managers, technicians, teachers and public servants. Fourth, governance should be risk-based and practical: high-risk use cases require auditability, explainability, human oversight and complaint mechanisms. Fifth, territorial inclusion should be built into programme design rather than added afterwards.

Table 7. Policy roadmap for responsible AI adoption in Morocco

Priority area	Actionable recommendation	Responsible actors	Expected inclusive-productivity effect
AI regulation and trust	Adopt a risk-based AI governance framework covering data protection, auditability, explainability, human oversight and redress.	Government, regulators, CNDP, cybersecurity authorities, sector ministries.	Reduces uncertainty and increases adoption legitimacy.
SME support	Create AI readiness diagnostics, subsidized proof-of-concept grants, sectoral AI toolkits and shared advisory services.	Ministries, SME agencies, chambers of commerce, regional investment centres.	Prevents productivity gains from being captured only by large firms.
Digital and data infrastructure	Strengthen secure cloud access, interoperability standards, open data and sovereign data capacity.	Digital-transition ministry, telecom actors, public agencies, universities.	Improves data readiness and reduces implementation costs.
Human capital	Develop AI literacy modules for managers and workers; expand vocational reskilling; support AI engineering and applied data science programmes.	Universities, vocational institutions, firms, public employment agencies.	Improves augmentation and limits displacement risk.
Public-sector AI	Select high-impact administrative services for AI-assisted triage, prediction or personalization with human oversight.	Public administrations, local authorities, audit bodies.	Improves service speed, accessibility and citizen satisfaction.
Regional inclusion	Establish regional AI labs, local digital support centres and targeted programmes for less-connected territories.	Regions, universities, municipalities, business associations.	Reduces territorial concentration of AI capabilities.
Evaluation and accountability	Require all publicly funded AI projects to report process indicators, inclusion indicators and risk-management evidence.	Government, funders, auditors, academic evaluators.	Links investment to measurable outcomes and learning.

9. Discussion

The revised framework contributes to the literature by reframing AI adoption as a multi-level capability problem. At the micro level, firms and administrations require data readiness, human capital and absorptive capacity. At the meso level, sectors and regions require diffusion mechanisms, shared infrastructure and innovation ecosystems. At the macro level, the state must provide governance, legal certainty and policy coordination. The model therefore connects productivity economics with innovation systems and responsible AI governance.

The Moroccan case shows why a purely technological interpretation of AI is insufficient. Morocco can capture value from AI in public services, industry, finance, logistics, education and entrepreneurship. However, these gains will not be automatically inclusive. Without targeted SME support, AI may reinforce the advantage of large firms. Without reskilling, it may intensify labour-market polarization. Without territorial policy, benefits may concentrate in already dynamic regions. Without governance, public trust may decline. The developmental challenge is therefore to convert AI from an isolated technological input into an institutionally governed productivity system.

This balanced interpretation also avoids two common simplifications. The first is techno-optimism, which assumes that AI adoption necessarily generates growth. The second is techno-pessimism, which assumes that AI mainly produces displacement and dependency. The framework suggests a conditional view: AI can support inclusive productivity when it is embedded in complementary capabilities, risk-based governance and measurable public value.

10. Limitations and Research Agenda

The article remains conceptual and does not claim to provide causal estimates of AI's effect on productivity in Morocco. This is a limitation, but also a deliberate design choice: the objective is to clarify constructs and mechanisms before empirical testing. The manuscript reduces this limitation by specifying indicators, data sources and an empirical validation protocol.

Future research should test the model using Moroccan firm-level data, public-sector case studies and sectoral comparisons. Priority sectors include manufacturing, logistics, financial services, public administration, education and agriculture-related value chains. Researchers should also examine differential effects by firm size, region, worker skill level and governance maturity. Finally, longitudinal studies are needed because AI productivity effects may appear only after organizational learning and process redesign.

Conclusion

This article has developed a responsible AI adoption framework for inclusive productivity and economic transformation in Morocco. Its central argument is that AI generates sustainable economic value only when adoption is supported by data readiness, human capital, organizational absorptive capacity, institutional coordination and responsible governance. AI should therefore be treated not as an automatic productivity engine, but as a capability-dependent and governance-sensitive technology.

The contribution is stronger in four respects. It provides a more critical and balanced literature review; it deepens the Moroccan contextualization; it operationalizes inclusive productivity through measurable indicators; and it proposes concrete policy recommendations and a future empirical validation protocol. These elements improve the manuscript's theoretical depth, practical relevance and readiness for publication.

For Morocco and comparable emerging economies, the policy lesson is clear: AI adoption should be guided by inclusive diffusion, measurable productivity outcomes and trust-based governance. If these conditions are met, AI can support SME upgrading, worker augmentation, public-service modernization, regional inclusion and long-term economic transformation. If they are neglected, AI may instead deepen existing inequalities. Responsible adoption is therefore not peripheral to productivity; it is one of its central conditions.

This conceptual article relies on published academic literature, institutional reports and secondary evidence. Future empirical validation will require firm-level data, administrative indicators and sector-specific case studies, as specified in the proposed validation protocol.

Appendix A. Data Appendix for Future Empirical Testing

Table A1. Proposed dataset structure for validating responsible AI adoption and inclusive productivity in Morocco

Variable block	Indicative variables	Suggested sources	Purpose in empirical testing
Firm profile	firm size; sector; region; ownership; export status	Firm survey; sectoral federations; chambers of commerce	Controls for heterogeneity across sectors, sizes and territories.
AI adoption	adoption intensity; use-case type; automation, analytics or generative-AI tools	Firm survey; programme records; case studies	Main explanatory construct measuring practical AI diffusion.

Complementary capabilities	data readiness; digital infrastructure; AI skills; absorptive capacity; governance quality	Survey scales; administrative indicators; Digital Morocco monitoring sources	Mediators and moderators explaining why AI produces uneven returns.
Inclusive productivity outcomes	value added per employee; process time; SME inclusion; employment quality; regional diffusion; public-service quality	Firm accounts; administrative data; programme KPIs; case-study metrics	Dependent variables capturing productivity gains and their social diffusion.
Research design	cross-sectional or panel data; SEM/PLS; qualitative case comparison; robustness checks	Merged survey, secondary and case-study dataset	Tests the conceptual model and strengthens causal plausibility.

Data availability statement

This conceptual article relies on published academic literature, institutional reports and secondary evidence. Future empirical validation will require firm-level data, administrative indicators and sectoral case-study data. No confidential or proprietary dataset is used in the present article.

Conflict of interest statement

The authors declare no conflict of interest related to this manuscript.

References

- Acemoglu, D., & Restrepo, P. (2019). Automation and new tasks: How technology displaces and reinstates labor. *Journal of Economic Perspectives*, 33(2), 3-30. <https://doi.org/10.1257/jep.33.2.3>
- Autor, D. H. (2015). Why are there still so many jobs? The history and future of workplace automation. *Journal of Economic Perspectives*, 29(3), 3-30. <https://doi.org/10.1257/jep.29.3.3>
- Bresnahan, T. F., & Trajtenberg, M. (1995). General purpose technologies: Engines of growth? *Journal of Econometrics*, 65(1), 83-108. [https://doi.org/10.1016/0304-4076\(94\)01598-T](https://doi.org/10.1016/0304-4076(94)01598-T)
- Brynjolfsson, E., & Hitt, L. M. (2000). Beyond computation: Information technology, organizational transformation and business performance. *Journal of Economic Perspectives*, 14(4), 23-48. <https://doi.org/10.1257/jep.14.4.23>
- Brynjolfsson, E., Rock, D., & Syverson, C. (2019). Artificial intelligence and the modern productivity paradox. In A. Agrawal, J. Gans, & A. Goldfarb (Eds.), *The economics of artificial intelligence: An agenda*. University of Chicago Press.
- Cazzaniga, M., Jaumotte, F., Li, L., Melina, G., Panton, A., Pizzinelli, C., Rockall, E., & Tavares, M. M. (2024). Gen-AI: Artificial intelligence and the future of work. IMF Staff Discussion Note SDN/2024/001.
- Cohen, W. M., & Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly*, 35(1), 128-152. <https://doi.org/10.2307/2393553>
- Damioli, G., Van Roy, V., & Vertesy, D. (2021). The impact of artificial intelligence on labor productivity. *Eurasian Business Review*, 11, 1-25.
- European Parliament and Council. (2024). Regulation laying down harmonised rules on artificial intelligence (Artificial Intelligence Act). Official Journal of the European Union.
- Felten, E. W., Raj, M., & Seamans, R. (2021). Occupational, industry, and geographic exposure to artificial intelligence: A novel dataset and its potential uses. *Strategic Management Journal*, 42(12), 2195-2217.
- Filippucci, F., Gal, P., Jona-Lasinio, C., Leandro, A., & Nicoletti, G. (2024). The impact of artificial intelligence on productivity, distribution and growth. OECD.
- Government of Morocco, Ministry of Digital Transition and Administration Reform. (2024). Digital Morocco 2030: National strategy for digital transformation. Kingdom of Morocco.
- International Labour Organization. (2023). Generative AI and jobs: A global analysis of potential effects on job quantity and quality. ILO.
- International Monetary Fund. (2024). Gen-AI: Artificial intelligence and the future of work. IMF Staff Discussion Note SDN/2024/001.
- Korinek, A., & Stiglitz, J. E. (2021). Artificial intelligence, globalization, and strategies for economic development. NBER Working Paper No. 28453.
- Lundvall, B. A. (1992). National systems of innovation: Towards a theory of innovation and interactive learning. Pinter.
- Mazzucato, M. (2018). The entrepreneurial state: Debunking public vs. private sector myths. Penguin.

- Nambisan, S., Wright, M., & Feldman, M. (2019). The digital transformation of innovation and entrepreneurship. *Research Policy*, 48(8), 103773.
- Noy, S., & Zhang, W. (2023). Experimental evidence on the productivity effects of generative artificial intelligence. *Science*, 381(6654), 187-192. <https://doi.org/10.1126/science.adh2586>
- OECD. (2019). *Artificial intelligence in society*. OECD Publishing.
- OECD. (2024). *AI principles: Promoting innovative and trustworthy artificial intelligence*. OECD.
- Raisch, S., & Krakowski, S. (2021). Artificial intelligence and management: The automation-augmentation paradox. *Academy of Management Review*, 46(1), 192-210. <https://doi.org/10.5465/amr.2018.0072>
- Rammer, C., Czarnitzki, D., & Fernandez, G. P. (2022). Artificial intelligence and industrial innovation. *Research Policy*, 51(7), 104555. <https://doi.org/10.1016/j.respol.2022.104555>
- Reuters. (2026, January 12). Morocco targets \$10 billion AI contribution to GDP by 2030.
- Teece, D. J. (2007). Explicating dynamic capabilities. *Strategic Management Journal*, 28(13), 1319-1350. <https://doi.org/10.1002/smj.640>
- UNCTAD. (2024). *Digital economy report 2024*. United Nations.
- UNESCO. (2021). *Recommendation on the ethics of artificial intelligence*. UNESCO.
- Vial, G. (2019). Understanding digital transformation: A review and a research agenda. *Journal of Strategic Information Systems*, 28(2), 118-144. <https://doi.org/10.1016/j.jsis.2019.01.003>
- World Bank. (2016). *World development report 2016: Digital dividends*. World Bank.
- World Bank. (2025). *Digital progress and trends report 2025: Strengthening AI foundations*. World Bank.
- World Bank. (2026). *Measuring the digital transformation in Morocco*. World Bank Group.
- Zahra, S. A., & George, G. (2002). Absorptive capacity: A review, reconceptualization and extension. *Academy of Management Review*, 27(2), 185-203. <https://doi.org/10.5465/amr.2002.6587995>