

Digital Transformation as a Lever to Enhance Local Economic Diversification: Reality and Challenges – A Case Study of the Smart Village in Biskra

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Abstract:

Digital transformation is increasingly viewed as a strategic tool for economic diversification in resource-dependent countries like Algeria. This study explores its role through the Smart Village in Biskra, a key initiative within Algeria's National Digital Economy Strategy (2023–2030). Using a qualitative case study approach, it identifies gaps between policy ambitions and implementation, linked to infrastructure, skills, regulation, and market integration. The findings highlight both opportunities and constraints, concluding with recommendations to strengthen the digital ecosystem and promote sustainable diversification.

Keywords: Digital Transformation; Economic Diversification; Smart Village; Rural Development; Algeria; Digital Economy; Case Study.

JEL Classification Codes : O33, O14, O18, L86, D22, H54, P48.

1. INTRODUCTION

In the Fourth Industrial Revolution era, digital transformation has become a strategic necessity for sustainable development, especially in resource-dependent economies. For Algeria, where hydrocarbons generate over 90% of export revenues, it offers a pathway to reduce oil dependency, address structural vulnerabilities, and promote inclusive growth. The National Digital Economy Strategy (2023–2030) positions digitalization as

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central to diversification and modernization, with the Smart Village in Biskra as a flagship initiative to foster digital innovation, youth entrepreneurship, and smart agriculture in rural areas.

This study examines how the Smart Village contributes to local economic diversification, assessing the gap between policy ambitions and on-the-ground realities. Despite investments in e-government, infrastructure, and startups, rural impact remains limited due to weak connectivity, skills shortages, fragmented legislation, and poor market alignment. The central research question asks whether digital transformation, as applied in the Smart Village, can effectively drive diversification and what structural and institutional barriers impede its success.

1.1. This study addresses the following research questions:

- What are the key components and strategic objectives of Algeria's National Digital Economy Strategy (2023–2030), and how do they support economic diversification?
- In what ways does the Smart Village in Biskra serve as a model for digital-driven rural development?
- What infrastructural, institutional, human, and cultural challenges hinder digital transformation in rural Algeria?
- How does Algeria's digital performance compare with regional and global benchmarks in e-government, internet speed, cybersecurity, and innovation?
- What policy measures can improve the effectiveness of digital initiatives in fostering sustainable local economic diversification?

1.2. Objectives of the Study

- Examine the role of digital transformation in advancing local economic diversification in Algeria.
- Assess the Smart Village in Biskra as a case study of rural digital development.
- Identify structural and institutional barriers limiting the impact of digital initiatives.

- Benchmark Algeria's digital performance against regional and global standards.
- Recommend evidence-based policies to strengthen the digital ecosystem and support sustainable economic transformation.

1.3. Significance of the Study

This research holds both theoretical and practical significance:

- Theoretically, it contributes to the growing literature on digital transformation in developing economies by providing an in-depth case study of a resource-dependent country attempting structural economic reform through digital innovation.
- Empirically, it offers a rare qualitative analysis of a recently launched digital initiative in rural Algeria, filling a gap in the existing research.
- Practically, the findings provide actionable insights for policymakers, development agencies, and local stakeholders on how to improve the design, implementation, and sustainability of digital development projects.
- Policy-wise, the study highlights the need for integrated ecosystems, market-oriented innovation, and sustainable financing models to ensure that digital transformation translates into real economic outcomes.

By focusing on a concrete case—the Smart Village in Biskra—this study moves beyond abstract policy discourse to examine the real-world challenges and opportunities of digital-driven development in marginalized regions.

2. Theoretical Framework of Digital Transformation and Economic Diversification: Theoretical Approaches to Understanding the Integrative Relationship

2.1. Concept of Digital Transformation

Digital transformation, driven by technologies like AI, big data, and cloud computing, is a strategic enabler of competitiveness and diversification, particularly in resource-dependent economies such as Algeria.

2.1.1 Definition of Digital Transformation

Digital transformation is defined as "a modern business model based on leveraging digital technologies to create new products and services, develop their distribution channels, and place central emphasis on customer needs

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and experience " (Ghareci Saddoki, 2021, p. 101) .It is also defined as "a process through which institutions transition to a work model grounded in digital technologies to innovate products and services, open new revenue streams, and increase added value. This transition requires the development of a comprehensive digital strategy, assessment of existing digital capabilities, identification of an optimal digital marketing structure, addressing barriers to digital integration, and adopting effective change management to achieve strategic objectives" (Mustapha, 2021, p. 286).

2.1.2. Objectives of Digital Transformation

In the context of digital transformation, two main types of objectives can be distinguished: external objectives focused on improving user experience, and internal objectives aimed at enhancing institutional performance (Taghreed Mohamed Atef & Abdul-Halim Al-Ghannadour, 2023, pp. 3-6) :

External strategic objectives focus on meeting citizens' needs by expanding access to online government services and promoting transparent, accountable engagement with public and private sectors. Internal objectives aim to improve administrative efficiency by streamlining procedures, enhancing performance, and reducing transaction costs. E-government, therefore, is not just a technical tool but a multidimensional concept encompassing political, economic, social, and technological aspects.

2.1.3. Benefits of Digital Transformation

Digital transformation is a pivotal strategy for any nation's future, offering multiple benefits for government institutions, private companies, and citizens alike. Key benefits include (Nassima, 2021, p. 343):

Key benefits of digital transformation include achieving institutional goals and strategic visions at lower costs, improving service quality, and simplifying procedures. It enables broader outreach, strengthens public-private partnerships through inter-ministerial cooperation, and enhances transparency and governance, reducing errors and corruption. Additionally, it fosters innovative services by leveraging modern technologies for flexibility, foresight, and sustainability—both environmental and financial—while improving efficiency, cutting expenses, and ensuring rapid, smooth service delivery across sectors.

2.1.4. Requirements, Technologies, and Application Domains of Digital Transformation

Digital transformation rests on three pillars: foundational requirements, enabling technologies, and application domains. Its success depends on more than technological progress—it requires skilled human capital, managerial commitment, and robust infrastructure. Leadership support, trained teams, and adequate technical tools are essential for implementation. Technologically, it draws on innovations such as AI, IoT, virtual and augmented reality, blockchain, 3D printing, big data, cloud computing, and cybersecurity to safeguard systems and data. Application spans diverse sectors—economy, industry, trade, tourism, health, and education—demonstrating its comprehensive and structural impact on the national economy. (Nassima, 2021, p. 344.)

These elements are summarized in the following table:

Table 01: Requirements, Technologies, and Application Domains of Digital Transformation

Requirements	Technologies	Application Domains
- Top management support	-Artificial Intelligence	- Economy
- Skilled human resources (integrated, trained teams)	- Internet of Things (IoT)	- Industry
-Technical requirements (hardware and software)	- Virtual and Augmented Reality	- Trade and Tourism
	-Blockchain	- Health and Education
	- 3D Printing	
	- Big Data	
	-Cloud Computing	

Source : (Nassima, 2021, p. 344.)

2.1.5. Factors Influencing the Adoption of Digital Transformation

The adoption of digital transformation is influenced by a set of interrelated factors that determine individuals' and institutions' ability to engage in the digital economy. These factors can be classified into five main categories: (Ridwan, 2012, p. 113)

Economic factors include the cost of adopting modern technologies, the financial capacity of individuals and institutions, and general income levels influencing investment in digital solutions. Administrative and regulatory factors involve institutional efficiency, a clear legal framework that protects consumers and fosters innovation, and the presence of financial institutions supporting digital adoption.

Infrastructure factors encompass internet connectivity, electricity supply, and the overall state of technological infrastructure, forming the foundation for digital transformation. Market structure factors include fragmentation, enterprise size, and the prevalence of the informal economy, which limit SMEs' capacity for digital adoption and hinder service standardization. Cultural factors involve education and literacy levels, language use, availability of relevant digital content, and trust in the digital economy—a prerequisite for broad participation in digital transformation.

2.2. Concept of Economic Diversification

Economic diversification is a strategic necessity for all countries, aiming to expand income sources, promote sustainable development, and ensure inclusive growth. In resource-dependent economies, it goes beyond diversifying exports to developing multiple sectors that strengthen national income and build a more resilient, sustainable economy.

2.2.1. Definition of Economic Diversification

Economic diversification is defined as "the process of diversifying income sources, expanding the production base, and increasing the contribution of goods and services sectors to GDP, thereby freeing the economy from the risks of dependence on the dominance of a single primary commodity" (Chakouri, 2012, p. 63) .

Economic diversification is a development policy aimed at reducing risks, increasing added value, and improving incomes by redirecting the economy toward diverse sectors or markets, rather than relying on a single

source. It may involve diversifying GDP sources, public revenues, or export markets ."(Alfi Merzoug Atef, 2014, p. 57)

Achieving economic diversification requires structural reforms that build a broad production base across multiple high-value, competitive industrial chains, pursued through two main types of expansion: (Association, 2017)

Achieving economic diversification requires structural reforms that establish a broad production base across high-value, competitive industrial chains, pursued through two types of expansion: horizontal diversification, which introduces new products related or unrelated to the dominant sector, and vertical diversification, which enhances product value by utilizing local or imported inputs and progressively moving across related industries.

2.2.2. Objectives of Economic Diversification

The main objectives of economic diversification can be summarized as follows: (Jirar, 2018, p. 515)

Rationales for economic diversification include reducing risks and enhancing resilience to external shocks such as commodity price volatility, agricultural droughts, and global economic downturns. It supports sustainable development by expanding diverse income and foreign currency sources, increasing GDP contributions, and attracting investment. Diversification also fosters self-sufficiency, boosts exports, reduces import dependence, creates jobs, and improves living standards, while empowering the private sector and limiting state dominance. (Bahi & Rouaïnia, 2016, p. 186):

Key drivers of economic diversification include trade fluctuations, global commodity price instability, long-term depletion of natural resources, the pursuit of external economies of scale, and risk reduction through diversified income sources. Objectives vary by time horizon: in the short term, the focus may be on boosting productivity and revenues in the primary sector (e.g., oil) to increase its GDP and export share; in the long term, revenues from this sector should finance sustainable development by investing in non-oil sectors, transforming it from a mere revenue source into a strategic tool for genuine diversification.

2.2.3. Indicators for Measuring Economic Diversification

The degree of economic diversification in any country can be assessed through a set of quantitative and qualitative indicators that reflect structural changes in the economy. These include: (Mehriq Adel & Benhamouda Mahboub, 2016):

Key indicators of economic diversification include: the rate of structural change measured by sectoral contributions to GDP over time; GDP stability relative to primary commodity price volatility; the shifting balance between public and private sector contributions, with greater private sector engagement signaling success; changes in labor distribution toward higher value-added sectors; and the ratio of non-oil exports to total exports, where sustained growth reflects tangible diversification. Ultimately, diversification is not merely multiplying activities, but building a real economy with a broader production base and multiple sustainable income sources, reducing reliance on a single resource and strengthening resilience to external shocks.

2.2.4. Determinants of Successful Economic Diversification

The United Nations Economic Commission for Africa (UNECA, 2006) identifies five categories of variables influencing the economic diversification process: (Arab Institute for Planning, 2006)

The drivers of economic diversification encompass several interrelated factors. Material factors—notably investment and human capital—form the foundation for building a diversified production base. Public policies, including fiscal, trade, and industrial strategies, play a central role in strengthening the industrial base and steering the economy toward high-value-added sectors. Macroeconomic variables, such as exchange rates, inflation, and external balances, shape the investment climate and overall stability. Institutional factors, including governance quality, the investment environment, and security conditions, are essential for attracting capital and fostering innovation. Finally, market access—through openness to trade in goods, services, and capital, the removal of trade barriers, and the availability of financing—enables domestic enterprises to integrate into and compete in global markets.

3. Digital Transformation in Algeria as a Lever for Economic Diversification: From Policy to Field Implementation (A Case Study of the Smart Village in Biskra)

Digital Transformation as a Catalyst for Economic Diversification in Algeria .Digital transformation represents a strategic lever for advancing economic diversification in Algeria. Nevertheless, a notable gap remains between ambitious policy frameworks and practical implementation. The Smart Village project in Biskra illustrates this disparity, acting as a microcosm where developmental aspirations intersect with structural and operational challenges. This section examines Algeria's digital transformation policies, assesses their potential contributions to economic diversification, and identifies the key barriers that impede their effective realization.

3.1. Analysis of Algeria's Digital Policies and Their Role in Economic Diversification

Digital transformation constitutes a pivotal instrument for diversifying Algeria's economy and reducing its dependency on hydrocarbons. National strategies have prioritized infrastructure enhancement, the promotion of innovation, and the modernization of public administration. While notable progress has been achieved in strategic planning, the overall effectiveness of these initiatives remains constrained by weak implementation mechanisms and the persistent fragmentation of the national digital ecosystem.

3.1.1. Algeria's National Digital Economy Strategy (2023–2030)

Algeria has adopted a National Digital Economy Strategy (2023–2030) aimed at transitioning toward a knowledge-based economy by reducing reliance on fossil fuels (Economy, 2023). The National Digital Strategy is structured around three key pillars: (1) development of digital infrastructure, (2) expansion of e-government services, and (3) support for innovation and entrepreneurship. This initiative is central to Algeria's efforts to diversify the economy, modernize public services, and generate employment in emerging digital sectors.

The strategy has significantly contributed to economic growth by fostering employment and innovation. For example, the National

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Employment Agency (ANSEJ) launched the digital platform Fursati, which connects job seekers to digital training and employment opportunities, thereby addressing unemployment. Furthermore, the expansion of mobile services has positively impacted the economy; empirical data indicates that a 10% increase in mobile subscriptions is associated with a 0.8% increase in GDP. (Adala Laajal & Goual Nadia, 2019, pp. 230-231). In 2016, the telecommunications sector contributed 4% to GDP, with projections indicating a rise to 8% in the coming years. Additionally, the sector has generated over 140,000 jobs, underscoring its role as a sustainable economic driver.

➤ Digital Infrastructure in Algeria

Digital infrastructure is the cornerstone of an effective digital economy, encompassing key indicators such as mobile subscriptions and internet penetration. In Algeria, fixed-line services are managed by "Algérie Télécom," while mobile services are provided by three operators: Djezzy, Mobilis, and Ooredoo (Khaloufi & others, 2020, p. 82). According to World Bank data, there has been gradual improvement: mobile subscription rates reached 109% in 2022, and internet usage stood at 71% in 2021. However, these figures remain low compared to regional and global standards, indicating a deep digital divide that hinders digital transformation (Bank W., 2022).

➤ E-Government in Algeria

In 2008, Algeria launched the "Digital Algeria 2013" program to institutionalize e-government. Key achievements under this initiative include the establishment of official websites for all ministries and public agencies, alongside economic platforms such as those of the National Investment Development Agency (ANDI) and the Directorate General of Customs. Additionally, digital public services have been introduced, including remote access to criminal record certificates, enhancing citizen access and administrative efficiency. (Btata & Abdel-Karim Baadach,, 2020, pp. 416–418).

The United Nations E-Government Development Index (EGDI) provides insight into Algeria's progress:

Table 02: E-Government Development Index (EGDI) in Algeria (2010 -2022)

Year	2010	2012	2014	2016	2018	2020	2022
EGDI Score	0.3181	0.3608	0.3106	.02999	.04227	.05173	.05611
Global Rank	131	132	136	150	130	120	112

Source: (E-Government, 2022, pp. 53-82)

Despite a modest improvement—from rank 131 in 2010 to 112 in 2022—Algeria lags behind regional peers such as Morocco (rank 82) and Tunisia (rank 91). This indicates limited deepening of digital applications and insufficient integration across government services.

➤ E-Commerce in Algeria

E-commerce in Algeria remains underdeveloped despite the emergence of prominent platforms such as Ouedkniss.com (launched in 2006), one of the oldest e-commerce marketplaces in the country, and others like Guiddini (2010), Achriya, Nchri fi el-net, Dar El Chahab, and SOUQ El Djazaïr. Public institutions such as Poste Algérie also offer digital services for parcel tracking and online requests.

However, e-commerce activities remain marginal due to:

- Limited marketing and digital awareness,
- User concerns about fraud and online scams,
- Absence of reliable electronic payment systems,
- Dominance of the informal economy (Karima Serrah & Baghdad Kerbali, 2019, p. 220).

➤ Support for Innovation and Startups

Digital transformation is critical for Algeria to align with global advancements. The country is advancing a knowledge- and innovation-driven economic model by prioritizing startups as a central pillar of economic diversification. Achieving this requires a conducive business environment and a supportive digital economy.

To foster innovative startups, the Algerian government has implemented strategic measures including:

- **Financial incentives:** tax exemptions on income and value-added tax (VAT),
- **Official recognition:** awarding the “Startup” label to qualifying ventures,

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- **Regulatory and financial frameworks:** enactment of startup-specific legislation and establishment of the Algerian Investment Fund (AIF) and Startup Support Fund (ASF),
- **Crowdfunding:** initiation of digital crowdfunding platforms,
- **Support structures:** creation of incubators and accelerators such as Algeria Venture and university-affiliated incubators,
- **Export facilitation:** exemption of startups engaged in digital service exports from bank domiciliation requirements. (APS., 2021).

3.2. Challenges Facing Digital Transformation in Algeria

Digital transformation is a multifaceted process requiring the alignment of various enabling factors. In Algeria, several structural challenges significantly hinder its effective implementation: (Hamou, p. 287)

- **Weak Digital Infrastructure:** Internet networks are characterized by low speeds and limited coverage, particularly in rural and remote areas. High data costs relative to average incomes restrict universal access and exacerbate digital divides across social and geographic groups.
- **Shortage of Skilled Human Capital:** Despite growth in higher education, critical deficits remain in expertise areas such as artificial intelligence, data analytics, cybersecurity, and digital entrepreneurship. This skills gap constrains institutional capacity to adopt advanced technologies and convert innovation into economic value.
- **Legislative and Regulatory Deficiencies:** Existing legal frameworks have not kept pace with the digital era. Algeria lacks comprehensive laws addressing personal data protection, digital intellectual property rights, and streamlined startup regulations. This regulatory void undermines investment confidence and creates uncertainty for economic actors.
- **Cultural Resistance and Adoption Reluctance:** Digital solutions face skepticism in some institutions, notably public administration, due to concerns over job security and changes in work practices. In

rural areas, limited digital literacy and difficulties in using digital tools further slow adoption.

- **Cybersecurity Threats:** The expansion of digital services increases vulnerability to cyberattacks such as hacking, data breaches, and corporate extortion. Weak cybersecurity infrastructure and inadequate preventive measures pose significant risks, eroding trust in the digital economy.

3.3. Algeria's Position Relative to Leading Digital Nations

International indicators reveal that Algeria remains relatively behind in the digital transformation race, despite modest improvements in some areas. This comparison highlights a deep digital gap in infrastructure, innovation, and internet speed, calling for enhanced investment and policy reform to keep pace with global trends.

3.3.1. Current State of Digital Transformation in Algeria

Algeria has witnessed notable momentum in digital transformation, with the government implementing multidimensional strategies to develop digital infrastructure, improve internet quality, and modernize digital administration systems: (Economy, 2023). These efforts aim to empower public and private institutions and vital sectors such as government services, health, education, financial services, and e-commerce.

Despite these ambitious initiatives, Algeria faces structural challenges that hinder tangible progress. A clear digital divide persists in technological integration compared to regional and global peers, evident in infrastructure, human capital, and widespread adoption of digital solutions. International reports suggest that this gap limits policy effectiveness and impedes real-world impact.

Thus, while digital transformation is a crucial strategic step toward improving institutional performance and modernizing public services, challenges related to digital infrastructure, funding, and technological adoption require sustained and intensified efforts to accelerate the process and achieve its medium- and long-term objectives.

3.3.2. Algeria's Ranking in Digital Transformation Indicators (2023–2024)

- **E-Government Development Index (EGDI):**

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- **Rank:** 112 globally (out of 193 countries, 2022)
- **Progress:** Slight improvement from rank 120 in 2020
- **Context:** Algeria ranks behind neighbors Morocco (82) and Tunisia (91)
- **Source:** (E-Government, 2022)
- **Internet Speed Index:**
 - **Average speed:** 35.2 Mbps (2024)
 - **Global rank:** 110
 - **Context:** Eight times slower than the UAE (290 Mbps)
 - **Source:** (Ookla, 2024).
- **Global Cybersecurity Index (GCI):**
 - **Rank:** 78 globally (2023)
 - **Progress:** Improved from rank 85 in 2022
 - **Context:** Still far behind Saudi Arabia (rank 13)
 - **Source:** :((ITU), 2023)
- **Digital Economy Index (Africa):**
 - **African rank:** 15 (2024)
 - **Arab rank:** 10 out of 22 countries
 - **Context:** Behind Morocco (8) and Egypt (9)
 - **Source:** (Bank A. D., n.d.)
- **Digital Innovation Index:**
 - **Global rank:** 125 (2023)
 - **Annual patents filed:** 3 (2020–2023)
 - **Context:** Significantly lower than Israel (1,200 annually)
 - **Source:** ((WIPO), 2023)
- **Overall Analysis:**
 - **Strengths:** Gradual improvement across most indicators.
 - **Weaknesses:** Limited investment in digitization (only 0.8% of GDP).
 - **Recommendations:** Increase investment in digital infrastructure and modernize legal frameworks.

- **Comprehensive Source:** World Bank, Digital Development Report 2024.

These indicators confirm that Algeria remains behind in the digital race (2023–2024), occupying mid-to-low positions globally. Despite slight gains in e-government (112) and cybersecurity (78), overall performance remains below expectations compared to neighboring countries. The data reveal a deep digital divide, particularly in internet speed (110) and digital innovation (125), reflecting insufficient investment—currently less than 0.8% of GDP. These findings underscore the urgent need for accelerated reforms to keep pace with global digital trends (Bank W. ..., 2024) .

3.4. Case Study: The Smart Village in Biskra – A Model for Digital Development in Rural Areas

3.4.1. Initiative and Strategic Vision

The Smart Village in Biskra is one of Algeria’s pioneering government initiatives, aiming to integrate digital technology into local development, particularly in marginalized rural areas. Launched under the National Digital Economy Strategy (2023–2030), the project is not merely technological but a strategic tool to diversify the local economic base beyond traditional resource-dependent models.

The strategic goal is to transform Biskra into a digital innovation hub, supporting entrepreneurship and creating sustainable jobs for youth in southern Algeria (Economy, 2023). This model represents a serious attempt to convert structural challenges—such as marginalization and unemployment—into development opportunities by empowering local talent to develop digital solutions for key sectors like smart agriculture, digital tourism, and logistics—promising pathways for economic diversification (ANSEJ, 2022).

The project is built on four pillars to create an integrated digital ecosystem:

- **Digital Training:** Specialized programs in programming, data analysis, digital marketing, and cybersecurity to build youth capacity in non-oil sectors.
- **Funding and Institutional Support:** Grants, subsidized loans, and incubation facilities to stimulate startups as new sources of GDP and exports.

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- **Digital Infrastructure:** Establishment of a local data center and provision of high-speed internet to enable digital innovation.
- **Market Linkage:** Facilitating access for startups to domestic and international markets through e-commerce platforms, opening new income streams (ANSEJ, 2022)

3.4.2. Field Challenges

Despite its strategic design, the initiative faces critical on-the-ground challenges:

- **Weak Connectivity:** Despite promises, actual internet speeds often do not exceed 15 Mbps, hindering the development of advanced digital applications and pushing startups toward traditional activities (Ookla, 2024).
- **Lack of Specialized Expertise:** The management team lacks experience in incubator management and digital entrepreneurship, limiting the project's ability to turn ideas into profitable ventures.
- **Unsustainable Funding:** The project relies almost entirely on government funding, with no self-sustaining financial mechanisms or effective private-sector partnerships, threatening its long-term viability.
- **Misalignment with Local Market Needs:** Many projects lack a clear business model and focus on unrealistic global markets, while overlooking real local opportunities in smart agriculture and digital tourism (Bank W. ..., 2024).. This disconnect weakens the project's ability to generate tangible local economic impact.

3.4.3. Lessons Learned and Recommendations

The Smart Village in Biskra offers a critical analytical lesson on the gap between ambitious digital planning and actual field implementation. The success of such initiatives should not be measured by the number of buildings or devices installed, but by their ability to drive real, sustainable economic diversification.

Success can be evaluated through three key indicators:

- Creation of genuine jobs in non-oil sectors,
- Support for profitable, sustainable projects contributing to GDP,
- Regional economic impact that reshapes the local production base.

According to the World Bank (2023), successful smart village models in developing countries are only achieved within an integrated ecosystem that brings together the state, academic institutions, and the private sector. In this context, the smart village is not merely a training center but an incubator for building a digital ecosystem capable of generating new economic activities in promising fields such as smart agriculture, digital tourism, and logistics—vital pathways for economic diversification.

In the absence of such integration, these projects remain vulnerable to failure, relying on centralized government funding and lacking feedback mechanisms, sustainable innovation, and local market linkages—factors that weaken their capacity for fundamental economic transformation.

4. CONCLUSION

Digital transformation holds significant potential as a strategic lever for local economic diversification, particularly in resource-dependent economies like Algeria. The case of the Smart Village in Biskra exemplifies the state's ambition to harness digital technologies to stimulate innovation, empower youth, and reduce regional disparities. As a flagship initiative under the National Digital Economy Strategy (2023–2030), the project aims to transform a marginalized rural area into a hub for digital entrepreneurship, smart agriculture, and digital tourism—sectors that represent promising pathways for economic diversification .

However, this study reveals a persistent and critical gap between policy formulation and field implementation. Despite the strategic vision and substantial public investment, the impact of digital initiatives on tangible economic outcomes remains limited. Structural barriers—such as weak digital infrastructure, lack of specialized human capital, legislative fragmentation, cultural resistance, and cybersecurity vulnerabilities—undermine the effectiveness of these projects (Hamou). International indicators confirm Algeria's lagging position: with an average internet speed of 35.2 Mbps (rank 110 globally), a digital innovation rank of 125, and only three patents filed annually, the country faces a deep digital divide compared to regional peers. ((ITU), 2023) ((WIPO), 2023) (Ookla, 2024)

The Smart Village in Biskra, while symbolically significant, struggles with practical challenges: unreliable connectivity, unsustainable funding

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models, misalignment with local market needs, and a lack of integrated ecosystems linking government, academia, and the private sector (Bank W. ..., 2024). These shortcomings highlight that digital transformation is not merely a technological endeavor but a complex socio-economic process requiring coordinated policies, skilled human resources, robust infrastructure, and market-oriented innovation.

To ensure that digital transformation translates into real economic diversification, Algeria must move beyond symbolic projects toward building a resilient and inclusive digital economy. This requires increasing investment in digital infrastructure—currently at only 0.8% of GDP—reforming education to meet digital economy demands, enacting comprehensive digital legislation, and fostering public-private partnerships to support sustainable innovation (Bank W. ..., 2024).

In conclusion, the success of initiatives like the Smart Village in Biskra should not be measured by the number of buildings constructed or devices installed, but by their ability to generate sustainable jobs, support profitable startups, and reshape the local production base. Only through such tangible outcomes can digital transformation fulfill its promise as a true engine of economic diversification and inclusive development in Algeria.

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