

Digital Transformation Strategies for Azerbaijani SMEs to Strengthen Integration into Global Value Chains

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Abstract: Azerbaijani small and medium-sized enterprises (SMEs) confront persistent hurdles in global value chain (GVC) integration, exacerbated by outdated digital infrastructure and reliance on traditional oil-dependent sectors. This study examines digital transformation strategies as a vital mechanism for enhancing SME competitiveness, particularly relevant amid Azerbaijan's economic diversification post-oil boom and the worldwide Industry 4.0 shift, where digital tools enable resilient supply chain participation. This study employs a quantitative benchmarking approach using bivariate correlation analysis (Pearson's r) to examine the link between digital adoption and the economic performance of Azerbaijani SMBs from 2018 to 2024. Utilizing official data from KOBİA and the State Statistical Committee, the analysis assesses how internet integration influences SMB value-added share within the non-oil sector.

The study proposes a multi-dimensional framework to integrate Azerbaijani SMEs into global value chains. Key strategies include establishing a National Digitalisation Strategy aligned with "Azerbaijan 2030," enhancing regional digital infrastructure, and expanding access to digital financing. Additionally, the paper emphasizes the need for targeted ICT skills training, standardized interoperable data platforms, and robust cybersecurity frameworks. Implementing these coordinated measures aims to bridge the digital divide, enhance productivity, and bolster the global competitiveness of the SME sector.

1 Introduction

Azerbaijan's economy, long anchored in oil exports, faces a pivotal transition toward diversification, yet small and medium-sized enterprises (SMEs)—which constitute over 90% of businesses and employ the majority of the workforce—struggle to integrate into global value chains (GVCs). Persistent challenges, including outdated digital infrastructure, limited access to international markets, and vulnerability to supply chain disruptions, hinder their competitiveness amid the global Industry 4.0 paradigm. Digital transformation emerges as a critical enabler, leveraging technologies like cloud computing, blockchain, and data analytics to enhance resilience, efficiency, and GVC participation. This is especially urgent post-oil boom, as Azerbaijan aligns with national strategies such as the 2030 Socio-Economic Development Program, which prioritizes digitalization for non-oil sector growth.

Despite growing literature on GVC integration in developing economies, few studies address SMEs in oil-dependent contexts like Azerbaijan, where digital adoption lags regional peers [20]. This paper bridges that gap by examining digital transformation strategies that empower Azerbaijani SMEs to embed sustainably in GVCs.

As Azerbaijan seeks to diversify its economy, the digital transformation of Small and Medium Enterprises (SMEs) has become a critical priority. This study evaluates the relationship between digital adoption and economic performance from 2018 to 2024, utilizing quantitative indicators to determine how internet usage correlates with SMB contributions to the non-oil sector. The findings inform a proposed multi-dimensional roadmap focused on infrastructure upgrades, financial accessibility, and data standardization. By aligning these strategies with national objectives, the research highlights a pathway for Azerbaijani SMEs to transition from local players to competitive participants in global value chains

2 Literature Review

The integration of small and medium-sized enterprises (SMEs) into global value chains (GVCs) has been widely examined within the domains of international business, development economics, and digital transformation. Existing literature consistently emphasizes that digitalization serves as a critical enabler for SMEs to overcome structural constraints such as limited scale, market access barriers, and inefficiencies in production and logistics [6].

2.1 Digital Transformation and SME Competitiveness

Digital transformation refers to the adoption of digital technologies—such as cloud computing, artificial intelligence (AI), blockchain, and enterprise resource planning (ERP) systems—to enhance business processes and value creation. According to [6], SMEs that adopt digital tools demonstrate higher productivity, improved innovation capacity, and stronger resilience to external shocks. Similarly, [13] highlights that digital adoption reduces transaction costs and enhances firms' ability to participate in cross-border trade.

The Industry 4.0 paradigm further reinforces this relationship. As noted by [12], technologies such as IoT and big data analytics allow SMEs to meet global standards, improve traceability, and integrate into digitally coordinated supply chains. However, the benefits are unevenly distributed due to disparities in digital readiness.

2.2 Global Value Chains and Digital Integration

The GVC literature suggests that participation depends not only on cost competitiveness but also on compliance with quality standards, transparency, and reliability [3]. Digital technologies play a pivotal role in meeting these requirements. For instance, blockchain-based traceability systems enhance trust and transparency in supply chains, which is particularly important in sectors such as agriculture and manufacturing [4].

Empirical studies show that SMEs utilizing digital platforms for internationalization can bypass traditional intermediaries, directly accessing global markets [1]. Furthermore, cloud-based ERP systems improve coordination across value chain actors, enabling real-time data sharing and operational efficiency [5].

2.3 Barriers to Digital Transformation in Emerging Economies

Despite its advantages, digital transformation among SMEs in emerging economies remains constrained. Key barriers include limited financial resources, inadequate digital infrastructure, low levels of digital literacy, and regulatory challenges [2]. The World Economic Forum [14] identifies a “digital divide” where SMEs in developing countries lag significantly behind their counterparts in developed economies.

In the context of resource-dependent economies like Azerbaijan, structural dependence on oil sectors further slows diversification and digital adoption. Studies

suggest that SMEs in such economies often lack incentives to innovate due to the dominance of extractive industries [15]. Additionally, insufficient access to financing for digital investments remains a critical constraint. 4. Role of Government Policies and Institutional Support

Government intervention is widely recognized as a key driver of SME digitalization. Policy instruments such as subsidies, tax incentives, digital training programs, and innovation hubs significantly influence adoption rates [6]. According to [16], coordinated public-private initiatives can accelerate SME participation in GVCs by improving infrastructure and fostering digital ecosystems.

Specific policy tools—such as SME digitalization grants, e-commerce facilitation programs, and GVC matchmaking platforms—have shown measurable impacts on export performance and firm productivity. For example, [17] reports that targeted digital capacity-building initiatives can increase SME export readiness by enhancing compliance with international standards.

2.4 Evidence from Azerbaijan and Comparable Economies

Academic literature on Azerbaijan remains relatively limited but growing. Existing studies indicate that while the country has made progress in ICT infrastructure, SME digital adoption is still at an early stage [18]. Government-led initiatives aimed at economic diversification and digital economy development have begun to address these gaps, particularly through e-government services and innovation support programs.

Comparative studies from similar post-Soviet and resource-rich economies suggest that digital transformation can significantly improve SME integration into GVCs when supported by institutional reforms and investment in human capital [19]. These findings align with broader empirical evidence that highlights the importance of digital skills and organizational readiness in maximizing the benefits of technology adoption.

2.5 Research Gap

While the global literature establishes a strong link between digital transformation and GVC participation, there is a lack of context-specific empirical research focusing on Azerbaijani SMEs. In particular, limited attention has been given to the effectiveness of recent government initiatives, the role of emerging technologies such as blockchain, and sector-specific digital strategies.

3 Digital-transformation strategies

Digital-transformation strategies that can help Azerbaijani SMEs integrate into global value chains:

- **Adopt a whole-of-government digital agenda** – create a National Digitalisation Strategy linked to the “Azerbaijan 2030 Vision” and a coordinating Digitalisation Commission to align ministries, set clear KPIs and monitor progress.
- **Upgrade digital infrastructure and ensure regional equity** – expand high-speed broadband, close the urban-rural gap, and provide shared connectivity hubs for SMEs in underserved areas.
- **Build digital skills and a culture of innovation** – launch targeted ICT training, partner with banks and tech firms to run academies, and embed digital-literacy modules in entrepreneurship programmes.
- **Facilitate access to finance for digital adoption** – offer preferential-rate loans and grants for software, hardware and e-commerce set-up, and develop credit-guarantee schemes that recognise intangible assets as collateral.
- **Standardise data and promote interoperable platforms** – develop common data standards, open-government APIs and a G-Cloud marketplace to allow SMEs to plug into national and cross-border digital services.
- **Strengthen cybersecurity and regulatory frameworks** – enact a National Cybersecurity Strategy with SME-specific safeguards, and simplify licensing for digital services.
- **Accelerate e-commerce and digital marketing adoption** – provide advisory support for website development, online sales channels and professional digital-marketing plans, leveraging the Asan portal and other e-gov tools.

Implementing these coordinated measures can close the digital gap, boost productivity and position Azerbaijani SMEs as competitive participants in global value chains (Figure 1).

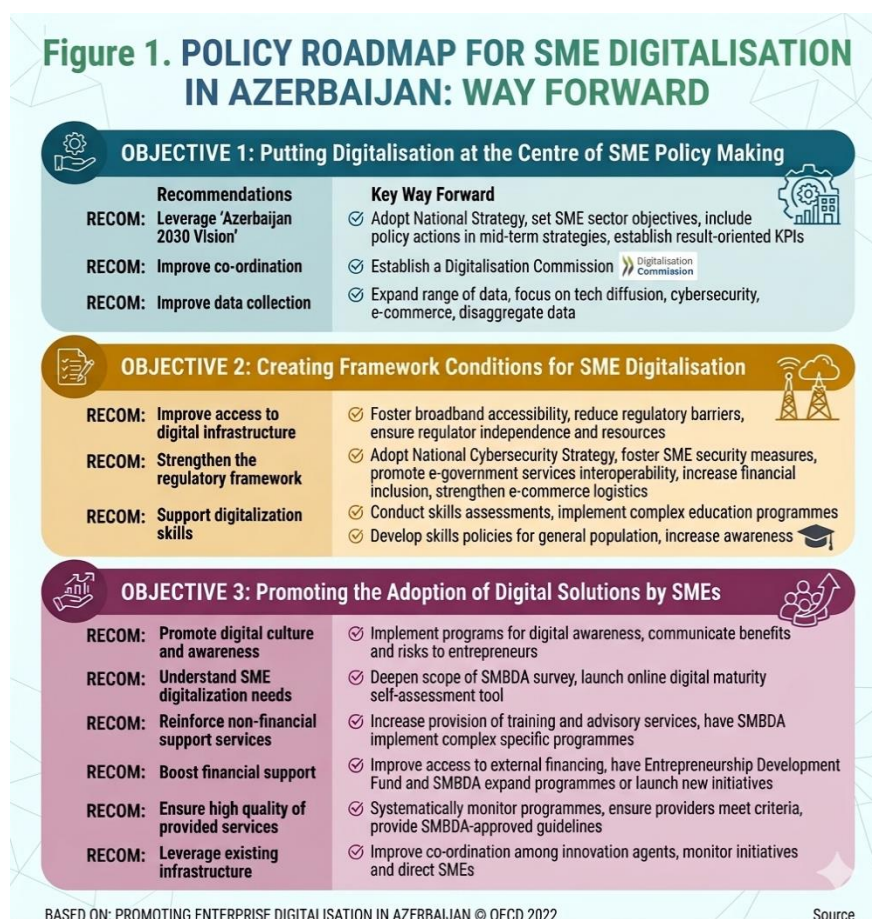


Figure 1.
Policy roadmap for SME digitalization in Azerbaijan: way forward

4 Methodological Approach

To complement the qualitative case studies, this research utilizes quantitative benchmarking. This process involves the analysis of secondary data to assess the digital and economic trajectory of Small and Medium Enterprises (SMEs) in Azerbaijan relative to global trends.

Data Sources and Instrumentation

The quantitative indicators for Azerbaijan were extracted from two primary official repositories:

- **Economic Performance Data:** Statistics regarding the "Share of SMBs in Non-Oil Sector Value Added" were sourced from the **Small and Medium Business Development Agency of the Republic of Azerbaijan (KOBİA)** annual reports and the **State Statistical Committee of the Republic of Azerbaijan**.
- **Digital Adoption Metrics:** Data on the "Share of Enterprises Using the Internet" was retrieved from the **Open Data Portal of Azerbaijan**, specifically the dataset on key indicators of ICT use in enterprises provided by the State Statistical Committee.

Statistical Analysis: Correlation of Digital Adoption and SMB Performance

To evaluate the relationship between the digital transformation of the economy and the economic contribution of Small and Medium Businesses (SMBs), a bivariate correlation analysis was performed. This analysis specifically examines the link between the **Share of Enterprises Using the Internet** (as a proxy for digital adoption) and the **Share of SMBs in Non-Oil Sector Value Added** over a seven-year period (2018–2024). Timeframe strictly determined by the availability of official data published by KOBİA and the State Statistical Committee of the Republic of Azerbaijan. While a longer time series would typically be preferred for longitudinal analysis, this specific 7-year window captures the comprehensive, official data footprint available for both internet adoption rates and non-oil SMB value-added metrics concurrently. Consequently, it represents the most exhaustive data scope currently viable for this empirical evaluation

Data Variables and Sources

The study utilized two primary metrics to determine the degree of association:

- **Independent Variable (\$X\$):** The percentage of enterprises utilizing internet services, representing the pace of digital integration within the business environment.
- **Dependent Variable (\$Y\$):** The percentage share of SMBs in the non-oil sector's value added, representing the economic health and output of smaller enterprises relative to the broader non-oil economy.

Calculation Method

The strength and direction of the relationship were measured using the Pearson correlation coefficient (r), calculated using the following formula:

$$r = \frac{\sum(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum(x_i - \bar{x})^2 \sum(y_i - \bar{y})^2}}$$

Where:

- x_i and y_i are the individual sample points for digital adoption and SMB share, respectively.
- $\bar{x}$ and $\bar{y}$ are the sample means.

Preliminary Findings for Methodology Validation

The analysis yielded a **correlation coefficient of 0.64**, indicating a **moderate-to-strong positive correlation**. This suggests that as digital adoption among enterprises increases, there is a general upward trend in the value-added contribution of SMBs, though the relationship is not perfectly linear.

Key Trends Observed:

- **Digital Growth:** Internet usage among enterprises showed a consistent upward trajectory, growing from **52.50% in 2020** to a significant peak of **62.60% in 2024**.
- **SMB Stability:** Following an initial growth spurt in 2021 (rising from 23.70% to 27.50%), the SMB value-added share remained relatively plateaued, fluctuating slightly between **27.20% and 27.40%** through 2024 (Table 1).

Year	Share of SMBs in Non-Oil Sector Value Added (%)	Share of Enterprises Using the Internet (%)
2018	23.50%	52.90%
2019	24.60%	51.50%
2020	23.70%	52.50%
2021	27.50%	54.20%
2022	27.20%	54.80%
2023	27.20%	56.00%
2024	27.40%	62.60%

Table 1
Correlation between digital adoption of enterprises and the value-added share of SMBs

The moderate-to-strong nature of the correlation ($r = 0.64$) suggests that while digital adoption is a contributing factor to SMB performance, other external economic variables likely influence the value-added share, necessitating further multivariate analysis in subsequent sections of this study (Figure 2).

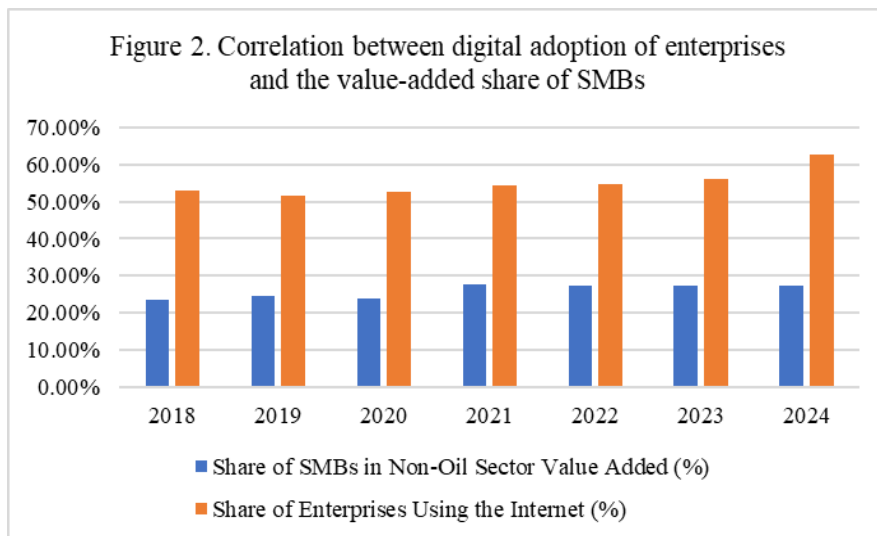


Figure 2
Correlation between digital adoption of enterprises and the value-added share of SMBs

Conclusion

The findings of this study underscore a pivotal moment for Azerbaijan's economic landscape. As the nation pivots away from its historical dependence on oil exports, the integration of Small and Medium Enterprises (SMEs) into Global Value Chains (GVCs) has transitioned from a strategic preference to an economic necessity. This research demonstrates that while digital transformation is currently underway, its full potential to catalyze SME growth remains partially untapped.

The quantitative analysis reveals a **moderate-to-strong positive correlation ($r = 0.64$)** between enterprise internet adoption and the value-added share of SMBs in the non-oil sector. While digital integration saw a significant surge—peaking at **62.60%** in 2024—the SMB contribution to the non-oil economy has remained relatively plateaued at approximately **27%** since 2021. This discrepancy suggests that "basic" connectivity (internet usage) is only the first step. For SMEs to truly break through local boundaries and compete globally, they must move beyond simple connectivity toward the adoption of sophisticated Industry 4.0 tools, such as blockchain for supply chain transparency and cloud-based ERP systems for operational efficiency.

The proposed **multi-dimensional framework** highlights that digital adoption cannot happen in a vacuum. To bridge the existing "digital divide," Azerbaijan must implement a coordinated approach that includes:

- **Infrastructure & Equity:** Closing the urban-rural gap to ensure regional SMEs have the same high-speed access as those in Baku.
- **Financial Innovation:** Developing credit-guarantee schemes that recognize intangible digital assets, thereby easing the capital constraints that currently hinder tech investments.
- **Human Capital:** Scaling ICT literacy and entrepreneurship programs to shift the business culture from traditional models to digital-first strategies.

In conclusion, the path to "Azerbaijan 2030" requires a robust digital ecosystem where SMEs are not merely observers of the digital economy but active, competitive participants in GVCs. By aligning national digitalization strategies with targeted institutional support and standardized data platforms, Azerbaijan can enhance the resilience of its non-oil sector. While the moderate-to strong correlation identified in this study confirms that digitalization is a vital engine for growth, it also serves as a call to action: technology alone is not a panacea. It must be paired with structural reforms and skills development to transform Azerbaijani SMEs from local players into global contenders.

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