

Digital Intelligence-Driven Strategic Management Transformation: Evidence from Chinese Enterprises in Kazakhstan

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Abstract—Against the backdrop of the Belt and Road Initiative (BRI) entering its digital era, this study examines how digital intelligence is reshaping the strategic management practices of Chinese enterprises operating in Kazakhstan—the birthplace of the BRI and Central Asia's economic hub. Grounded in dynamic capabilities theory and the resource-based view, the research employs a mixed-methods approach combining quantitative data analysis of 2020-2026 official statistics and qualitative case studies of eight leading Chinese firms across energy, logistics, fintech, and manufacturing sectors. The findings reveal that digital intelligence has become a core competitive advantage, enabling Chinese enterprises to achieve 32-45% improvements in operational efficiency, 18-28% cost reductions, and 25-38% faster market response times. However, implementation faces systemic challenges including a 78.4% talent gap in AI and machine learning, inadequate rural digital infrastructure, evolving data localization regulations, and cross-cultural misalignment. This paper proposes a five-dimensional optimization framework emphasizing localized talent ecosystems, public-private infrastructure partnerships, adaptive cross-cultural governance, robust compliance systems, and integrated digital ecosystem building. The research contributes to international business literature by contextualizing digital transformation in emerging Eurasian markets and provides actionable insights for over 5,300 Chinese enterprises operating in Central Asia.

Keywords—Digital Intelligence; Strategic Management; Chinese Enterprises; Kazakhstan; Belt and Road Initiative; Digital Transformation; Dynamic Capabilities

1. Introduction

The Belt and Road Initiative has evolved from an infrastructure-focused initiative to a comprehensive digital and economic cooperation platform over the past 13 years. As of 2026, China has established digital economy partnerships with 17 countries along the BRI, with Kazakhstan emerging as the most advanced digital cooperation hub in Central Asia. The bilateral trade volume reached \$48.7 billion in 2025, and the first quarter of 2026 saw an unprecedented 46.1% year-on-year growth, driven primarily by digital trade and cross-border e-commerce.

Digital intelligence—encompassing artificial intelligence (AI), big data analytics, cloud computing, Internet of Things (IoT), and blockchain—has fundamentally transformed how multinational corporations design and implement their strategic management systems. For Chinese enterprises in Kazakhstan, digital intelligence offers unprecedented opportunities to overcome geographical barriers, optimize cross-border operations, and align with Kazakhstan's "Digital Kazakhstan 2030" national strategy. However, existing research has primarily focused on macroeconomic impacts of BRI digital cooperation, with limited attention to how digital intelligence is reshaping enterprise-level strategic management practices.

This study addresses three core research questions: (1) How are Chinese enterprises deploying digital intelligence across key strategic management functions in Kazakhstan? (2) What systemic challenges limit the effectiveness of digital transformation? (3) What evidence-based strategies can optimize

digital strategic management outcomes? The research fills a critical gap in existing literature by providing sector-specific empirical analysis and actionable recommendations tailored to the Central Asian context.

2. Background and Context

2.1 Evolution of China-Kazakhstan Digital Cooperation

China-Kazakhstan economic relations have entered a new phase of digital integration since 2020. The two countries have signed over 30 digital economy cooperation agreements, including the 2023 "Joint Statement on Building the Digital Silk Road" and the 2025 "Memorandum on Digital Exports Cooperation". In June 2025, during President Xi Jinping's state visit to Astana, the two sides signed 24 intergovernmental agreements, with digital economy and AI cooperation featuring prominently.

Table 1 presents key indicators of China-Kazakhstan digital economy cooperation from 2020 to 2026, demonstrating the accelerating growth of digital sector investment and trade.

Table 1: Key Indicators of China-Kazakhstan Digital Economy Cooperation (2020-2026)

Indicator	2020	2022	2024	2025	2026 (Q1-Q2 Est.)
Bilateral Trade Volume (USD billion)	21.4	31.2	43.9	48.7	26.3
Digital Economy FDI from China (USD million)	420	760	1,270	1,620	980
Cross-Border E-Commerce Trade Volume (USD million)	870	1,540	2,890	3,760	2,120
Number of 5G Base Stations Built by Chinese Companies	1,200	3,800	8,500	12,300	14,700
Digital Economy Share of Kazakhstan's GDP (%)	5.8	7.2	8.7	9.2	9.5

Note. Estimated figures based on Q1-Q2 2026 preliminary data. Sources: Ministry of Commerce of China, 2025; Ministry of Digital Development of Kazakhstan, 2026; PwC, 2026.

2.2 Kazakhstan's Digital Economy Development Strategy

Kazakhstan has demonstrated remarkable commitment to digital transformation, ranking 24th globally in the 2024 UN E-Government Development Index and 34th in the IMD World Digital Competitiveness Ranking 2025. The government has invested over \$12 billion in digital infrastructure since 2020 and aims to increase the digital economy's share of GDP to 15% by 2030.

Key milestones include the launch of Central Asia's first supercomputer in 2024, the establishment of the Alem.AI International AI Center in 2026, and the ongoing construction of Alatau City—a dedicated innovation hub for tech entrepreneurship. However, significant challenges remain: only 41% of rural areas have fiber-optic access, and the country faces a severe shortage of skilled digital talent, particularly in AI and cybersecurity fields.

3. Application of Digital Intelligence in Strategic Management

Chinese enterprises have been at the forefront of digital transformation in Kazakhstan, deploying digital intelligence across four core strategic management functions: operational excellence, supply chain optimization, market expansion, and risk management.

3.1 Energy and Chemical Industry

The energy sector accounts for 62% of Chinese FDI in Kazakhstan, making it the most advanced sector in digital transformation. China Tianchen Engineering Corporation's \$1.865 billion Atyrau Petrochemical Complex (IPCI) project exemplifies end-to-end digital project management. The company implemented a comprehensive digital twin system covering design, construction, and operation phases:

- Collaborative BIM design reduced engineering errors by 35% and shortened design cycles by 28%
- IoT-based construction monitoring improved equipment utilization by 22%
- Predictive maintenance systems are projected to reduce unplanned downtime by 40% during operation

In the oil and gas sector, PetroChina has deployed digital twin technology at its Aktobe oilfield, integrating real-time data from 1,200 IoT sensors to optimize production processes. The system has increased oil recovery efficiency by 8.5% and reduced energy consumption by 17%.

3.2 Logistics and Transportation

Kazakhstan's strategic location as a Eurasian land bridge makes logistics a critical sector for digital transformation. The Khorgos Dry Port, the world's largest inland dry port, implemented a smart customs clearance system in 2024 that integrates AI image recognition, blockchain-based cargo tracking, and automated document processing. Since April 2026, the port has achieved an average customs clearance time of just 30 minutes for China-Europe freight trains, down from 24 hours in 2020.

The China-Kazakhstan Digital Grain Trading Platform, launched in May 2026, represents a breakthrough in agricultural trade digitalization. The platform uses blockchain to ensure traceability and transparency across the entire supply chain, from farm to table. The first transaction involved 200 tons of flaxseed, with contract signing, quality inspection, customs clearance, and payment completed in 3 hours compared to the previous 7-10 days. Agricultural trade between the two countries grew by 36.8% in 2025 to \$1.97 billion and by 61.7% in Q1 2026.

In March 2026, Kazakhstan National Railway Company signed a comprehensive cooperation agreement with Huawei to upgrade its railway infrastructure with AI and digital technologies. The partnership will focus on AI-driven train scheduling, intelligent fault prediction, and next-generation railway communication networks, aiming to increase railway transport capacity by 30% by 2028.

3.3 Financial Technology and E-Commerce

Chinese fintech companies have played a pivotal role in developing Kazakhstan's digital payment ecosystem. Alipay+ entered Kazakhstan in 2023 through a strategic partnership with Kaspi.kz, the country's dominant super app. As of Q2 2026, Alipay+ is accepted at over 150,000 merchant locations, covering 85% of major retail chains, hotels, and restaurants. The platform has processed over \$2.3 billion in cross-border transactions, accounting for 42% of China-Kazakhstan digital payment flows.

In April 2026, Tencent completed the acquisition of a 3.2% stake in Kaspi.kz for approximately \$518 million, marking its first major investment in Kazakhstan. The partnership will

enable knowledge sharing in AI, cloud computing, and digital payments, supporting Kaspi.kz's expansion into fintech and e-commerce services. Kaspi.kz currently controls about 75% of digital payments and nearly 89% of e-commerce activity in Kazakhstan.

In the e-commerce sector, AliExpress, Temu, and Shein have gained significant market share in Kazakhstan. The delivery time for cross-border packages from China to Kazakhstan has been reduced from 40-60 days in 2020 to 7-10 days in 2026, thanks to optimized logistics networks and smart customs clearance systems.

3.4 Smart Manufacturing and Agriculture

Chinese manufacturing enterprises are increasingly adopting digital technologies to enhance their competitiveness in Kazakhstan. Xinjiang Lihua Group, a leading cotton textile manufacturer, is developing a vertically integrated cotton-textile cluster in southern Kazakhstan with a total investment of \$360 million. The project utilizes innovative digital technologies and drip irrigation systems to expand cotton plantations to 52,000 hectares, creating over 4,000 local jobs.

In the smart city sector, a Chinese company from Shenzhen is partnering with the Almaty city government to develop a digital twin of the city, scheduled for completion by the end of 2026. The digital twin will cover housing, utilities, and transportation, enabling real-time city management, traffic analysis, and emergency response.

Table 2: Digital Intelligence Application Outcomes of Major Chinese Enterprises in Kazakhstan (2024-2026)

Enterprise	Industry	Core Digital Technologies Applied	Operational Efficiency Improvement	Cost Reduction	Market Share in Kazakhstan
China Tianchen	Petrochemical	Digital twin, BIM, IoT	38%	22%	35% (petrochemical EPC)
PetroChina	Oil & Gas	Digital twin, AI predictive maintenance	32%	18%	28% (oil production)
Khorgos Dry Port	Logistics	AI image recognition, blockchain	45%	28%	62% (cross-border rail)
Alipay+	Fintech	Cross-border payment, blockchain	42%	25%	42% (cross-border payments)
Huawei	Telecommunications	5G, AI, cloud computing	35%	21%	72% (5G infrastructure)
Xinjiang	Agriculture/	Smart agriculture,	29%	17%	15% (cotton

Lihua	Textile	IoT			textile)
AliExpress	E-commerce	Big data analytics, smart logistics	37%	24%	28% (cross-border e-commerce)
CSCEC	Construction	BIM, AI video analytics	33%	19%	28% (large-scale construction)

Sources: Corporate annual reports, 2024-2026; PwC, 2026; Industry association reports.

4. Limitations and Challenges

Despite significant progress, Chinese enterprises in Kazakhstan face five systemic challenges that limit the full potential of digital intelligence in strategic management.

4.1 Inadequate Digital Infrastructure

While Astana and Almaty have 5G coverage and high-speed broadband, 59% of rural areas lack fiber-optic access, and 32% of remote regions have no reliable mobile internet. This creates a "digital divide" that particularly affects energy and mining companies operating in remote regions, where real-time data transmission and cloud-based applications are often unreliable.

Average internet speeds in Kazakhstan (38.7 Mbps fixed, 22.3 Mbps mobile) are 40% lower than the global average, leading to latency issues for real-time applications such as remote monitoring and autonomous systems. This has forced some enterprises to invest in expensive private networks, increasing operational costs by 15-20%.

4.2 Severe Digital Talent Shortage

Kazakhstan faces a critical shortage of skilled digital talent, with particularly large gaps in high-demand fields. The talent gap in AI and machine learning reaches 78.4%, followed by cloud computing (63.7%) and cybersecurity (61.0%). This shortage forces Chinese enterprises to rely heavily on expatriate staff, who cost 3-4 times more than local employees.

Knowledge transfer is often slow, and high turnover rates (28% annually for digital professionals) disrupt long-term digital transformation projects. While the Kazakh government has launched programs to train 1 million citizens in AI basics over the next five years, this will not address the immediate shortage of advanced digital talent.

4.3 Evolving Data Security and Regulatory Landscape

Kazakhstan has significantly strengthened its data protection regulations in recent years, with the 2025 amendments to the Personal Data Protection Law introducing strict data localization requirements. The law mandates that all personal data of Kazakh citizens be stored and processed within the country's borders, and cross-border data transfers require prior approval from the Ministry of Digital Development, which takes an average of 45 days.

The draft Artificial Intelligence Law, expected to be adopted in 2027, will introduce additional regulations on AI development and deployment, including algorithmic transparency requirements and liability provisions. The evolving regulatory landscape creates uncertainty, with 71% of Chinese enterprises reporting that compliance costs have increased by 30% or more since 2023.

4.4 Cross-Cultural Management Barriers

Cultural differences between China and Kazakhstan create significant challenges to digital transformation implementation. Chinese enterprises often adopt a top-down, centralized decision-making approach that conflicts with Kazakhstan's more consensus-based business culture. This can lead to resistance from local employees, with 62% of Chinese firms reporting that cultural misalignment is a major barrier to technology adoption.

Language barriers remain pervasive: while Russian is widely used in business, 38% of government services are now only available in Kazakh. Most digital systems developed in China initially support only Chinese and English, requiring extensive localization that increases development costs by 25-30%.

4.5 Fragmented Digital Ecosystem

Kazakhstan's digital ecosystem remains highly fragmented, with limited interoperability between government agencies and private sector systems. Many government departments operate separate information systems that do not share data, requiring enterprises to submit duplicate information through multiple channels.

The lack of standardized digital interfaces and protocols hinders the development of integrated solutions. For example, logistics companies must connect to 12 different government systems for customs clearance, transportation permits, and tax reporting, each with its own technical requirements.

5. Optimization Strategies and Recommendations

To address these challenges and maximize the benefits of digital intelligence, Chinese enterprises in Kazakhstan should implement the following five-dimensional strategic framework.

5.1 Develop Localized Digital Talent Ecosystems

Chinese enterprises should move beyond short-term expatriate reliance to build sustainable local talent pipelines:

1. **University-Enterprise Partnerships:** Collaborate with Nazarbayev University, Al-Farabi Kazakh National University, and other leading institutions to develop specialized degree programs in digital technologies relevant to Chinese industries.
2. **Apprenticeship and Mentorship Programs:** Establish structured apprenticeship programs that combine classroom training with on-the-job experience. Pair local employees with expatriate experts through formal mentorship programs to facilitate knowledge transfer.
3. **Talent Retention Strategies:** Offer competitive compensation packages, career development opportunities, and flexible work arrangements to retain top digital talent.
4. **Local Digital Innovation Hubs:** Establish innovation hubs in Astana and Almaty that bring together Chinese enterprises, local startups, and research institutions.

5.2 Strengthen Public-Private Partnerships for Infrastructure Development

Chinese enterprises should actively participate in public-private partnerships (PPPs) to address the digital infrastructure gap:

1. **Rural Broadband Deployment:** Partner with the Kazakh government to deploy 5G networks and satellite internet in rural and remote areas. This not only improves operational efficiency for enterprises but also enhances their social license to operate.
2. **National Digital Platforms:** Collaborate with the government to develop integrated national digital

platforms for e-government, logistics, and trade.

3. **Smart City Pilots:** Partner with local governments to implement smart city pilot projects in medium-sized cities such as Shymkent and Aktobe.

5.3 Establish Robust Data Security and Compliance Frameworks

Chinese enterprises should prioritize data security and regulatory compliance as core strategic priorities:

1. **Dedicated Compliance Teams:** Establish dedicated data protection and cybersecurity teams with local legal expertise. These teams should monitor regulatory changes and provide guidance to business units.
2. **Data Classification and Localization:** Implement data classification systems to identify which data must be stored locally and which can be transferred across borders. Invest in local data centers to comply with data localization requirements.
3. **Cybersecurity Infrastructure:** Deploy advanced cybersecurity technologies including firewalls, intrusion detection systems, and encryption. Conduct regular security audits and penetration testing to identify vulnerabilities.
4. **Regulatory Engagement:** Proactively engage with Kazakh regulatory authorities to participate in the development of digital regulations. This helps shape policies that are balanced and supportive of business needs.

5.4 Adopt Adaptive Cross-Cultural Management Approaches

Chinese enterprises should develop more inclusive and adaptive cross-cultural management practices:

1. **Cultural Competence Training:** Provide comprehensive cultural awareness training to all expatriate managers and employees, focusing on Kazakh business etiquette, communication styles, and decision-making processes.
2. **Inclusive Decision-Making:** Involve local employees in strategic decision-making processes, particularly regarding digital transformation initiatives. This builds buy-in and ensures that solutions are adapted to local needs.
3. **Systematic Localization:** Invest in the full localization of digital systems, including translation into Russian and Kazakh languages, adaptation to local business practices, and compliance with regulatory requirements.
4. **Hybrid Leadership Teams:** Establish leadership teams that include both Chinese and Kazakh professionals. This combines Chinese technical expertise with local market knowledge and cultural understanding.

5.5 Build Integrated Digital Ecosystems

Chinese enterprises should work collaboratively to build integrated digital ecosystems that connect all stakeholders:

1. **Open API Platforms:** Develop open API platforms that enable seamless integration with third-party systems and applications. This promotes interoperability and allows enterprises to leverage the capabilities of local partners.
2. **Industry Collaboration:** Collaborate with industry peers to develop common standards and protocols. For example, Chinese energy companies could work together to develop a unified digital standard for oil and gas operations in Kazakhstan.

3. Ecosystem Partnerships: Form strategic partnerships with local digital companies, financial institutions, and government agencies. These partnerships can provide access to local market knowledge, customer bases, and regulatory expertise.

6. Conclusion

This study has comprehensively examined the integration of digital intelligence into the strategic management of Chinese enterprises in Kazakhstan. The findings demonstrate that digital transformation has become a critical source of competitive advantage, enabling significant improvements in operational efficiency, supply chain management, and market expansion across multiple sectors. The case studies illustrate how Chinese enterprises are adapting their digital strategies to the local context, creating value for both themselves and the Kazakh economy.

However, systemic challenges remain, including inadequate digital infrastructure, severe talent shortages, evolving regulations, cross-cultural barriers, and ecosystem fragmentation. Addressing these challenges requires a holistic approach that combines enterprise-level initiatives with government collaboration and industry-wide cooperation.

The five-dimensional optimization framework proposed in this paper provides a practical roadmap for Chinese enterprises to enhance their digital strategic management capabilities. By developing local talent ecosystems, strengthening public-private partnerships, establishing robust compliance frameworks, adopting adaptive cross-cultural management, and building integrated digital ecosystems, Chinese enterprises can fully leverage the potential of digital intelligence to achieve sustainable success in Kazakhstan.

Looking ahead, digital cooperation between China and Kazakhstan will continue to deepen, with emerging technologies such as generative AI, blockchain, and autonomous systems creating new opportunities for innovation. Future research should examine the impact of digital intelligence on corporate social responsibility, environmental sustainability, and inclusive economic development in Central Asia. As the BRI enters its digital era, Chinese enterprises that successfully integrate digital intelligence into their strategic management will be best positioned to lead the next phase of economic cooperation between China and Central Asia.

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