

Research on Digital Trade Empowering Digital Innovation in Dalian's Traditional Enterprises

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Abstract: As an emerging modality of trade, digital trade serves as a critical conduit for deepening the integration between the digital economy and the real economy, injecting renewed momentum into the digital innovation endeavors of traditional enterprises. Nevertheless, in the course of leveraging digital trade to advance digital innovation, traditional enterprises in Dalian continue to grapple with a set of persistent challenges: integration that remains superficial, transformation that lacks depth, infrastructure that proves inadequate, and competitiveness that falls short of expectations. To promote the deeper convergence of Dalian's digital and real economies and to facilitate the upgrading of its traditional advantageous industries toward higher-end, intelligent, and globally oriented development, there is an urgent need to guide and support traditional enterprises in treating digital trade as both a breakthrough point and a catalyst for digital innovation—one that enables the renewal and reshaping of production processes, business models, and positions within global value chains. Accordingly, this study employs in-depth interviews, benchmarking analysis, and other methods to put forward targeted recommendations, including the creation of industry-specific industrial internet platforms and concerted efforts in key technology breakthroughs, with the aim of accelerating Dalian's traditional enterprises in their strategic transition from conventional manufacturing to digital intelligent manufacturing and from product export to brand going global.

Keywords: Digital trade; Innovation in traditional enterprises; Digital innovation

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1. Introduction

As a novel form of trade in the era of the digital economy, digital trade facilitates the cross-border transmission, transaction, and consumption of goods and services through digital technologies, positioning itself at the forefront of global trade development, a new engine of economic growth, and an emerging arena of international economic competition^[1]. To date, scholarly inquiry into the economic effects of digital trade has concentrated predominantly on macroeconomic growth and trade competitiveness, while exploration of the mechanisms through which digital trade empowers enterprises at the micro level remains

comparatively underdeveloped—particularly with respect to the theme of enterprise innovation. The limited body of research that does exist has chiefly examined how digital trade stimulates enterprise innovation, green technological innovation, and how it enhances innovation efficiency and innovation resilience ^[2–7]. By contrast, scant attention has been paid to how digital trade, by means of digital platforms, strengthens the sharing and flow of innovation factors—technologies, knowledge, and talent—across industries, thereby helping traditional enterprises transcend industry boundaries, generate cross-sectoral digital innovation, and accelerate their transformation and upgrading in the context of digital trade.

Dalian, as the leading city for opening-up in Northeast China and a major foreign trade port, possesses distinctive representativeness and demonstrative significance in the region's digital trade development. Nevertheless, most of its traditional enterprises remain at the stage of mere tool application, and conspicuous gaps persist—relative to advanced regions such as the Yangtze River Delta—in industrial collaboration, technological service provision, and policy support systems ^[8]. There is, therefore, an urgent need to ground policy and practice in Dalian's industrial foundations and opening-up advantages, guiding and supporting traditional enterprises in treating digital trade as both a breakthrough point and a catalyst for digital innovation, so as to accelerate the strategic transition from conventional manufacturing to digital intelligent manufacturing ^[9].

2. Current state of digital development among traditional enterprises in Dalian

2.1. Current state of digital trade development among traditional enterprises in Dalian

At present, the city is advancing its digital trade agenda around one overarching objective, three differentiated carrier platforms, eight key tasks, and four priority domains, and has already achieved preliminary results. In the first three quarters of 2024, the city's cross-border e-commerce import and export volume reached RMB 12.16 billion, with more than 1,200 cross-border e-commerce operators cultivated cumulatively. At the industrial level, Dalian took the lead in designating eight advantageous cross-border e-commerce industrial belts—covering bearings and machine tools, chemical products, and auto parts, among others—bringing together over a thousand enterprises that have leveraged digital channels to go global, with export values exceeding RMB 4 billion. And yet, when measured against the sheer scale of the city's traditional industrial base, the breadth and depth of digital trade penetration remain notably insufficient ^[10].

2.2. Current state of digital innovation among traditional enterprises in Dalian

Dalian is among the first batch of pilot cities for SME digital transformation in China, and 33 pilot enterprises have cumulatively passed verification and received subsidies, achieving both cost reduction and efficiency gains. In 2025, the city established an Industrial Enterprise Digital Transformation Park and unveiled three major innovation platforms, including the Bearing Industry Brain, marking key digital technology breakthroughs in such traditional strongholds as high-end bearings, hydrogen energy, and shipbuilding. Meanwhile, other traditional advantage sectors—petrochemicals, equipment manufacturing, and auto parts—are also actively exploring digital innovation. Evidently, Dalian's traditional enterprises are now in a period of vigorous digital transformation and innovation.

2.3. Emerging catalytic role of digital trade in traditional enterprise innovation

First, digital trade opens up new channels to international markets, driving the upgrading of products

and services. Alibaba's AliExpress has established an industrial park in Dalian, directly advancing the internationalization of the "Made in Dalian" brand. Second, digital trade propels the restructuring and reengineering of conventional production processes, accelerating innovation in both production workflows and management. The Dayang Group offers an illustrative case: its self-developed Ustyylit industrial internet platform and intelligent flexible customization factory connect directly with overseas end customers and their data, fundamentally reshaping its production model. Finally, digital trade unlocks the value of data as a production factor, empowering enterprise decision-making and business model innovation. Wanzhong Cloud Warehouse, for instance, through its 1210 retail export business model and supporting digital service platform, provides SMEs with an entirely new digital pathway to overseas markets and has facilitated the digital onboarding and transformation of 62 enterprises.

3. Digital innovation dilemmas confronting Dalian's traditional enterprises in the context of foreign trade

3.1. Superficial integration: Obstacles to the transition between old and new growth drivers

Although Dalian possesses a solid foundation in its software industry and a comprehensive traditional manufacturing system spanning multiple sectors, the convergence between digital technologies and the real economy remains at a superficial level and has yet to effectively support enterprises in building core competitiveness within global digital trade.

On the one hand, the technical capabilities and solutions offered by local software firms are largely concentrated in general-purpose management or consumer internet domains. As a result, they demonstrate insufficient understanding of—and limited penetration into—the specific production processes, craft know-how, and supply chain coordination requirements of traditional pillar industries such as equipment manufacturing and petrochemicals. On the other hand, while the global ecosystem of industrial internet platforms has expanded rapidly, Dalian lacks a vertical industry-level industrial internet platform with influence either domestically or internationally. Although the Dayang Group has independently developed the Ustyylit apparel customization industrial internet platform, this represents an isolated breakthrough by a single enterprise rather than an evolution into a regional public service platform capable of empowering the entire textile and garment industry. Consequently, the broad base of SMEs continues to face formidable barriers in accessing global digital trade networks at low cost and with high efficiency.

3.2. Incomplete transformation: Impeded circulation of data elements

At present, Dalian's traditional enterprises exhibit insufficient depth in leveraging data elements to empower cross-border operations, and the value of such data has yet to be fully realized.

On the one hand, data silos obstruct full-chain coordination. Some large industrial enterprises lack intelligent trade application platforms and tools built on big data, with the result that data across the entire chain—from order acquisition and intelligent production scheduling to cross-border logistics and after-sales service—fails to flow seamlessly. Key information cannot be shared, and enterprises find it difficult to respond swiftly to shifts in international markets. On the other hand, data-driven decision-making capabilities remain weak. Although platforms such as Wanzhong Cloud Warehouse have integrated multi-party data interfaces to offer enterprises one-stop data connectivity services, a far greater number of

traditional enterprises are still at an early stage in exploiting the valuable resources accumulated through digital trade—overseas market data, user behavior data, and the like. This hampers their ability to conduct precise market forecasting, inventory management, and supply chain optimization, thereby constraining their competitiveness in global markets.

3.3. Inadequate foundations: Weak support from the innovation ecosystem

In the face of fierce competition in global digital trade, Dalian exhibits conspicuous shortcomings in its support for critical innovation factors, which in turn constrains the digital innovation vitality of its traditional enterprises.

On the one hand, there is a shortage of high-end interdisciplinary talent. The development of digital trade requires not only professionals well-versed in traditional industries, but also interdisciplinary talents equipped with digital technology skills, as well as specialists proficient in digital trade operations. At present, such talent is relatively scarce in Dalian, and enterprises engaged in cross-border digital business frequently encounter talent bottlenecks in areas such as multilingual customer service, digital marketing, and international compliance ^[11]. On the other hand, specialized facilities and services—cross-border logistics and payment, among others—remain inadequate. Although Dalian has completed the province’s first “1210 retail export” transaction, achieving a model of “batch import, tax rebate in advance, and batch export,” the service capacity and coverage of digital platforms for intelligent logistics, cross-border payment, and digital customs clearance still require substantial improvement if they are to serve the broader cross-border e-commerce industrial belts ^[12].

3.4. Competitiveness without strength: Insufficient digital innovation capability

Against the backdrop of global digital trade development, Dalian’s traditional enterprises demonstrate a marked deficiency in their capacity to harness digital technologies for innovating business models and enhancing core competitiveness.

On the one hand, their capacity for applied digital technology innovation remains weak. The majority of these enterprises continue to operate within conventional manufacturing paradigms and have invested insufficiently in leveraging artificial intelligence and other digital technologies to empower production. As a consequence, they lack the ability to innovate product forms and optimize service experiences through digital means, making it difficult for them to achieve a leap in brand value via technological innovation. On the other hand, a globally collaborative innovation network has yet to take shape. Dalian’s traditional enterprises remain largely confined to closed innovation models and have failed to make full use of digital trade platforms to integrate global innovation resources for open innovation activities such as cross-border technological cooperation, joint research and development, and crowdsourced design. Their access to international innovation networks and frontier technological developments is likewise limited, and they lack the strategic awareness to leverage digital tools for building cross-border innovation alliances—a deficiency that ultimately constrains the competitiveness of their products in global markets.

4. Countermeasures and recommendations for the digital transformation and development of Dalian's traditional enterprises

4.1. Cultivating platforms and strengthening industries: Building a new vertically interconnected ecosystem

On the one hand, a “one industry, one platform” cultivation program should be implemented, with priority given to the city’s advantageous and distinctive sectors—intelligent equipment manufacturing, green petrochemicals, modern textiles, the smart marine economy, and digital agriculture. Under government guidance and with leading enterprises taking the lead, software firms should be enlisted as partners in jointly developing vertical industry-level industrial internet platforms ^[13]. In parallel, support should be extended to upgrade existing single-enterprise platforms into regional public service platforms, with dedicated subsidies allocated for platform research, development, and promotion. On the other hand, the digital transformation of industrial clusters should be advanced. Digital platform enterprises should be introduced in response to shared transformation needs, creating virtual clusters that connect digital firms with traditional ones, facilitating knowledge sharing and collaborative innovation among enterprises, and ultimately cultivating an innovation ecosystem characterized by synergy between the digital and real economies ^[14]. For reference, Shandong Province issued its Measures for the Management of Funds and Implementation Rules for Industrial Internet-Empowered Manufacturing Digital Transformation at the end of 2024. Guangdong Province, on October 21, 2025, released its Action Plan for AI-Empowered High-Quality Development of Manufacturing (2025–2027), encouraging prefecture-level cities to establish “model vouchers” that support enterprises in purchasing industrial model services and to accelerate the creation of demonstration zones for integrated “AI + manufacturing” development.

4.2. Aggregating factors and facilitating data flow: Constructing a new system of coordinated services

On the one hand, a Dalian Digital Trade Public Service Platform should be established, integrating government and market resources to create an online public service hub that combines policy consultation, talent training, technology matchmaking, legal compliance, cross-border payment, and credit guarantee functions. This platform would promote full-chain data connectivity from order acquisition through after-sales service, effectively removing key obstacles to the circulation of data elements and converting data resources into drivers of innovation. On the other hand, a demonstration and outreach program for data empowerment should be launched. By distilling the successful experience of platforms such as Wanzhong Cloud Warehouse in data integration and service models—and through the promotion of exemplary cases and pilot demonstrations—traditional enterprises should be guided to conduct in-depth mining and multidimensional analysis of the overseas market data and user behavior data accumulated through digital trade, thereby comprehensively enhancing their capabilities in data-driven market forecasting, product innovation, and supply chain optimization ^[16]. For reference, the “Suhao Cloud” platform, led by Jiangsu Suhao Cloud Commerce Co., Ltd., was selected for the first batch of “Jiangsu Province Data Industry Public Service Platforms.” Guangzhou, through its Measures to Support the Innovative Development of Digital Trade, has prioritized the construction of a number of digital trade public service platforms with prominent core functions, offering support of up to RMB 4 million.

4.3. Strengthening technology and optimizing the ecosystem: Building solid support for digital innovation

On the one hand, traditional enterprises should be encouraged to collaborate with universities and research institutions in launching targeted training programs in “digital trade” and “digital innovation,” thereby promoting cross-disciplinary knowledge sharing and accelerating the penetration of digital technologies into traditional industries. On the other hand, digital infrastructure must be consolidated. Priority should be given to building digital platforms for intelligent logistics, digital marketing, information sharing, and cross-border payment, while advancing the application of artificial intelligence, the Internet of Things, and big data to provide traditional enterprises with end-to-end digital support spanning supply chain optimization, market analysis, and cross-border transactions. Concurrently, the financial support system should be reinforced. A dedicated digital innovation fund should be established to offer low-interest loans and risk compensation mechanisms for traditional enterprises. Meanwhile, fiscal and tax incentive mechanisms should be refined, with differentiated tax preference policies implemented. Traditional enterprises engaged in digital technology research should be granted super-deductions for research and development expenses, thereby enhancing their capacity for sustained innovation investment ^[17]. For reference, Zhejiang Province has issued its Implementation Plan for the Reform, Innovation, and Development of Digital Trade, with a focus on advancing the construction of a Digital Trade Port and encouraging other cities to develop distinctive projects or application scenarios.

4.4. Engaging internationally and aggregating resources: Expanding new space for open cooperation

On the one hand, the “open competition for key challenges” mechanism should be supported. Focusing on critical generic technologies in digital trade—such as multilingual natural language processing, cross-border data compliance technology, and digital marketing algorithms—the government or traditional enterprises should publish lists of research needs, inviting universities, research institutes, technology-based SMEs, high-tech enterprises, gazelle enterprises, and unicorn enterprises to bid for and tackle these challenges ^[18]. On the other hand, active participation in the alignment of international digital rules should be pursued. Full advantage should be taken of free trade agreements such as RCEP, and with the support of relevant national ministries and commissions, pilot measures such as “whitelists” for cross-border data flows and mutual recognition of digital certificates should be explored, creating a more convenient and compliant environment for Dalian enterprises to participate in digital trade ^[19]. At the same time, a Northeast Asian digital trade cooperation hub should be developed. Leveraging Dalian’s geographical advantages, digital trade expositions and high-level forums should be organized to strengthen cooperation with Japan, the Republic of Korea, and Russia in fields such as digital technology, smart cities, and digital content, thereby attracting international digital resources ^[20]. For reference, Shanghai has piloted a general data list system in its Free Trade Pilot Zone, providing compliant enterprises with facilitated cross-border data flows.

5. Conclusion

Digital trade is not merely a new channel for cross-border transactions; it is also an important strategic lever for empowering digital innovation in Dalian’s traditional enterprises. This study finds that Dalian has already made preliminary progress in digital trade and enterprise digital transformation, as reflected in the growth

of cross-border e-commerce, the formation of distinctive industrial belts, the pilot transformation of SMEs, and the continuous emergence of platform-based and data-driven innovation practices. However, traditional enterprises in Dalian still face prominent dilemmas: integration remains superficial, transformation lacks depth, support from the innovation ecosystem is inadequate, and digital innovation competitiveness remains weak. These problems constrain the full release of digital trade's enabling effects and also hinder the deep integration of the digital economy and the real economy. In response to these challenges, this paper proposes a coordinated pathway centered on platform cultivation, factor aggregation, data flow, technological support, ecosystem optimization, and international open cooperation. Only when government, enterprises, universities, research institutions, platform operators, and industry associations work together can the external opportunities of digital trade be converted into an endogenous driving force for enterprise innovation.

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