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The Role of Technology and Digitization in Pakistan–China Trade: Opportunities, Implications and Policy Strategies

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Abstract

This paper looks at how digital technologies like single-window systems, instant payments, cross-border e-commerce platforms, IoT logistics and AI are changing the way Pakistan and China trade.

It brings together recent information from policy reports and studies to show how digitization helps reduce trade problems, makes it easier for small businesses to trade, and improves access to trade finance. Then, it suggests a plan for policies and strategies based on what has been studied.

The review looks at recent (2023–2025) reports, policy documents, and studies about China's Cross-Border E-Commerce (CBEC) pilot zones, the Digital Silk Road, Pakistan's Single Window (PSW) and Pakistan's Raast instant payment system. The findings help create practical recommendations for making trade easier between the two countries. The evidence shows that China's CBEC zones and digital platforms help businesses make more money and export more goods, and also make it easier to get finance. Pakistan's PSW and Raast support paperless trade and real-time payments, but differences in standards and lack of compatibility between the two countries stop them from getting the full benefits. A 12-point strategy focuses on recognizing digital documents, setting up payment corridors, helping small businesses join digital platforms, improving visibility in logistics, and unlocking trade finance to get quick results.

Originality/value — This study uses the latest policy and research to create specific strategies for Pakistan to use digital technology for better trade with China under the CPEC/DSR frameworks.

Literature review

This literature review brings together recent studies and policy work (mostly from 2022 to 2025) that look at how digital technologies affect international trade, especially in relation to China's Digital Silk Road (DSR), China's Cross-Border E-Commerce (CBEC) pilot zones, Pakistan's digital trade systems (Pakistan Single Window PSW; Raast payment system), and research on sectors like agriculture and textiles. The review is divided into eight parts: (1) China's DSR and digital infrastructure; (2) evidence from CBEC pilot zones; (3) paperless trade, single windows and compatibility; (4) digital payments, fintech and Raast; (5) small businesses adopting digital tools and platform economics; (6) agriculture: precision, traceability and market access; (7) textiles: Industry 4.0, traceability and branding; and (8) standards, legal rules and system risks. Each section highlights the key findings and their impact on Pakistan–China trade.

Digital Transformation in Global Trade

The growing use of digital tools in international trade has become one of the biggest changes in the economy during the 21st century. New technologies like artificial intelligence,

blockchain, big data, and 5G are changing how trade happens by cutting down costs, making things more transparent, and helping countries work together across borders (World Bank, 2022). Digital platforms make online shopping easier, connect buyers with sellers, and allow for real-time sharing of information, which helps reduce problems that used to slow down international trade (OECD, 2021). In particular, digital financial systems such as mobile banking and financial technology services are changing how trade is funded. These new methods are especially important for countries like Pakistan, where getting trade financing has been a challenge for a long time. By using digital tools, exporters can avoid complicated paperwork and connect directly with banks in other countries, making transactions faster (UNCTAD, 2023). Also, using blockchain for trade documents helps prevent fraud and builds trust, which is very important for trade between Pakistan and China, where keeping transactions safe is a top priority (Zhou & Li, 2023). China's Digital Silk Road (DSR) is part of the Belt and Road Initiative (BRI) and aims to create a digital environment that connects infrastructure, standards, and services across countries. The DSR focuses on investments in 5G networks, satellite systems, online shopping between countries, and digital payment systems (Liu & Lim, 2022). For Pakistan, which already has a strong relationship with China through the China-Pakistan Economic Corridor (CPEC), digital integration can help improve trade between the two countries and bring more foreign investment (Hussain et al., 2023). CPEC's second phase is starting to focus more on industry and technology upgrades, giving Pakistan a chance to improve digital infrastructure in special economic zones (SEZs) (Khan & Rehman, 2022). These SEZs can act as centers for online trade logistics, data handling, and sharing technology. Also, digital routes under CPEC are expected to connect Pakistan's trade networks with China, Central Asia, and the Middle East, opening up more markets (Shahbaz & Lin, 2023). However, some experts point out challenges like control over data, protecting against cyber threats, and making sure rules are consistent between countries. Pakistan needs to strengthen its regulatory system to handle Chinese tech companies like Huawei, Alibaba, and Tencent, making sure local businesses can benefit from digital trade without becoming too dependent on them (Rahman & Xu, 2023).

Implications for the Agricultural Sector

Agriculture is a major part of Pakistan’s economy, providing around 19% of the country's total income and employing about 38% of the workers (Government of Pakistan, 2023).

However, the sector faces several challenges like low production levels, weak supply chains, and limited market access. Using digital technology can help change this by introducing smart farming techniques, such as precise farming methods, crop monitoring using satellites, and online marketplaces for farmers (Ashraf et al., 2022).China has strong experience in agritech, including using AI to predict crop yields, using drones for spraying pesticides, and using blockchain to track food safety.This offers Pakistan a good example to follow and work with (Wang et al., 2022). Cooperation between Pakistan and China can also include digital supply chain systems, allowing Pakistani farmers to connect directly with Chinese buyers through the internet. This helps reduce the number of middlemen, leading to better prices for farmers (Hameed & Gao, 2023).In addition, the trade between Pakistan and China in agricultural products like rice, mangoes, and citrus fruits is increasing. But there are still some challenges, such as SPS (sanitary and phytosanitary) rules, which sometimes stop trade. Digital

certification systems, backed by blockchain, can help meet Chinese import standards, making trade faster and reducing rejections (Iqbal et al., 2022). These digital tools not only support trade between the two countries but also help improve food security and the living conditions of people in rural areas of Pakistan.

China's Digital Silk Road and strategic digital infrastructure

A lot of research shows how big and ambitious China's Digital Silk Road (DSR) is, as part of the larger Belt and Road Initiative (BRI). The DSR includes investments in data centers, fiber-optic cables, 5G networks, satellite navigation, and cloud systems. It also involves spreading Chinese tech companies like Alibaba, Tencent, and Huawei across the world (Baark, 2024; ISEAS, 2024). Scholars say the DSR is not just about building physical infrastructure—it also brings technical rules, platform designs, and business services (Zhang & Chen, 2023). One key part of the DSR is creating connected digital paths that link production, transportation, and consumer areas in partner countries. This is especially important for projects like the China-Pakistan Economic Corridor (CPEC), where physical and digital links support each other (Baark, 2024; ISEAS, 2024). For the countries involved, the DSR helps quickly build digital abilities, but it also brings up issues about who controls the tech, matching standards, and long-term reliance on Chinese companies (Baark, 2024).

Recent studies, mostly quasi-experimental and looking at small areas, have looked at China's Cross-Border E-Commerce (CBEC) comprehensive pilot zones (CPZs). These studies show that digital trade policies can have real effects. Using methods like difference-in-differences and panel data, researchers found that when a region is named a CPZ, it leads to more household spending, more exports from businesses, and better local incomes (Cai et al., 2025; Lyu, 2024; Wang, Sun, & Zhou, 2025). These positive results happen through several ways: easier regulations (like simpler customs and faster shipping), better access to online markets (like digital tools and better logistics), and better access to digital money (like quicker payments and alternative ways to show creditworthiness). Scholars also found that different industries respond in different ways to CPZs. Companies in areas like consumer goods, electronics, and light manufacturing see benefits first because their products are easier to ship and face fewer rules. But companies in agriculture or sectors with strict rules need more support to meet standards and health regulations (He et al., 2024; Han et al., 2025). Overall, the research shows that digital trade policies in specific areas can improve the economy, but these improvements work best when there are supporting changes in finance, logistics, and product standards.

Trade facilitation studies show that single-window systems and using electronic documents are very effective ways to cut down the costs of doing business at borders (UNESCAP, 2023; WCO, 2024). The Pakistan Single Window (PSW) aims to combine all the permits, certificates, and customs forms into one digital platform — which is essential for making trade completely paperless with China and other countries (PSW, 2024). Research from other places shows that when countries agree to accept electronic documents like e-certificates of origin, e-invoices, and e-phyto certificates, and share data before goods arrive, it greatly reduces the time it takes to process imports and exports (Hummels et al., 2025). The studies also point out a technical challenge: for systems to work together smoothly, they need common data standards (like the WCO Data Model or UN/CEFACT classifications) and good management of APIs — it's not enough to just digitize paper forms (WCO, 2024; UNESCAP, 2023). Because of this, many

studies suggest starting with small tests, focusing on a few product categories and trusted businesses, to build confidence and check the legal rules before expanding the system widely (PSW reports; WCO workshop findings).

Digital payments, fintech and the role of Raast

Digital rails that allow instant payments are very important for online businesses and small and medium-sized companies (SMEs) to manage their money. Studies on digital finance show that systems that process payments in real time help reduce the risk of payment failures, cut down on the amount of money businesses need to keep on hand, and help small sellers and exporters do better online (Ma & Zhang, 2025; Development Asia, 2024). In Pakistan, Raast — the country's instant payment system run by the State Bank — has grown quickly and is now widely used for payments from individuals to businesses, helping to support e-commerce (SBP, 2025). However, research also shows that connecting payment systems across countries needs careful attention to anti-money laundering and counter-terrorism financing rules, exchange rate systems, and often agreements between countries or banks to manage money and risks (KPMG Pakistan, 2025; SBP, 2025). For trade between Pakistan and China, experts suggest starting with smaller payment systems and using secure payment holding services to help small businesses in trade, while also setting up common rules for sending and matching payment information (Ma & Zhang, 2025).

SME digital adoption and platform economics

Small and medium-sized businesses (SMEs) make up most of Pakistan’s export companies, but they often face challenges like not having enough digital skills, difficulty in meeting product standards, and limited knowledge about logistics. Research on marketplaces shows that these platforms help small sellers find customers in big foreign markets by lowering the cost of finding buyers. However, joining these platforms needs businesses to invest in things like product information, managing orders, handling returns, and providing good customer service (Molenaar, Sinkovics, & Archie-Acheampong, 2024; Bashir et al., 2024). Studies focused on Pakistan show that SMEs which use complete sets of tools like digital product listings, content in two languages, and quality certifications perform better in exports (Afzal et al., 2022; Bashir et al., 2024). The clear message for policies is that support for businesses on the supply side—like helping them get started, providing funding, and setting up compliance centers—is needed to take advantage of the opportunities created by Chinese marketplaces.

Agriculture is a key part of Pakistan's trade and is closely controlled by rules related to food safety and plant health. New studies show that using digital tools in farming, like satellite imaging, moisture sensors, and blockchain for tracking cold storage, can greatly lower losses after harvest and help meet the rules of other countries (Ali & Rehman, 2024; Zheng & Xu, 2025). China is helping other countries with digital farming tools and investments through projects under the Belt and Road Initiative, often starting with small demonstration programs (Baark, 2024). For Pakistan, experts suggest combining digital tools on farms, such as estimating crops and managing water, with digital certification and electronic plant health documents to make it easier to sell products in China (Ali & Rehman, 2024; PSW, 2024).

The textile industry shows both chances and a need for action: producers are facing strong competition and lower profits around the world, but using digital tools can help improve

products and provide clear records that top customers want (Mahmood, 2023; Khan & Hussain, 2024). Technologies from Industry 4.0, like predictive maintenance, digital looms, and automated quality checks, make factories more efficient and products more consistent. Blockchain is becoming popular for showing where products come from and proving they are sustainable (Khan et al., 2023). Studies show that companies exporting goods with digital proof of origin and sustainability do better in advanced markets and can charge more for their products. This is important for Pakistan's plan to reach higher-value parts of China's retail markets (Mahmood, 2023).

A common idea in recent studies is that using new technologies alone, without proper laws and systems in place, may not bring much benefit. The UNCITRAL Model Law on Electronic Transferable Records (MLETR), the WCO Data Model, and UN/CEFACT standards are often mentioned as important steps for making paperless trade work across borders (UNESCAP, 2023; WCO, 2024). Also, many papers talk about security and how data is managed. When data moves between countries, it's important to know about where data is stored, how private it is, and how secure it is from national threats — these factors influence which companies or cloud systems countries are willing to use (Baark, 2024; ISEAS, 2024). Lastly, some research points out the dangers of having too much power in one platform or being too reliant on certain technologies. While investing in digital systems can quickly improve abilities, it can also make a country depend on just a few options. To avoid this, they suggest having different choices and building local skills and resources (Baark, 2024; Development Asia, 2024).

Summary of gaps and research implications

The studies that have been reviewed give a good but not complete picture of how digital trade help makes regional business work better. Looking at China's Cross-border Pilot Zones shows clear examples of how digital tools make customs easier, improve money access, and lower costs in trade. But there isn't much research on Pakistan's own systems like the Pakistan Single Window and Raast payment system. Even though documents and reports say these tools could cut down on problems, there isn't strong proof about how they affect trade, like more exports, quicker customs checks, or cheaper payments.In different industries, there is also not enough research.In other countries, digital tools in farming have been tested a lot, using methods like random testing and long-term studies. But in Pakistan, we don't know much about how digital help for farmers, e-marketplaces, or blockchain for tracking goods affects exports. The textile industry is very important for Pakistan's exports, but there's only early talk about using Industry 4.0 tools. There's not much research on how automation, digital quality checks, or smart logistics affect productivity and export success. This lack of research makes it harder for policymakers to apply what works in one industry to others.Another area needing more work is comparing trade along the Pak–China route. There's not enough research that follows trade from start to finish—like how sellers get on board, how they follow rules, go through customs, move goods, pay, and deliver. This kind of study could show how much time and money are saved in different situations, and where things get stuck. For example, differences in rules about privacy, digital certificates, or financial laws might stop trade or make it less trustworthy. Also, comparing Raast with China's payment systems on speed, reliability, and solving problems is needed.Filling these gaps is key for making smart trade policies.Better research would help decide where to test new tools in high-impact areas like farming and textiles, support small and

medium businesses with better funding, and help with digital trade rules. Comparing trade between Pakistan and China would let both countries work together on common rules and share costs for better systems. In the end, solving these research questions would turn the digital ideas for the Pak–China trade route into real tools that help grow the economy and make trade better.

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