



Blockchain for Sustainable Higher Education: Degree Attestation and Public Procurement in Pakistan

Digital Transformation of Public Procurement in Pakistan

The Higher Education Commission (HEC) has recently introduced a historic initiative for degree attestation using blockchain technology, marking a digital development in Pakistan's higher education system. This article examines whether such innovation can be scaled up to public-sector procurement across universities and how policy, regulatory and technical aspects can work together to establish smarter and sustainable supply chains.

The PPRA Ordinance and subsequent rules and regulations are in force to regulate public procurement in Pakistan. To achieve "One Nation, One System," the government has been actively digitalizing the procurement process through the e-Pak Acquisition & Disposal System (EPADS). EPADS 1.0 processed over 1.4 trillion in FY2024–25 and registered almost 10,000 agencies and 51,000 suppliers. The enhanced EPADS 2.0 pilot, launched in February 2026, includes automated supplier onboarding, e-invoicing, e-payments, e-bidding, system-based bid evaluation and integration with national data repositories such as NADRA, FBR and SECP. These initiatives have reportedly resulted in savings of more than 20 billion through administrative efficiencies and increased competition in contract prices.

Challenges in Public University Procurement

However, gaps remain in implementation, particularly at the higher education level. A recent survey of public universities in Sindh by Khuhro et al. (2025) concluded that 91.9% of procurement processes remain manual and paper-based. These processes result in slow documentation, limited transparency and inefficiencies, with around 90% of participants calling for replacement of the existing system.

These findings are consistent with other studies identifying similar shortcomings in Pakistan's procurement system. Very few federal universities and HEC bodies have adopted EPADS, while many continue to rely on legacy or spreadsheet-based systems.

Blockchain and Public Procurement

Blockchain can replace numerous hand-off processes with cryptographically protected transactions and smart contracts. This can provide real-time visibility and traceability, with bids, approvals, product checks and payments recorded on an immutable ledger accessible to regulators and authorised stakeholders.

In Pakistan, blockchain could complement the existing EPADS infrastructure, with supplier registration and release of funds managed through EPADS while detailed provenance and contract information are captured through a permissioned blockchain layer.

HEC's Blockchain-Based Degree Attestation Initiative

HEC already has experience connecting university ERP data to blockchain for degree verification. In late 2025, HEC launched a blockchain-based degree attestation system under the Higher Education Development in Pakistan project funded by the World Bank. The initiative aims to streamline the attestation process and eliminate paper-based procedures and physical visits.

The 25 universities integrated into the system provide graduation data that is uploaded directly to the HEC blockchain. At other universities, students upload digital transcripts that are verified by the universities on-chain, after which HEC attests and stores them in a tamper-proof manner. Blockchain-based degrees provide instant and verifiable proof of authenticity that can be accessed by government agencies, embassies and employers.

The HEC system demonstrates several important enablers, including a central record, cross-institutional links and high-level institutional engagement.



It also demonstrates potential synergies, as the same blockchain network could be extended to other documents, repositories and procurement records. The attestation initiative illustrates the potential of blockchain to improve transparency and transaction speed when core processes are digitized and supported by appropriate governance.

Applying the HEC Blockchain Model to Procurement

The HEC system provides a common chain for verifying official documents and activities. A procurement system could similarly maintain shared tender, bid and contract records. The analogy is direct: degrees can be represented as verifiable digital records that authorized agencies can access to confirm the authenticity of a student's qualifications. Similarly, invoices and product certificates in a supply chain can be integrated into a blockchain-based system.

One of the most significant benefits of blockchain in procurement is its potential to improve transparency, traceability and trust among multiple parties. Transactions such as tender submission, bid submission, contract award, delivery and payment can be time-stamped and cryptographically connected, providing a verified source of information for authorized parties. This makes unauthorized alteration and fraud more difficult.

Blockchain can also streamline processes by reducing paperwork and intermediaries. Smart contracts can automatically enforce conditions for contract stages such as delivery confirmation and payment without manual intervention. The Inside Supply Chain Management (ISM) points out that smart contracts can manage several procurement processes, including documenting purchase orders, delivery checks, receipt of invoices and settlement payments. Walmart has already demonstrated that blockchain can reduce the time required for traceability from days to seconds.

Blockchain for Sustainable Supply Chains

Blockchain integrations are also being tested globally to support sustainable supply chains. Provenance data such as the origin of materials, CO₂ emissions per shipment and social compliance certificates can be recorded on-chain and used by procurement officers to assess sustainability criteria.

Companies can track metrics such as carbon footprints, working conditions and sourcing practices and enforce supplier ESG conditions through smart contracts. In Pakistan, the new PPRA framework explicitly includes a "Sustainable Procurement Policy" and framework

agreements that may incorporate ESG metrics.

Blockchain can therefore support measurable green procurement through traceable environmental and social compliance records.

Legal, Technical and Implementation Challenges

Several issues need to be addressed for successful blockchain adoption and integration. Pakistan's existing procurement legislation requires e-procurement but does not specifically address blockchain. Although the Public Procurement Rules 2025 mandate e-bidding and digital records, they do not explicitly address blockchain records or digital signatures. Clarification regarding the legal admissibility of blockchain records will therefore be necessary.

Data privacy is another concern, as procurement data may include personal information of stakeholders. Although Pakistan does not have comprehensive data protection legislation, privacy best practices can be applied to safeguard personal information.

Successful blockchain adoption would also require integration of existing systems, including EPADS, universities, banks and NADRA/SECP for vendor verification and payment processing. Due to the size of documents involved in e-procurement, careful system design will also be required. Global public blockchains may face limitations related to transaction speed and block size.

Clear legislation defining who will manage and operate the blockchain network will also be necessary to ensure effective governance. The EPADS framework recommends a federated approach involving federal and provincial units, which could potentially be replicated through a blockchain network with a shared data layer.

Cost, Capacity Building and Digital Readiness

Development, hardware, training, maintenance and validation would involve both initial and recurring costs. Existing digital reforms such as EPADS have already generated significant savings, with administrative cost savings of PKR 20.5 billion recorded in FY2024–25.

Greater transparency in procurement could further reduce losses associated with corruption and process delays. Reducing paperwork and accelerating tendering could also improve budget and resource management.

Training procurement officials and vendors would be

essential for successful adoption. PPRA reforms have focused on capacity building, with more than 14,000 officials and vendors trained over two years. Similar programmes would be required at universities.

Vendors would also need to register on the blockchain network and understand how to participate in digital procurement. The principal challenges therefore include scalability, security, legal recognition of blockchain transactions and the digital divide.

Conclusion

Blockchain integration holds significant potential to improve procurement processes in higher education institutions by making them more transparent, efficient, secure and sustainable. Its immutable ledger can provide a permanent record of procurement transactions, reducing opportunities for bid manipulation, fraud and document forgery while strengthening accountability.

Smart contracts can reduce paperwork, processing time and human error. Blockchain can also support supplier management through secure digital vendor credentials and improve collaboration among stakeholders through a trusted platform.

End-to-end traceability of goods and services can further support sustainable procurement by enabling institutions to monitor supply chains and assess environmental, social and governance (ESG) compliance.

Overall, blockchain may not transform supply chains on its own, but it can strengthen them by improving visibility and reducing risk. With the government's push towards Digital Pakistan and recent procurement reforms, the environment is favourable for further experimentation. However, pilot testing is essential to identify challenges and demonstrate benefits before wider implementation.

Given HEC's pioneering blockchain-based degree attestation initiative and the broader Digital Pakistan agenda, Pakistan's higher education sector has a foundation for exploring blockchain-based procurement. The government could develop a permissioned blockchain network integrated with existing e-procurement systems to support faster, fairer and greener procurement.

Potential benefits include improved transparency, reduced fraud, stronger contract management and real-time sustainability monitoring. Legal requirements, data privacy and capacity development must, however, be addressed.

A staged approach, beginning with small-scale pilots before wider implementation, can help identify practical challenges and demonstrate value. The



convergence of blockchain-based degree attestation and e-procurement could also enable universities to verify academic and supplier credentials through secure digital systems.

In the future, this approach could be extended to other public sectors and combined with technologies such as IoT sensors and AI analytics to support sustainable supply chains across Pakistan.

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About the Author: **Dr. Muhammad Haroon Rasheed** is a Lecturer (Commerce) at Malik Firoz Khan Noon Business School, University of Sargodha. His academic journey up until his postdoctoral research at the College of Economics and Management, Nanjing University of Aeronautics and Astronautics, China, has been focused on Financial Markets. Particularly, his research interests lie in exploring the dynamics of financial decision-making through the lens of behavioral finance. Additionally, he also holds the status of Affiliate Financial Accountant (AFA) from ICMA.