Digital Innovation in Admission Processes based on an Architectural Model of Information Security using Blockchain Technology

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Abstract

INTRODUCTION:
The digital transformation in higher education, particularly in admission processes, has raised concerns about data integrity and security. In Peru, public universities face challenges in ensuring transparency and protecting sensitive information during admissions. This research proposes an innovative solution using BLOCKCHAIN technology to enhance data security and integrity.
OBJECTIVES:
The study aims to develop a digital innovation proposal based on an architectural model of information security, specifically to (1) ensure data integrity and confidentiality, (2) propose a secure online admission process, and (3) analyze current admission processes (AS-IS) while designing an improved model (TO-BE) with BLOCKCHAIN technology.
METHODS:
This study follows a quantitative approach, aiming to implement digital innovation through an architectural information security model to ensure data integrity in admission processes. To achieve this, BLOCKCHAIN technology is applied, known for its ability to securely record transactions and enhance data transparency and security. A proposed eight-phase process was then developed, focusing on an architectural model for secure information handling, incorporating BLOCKCHAIN for data transparency.
RESULTS:
The proposed model significantly improves data integrity and security, ensuring transparency and reducing fraud risks. The TO-BE process addresses vulnerabilities in the current system, offering a more efficient framework for managing sensitive data throughout the admission phases.
CONCLUSION:
Public universities in Peru must adopt BLOCKCHAIN technology to safeguard data integrity in admissions. The proposed model offers a robust solution for secure and reliable online processes, with potential for a transformative impact.

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1. Introduction

In a competitive and globalized environment in higher education, cloud-based technological infrastructures are essential (16). It is important to highlight that the spread of COVID-19 has led universities worldwide to virtualize their academic and administrative activities, driven by digital innovation. Furthermore, as Choi comments, "given that many offline transactions and services have migrated to the virtual environment due to the COVID-19 pandemic, it is now crucial to ensure data reliability and security in the so-called 'contactless' environment" (7). This has been done to ensure the continuity of educational processes and provide security and quality in the services offered. Additionally, as Wu and Gu point out, technological advances and the knowledge and skills of global technology professionals in digital innovation within the educational sector bring many benefits (36). All of this creates a market by adding value to the process and creating a competitive environment.

Therefore, it is imperative for corporations to adapt to global environmental transformations. Education has undergone significant changes by adopting virtual and distance learning, which have become a reality and a necessity in our globalized world (14). This brings uncertainty that must be accepted as a strategy in these processes. Additionally, Wu and Gu argue that continuous digital innovation adds value to the educational system (36). Consequently, it can lead to a transformation and evolution of business processes into a completely modern state, with innovative and sustainable quality over time. As mentioned earlier, there is an urgent need to implement digital innovation in higher education processes. (33) However, these changes are challenging and face numerous difficulties, such as a lack of security and transparency in information, highlighting critical vulnerability gaps. Therefore, it is necessary to use robust and appropriate technology to address the mentioned challenges, and in this regard, BLOCKCHAIN technology emerges as the most suitable option. This choice is justified by the inability to modify the timestamp and sensor data, fundamental aspects of BLOCKCHAIN that ensure the integrity and security of information (31). By allowing the complete transformation of a higher educational institution's digital process into a secure and transparent one, it is essential to point out that this article proposes the use of BLOCKCHAIN technology as an integrated system. This technology enables the custody of information in a disruptive, incorruptible, and transparent manner. (24) It also reinforces the conclusion made by Ali, where it is stated that universities can manage a Student Information System (SIS) in a way that greatly guarantees security (1). In this manner, storing and sharing data will be simplified with the use of decentralized data storage, which can be implemented in the blockchain (1). In this context, Guz highlights the value of this technology in each of an organization's processes (9). Therefore, the new uncertainty scenario implies that organizations must adapt to changes not only internally but more broadly to remain competitive. In this sense, it can be said that organizations must digitally innovate their processes using BLOCKCHAIN technology to be prepared for the future. As Dai points out: "Building a university educational resource sharing model based on BLOCKCHAIN technology can not only increase the scope of shared educational resources, improve the quality of educational resources, but also protect the intellectual property rights of uploaders" (10).

This is a tool that will enable fast data integration, so organizations must be prepared to accept changes. Additionally, Ivanov et al. consider the importance of digital transformation and restoring trust in each process within the university (26). This transformation also includes artificial intelligence and BLOCKCHAIN, which is moving toward process automation (15). Therefore, universities themselves must implement changes that keep pace with the world. There is a need to integrate systems securely, especially when there is a lot of data involved. And although BLOCKCHAIN technology has a disadvantage in scalability, it has proven to handle identity management and transparency systems well (35). This implies an increase in security, transparency, trust, and real-time information availability. During the critical pandemic period, various situations arose where digital processing became crucial for online classes, administrative processes, and more. Cases of fraud were observed that compromised security, underscoring the importance of more secure and reliable technological solutions, such as BLOCKCHAIN technology. Therefore, it is necessary to detect prevailing limitations that damage the authenticity of the accreditation process and have detrimental effects on education (32). As Ramos states, "trust relationships are influenced by the potential benefits that can be generated by adopting and implementing BLOCKCHAIN, such as the ability to prevent fraud in the issuance and certification of academic documents, security in information exchange, traceability, standardization of daily tasks, building a collaborative environment, and cost reduction" (30). That is why it is imperative to work with innovative technology in these institutions, where their processes are still up to date (36). Moreover, the principles of the European Union's General Data Protection Regulation emphasize that data related to a person on the blockchain must remain confidential (11). Thus, the application of BLOCKCHAIN technology in a university will reduce issues related to documentation and data information, generating a robust and integrated architectural security. This will mean a quick, orderly, and fully secure response backed by information.

In this regard, Cabrera-Mora et al. point out that some factors limit the development of this technology in a public university, such as connectivity and information restoration (12). Therefore, the process could be halted because the information center could become saturated, making the process slow and insecure. Additionally, Naúmenko and Fakhrutdínova complement by pointing out that there are significant challenges for Latin America regarding

BLOCKCHAIN technology, as the continent does not have a well-developed infrastructure, and the technology gap is wide (13). Therefore, in this sense, there is a need for innovative proposals that adopt new prototypes based on this technology to bridge the gap and empower organizations to be connected in each of their processes. Nevertheless, in this continent, the banking, financial, and insurance sectors took the initiative of digital innovation by using BLOCKCHAIN in their own business processes, as it offers several significant advantages in terms of security for making risk-free financial transfers, preventing fraud, and providing high transparency in their processes (23). One of these is the integration that works well with BLOCKCHAIN (18), which is due to its novel use of cryptography and the proof-of-work approach (31). In this scenario, universities in Peru have seen their online admission processes postponed due to the lack of innovation focused on the security of their technological infrastructure, which is essential to ensure data protection, transparency, reliability, integrity, and accessibility, thus reducing the income of these entities. (8) The research proposes an innovative and relevant solution in the global context aimed at improving the security of technological infrastructure through an information security architectural model based on BLOCKCHAIN.

To ensure the trust, integrity, and authenticity of the information obtained during the admission process, it is essential that the data cannot be modified without the prior authorization of those responsible for its management. This technology facilitates recording events in a disruptive and innovative way in blocks, ensuring information security against potential eventualities. BLOCKCHAIN is known for its security and sustainability (16). Therefore, as Khashan states, "BLOCKCHAIN is intended to enhance security and trust among users where transaction data can be shared across an unsecured network of participants without the mediation of centralized third parties" (22). It thus has a wide range of future application possibilities (21). However, this research topic is still in a learning and implementation process in various organizations, raising the following question: How does digital innovation based on an information security architectural model ensure the integrity of information in admission processes using BLOCKCHAIN technology?

2. Methodology

This research has a quantitative approach, as the objective is to utilize digital innovation based on an architectural model of information security to ensure data integrity in admission processes by applying BLOCKCHAIN technology. As Cai precisely states, "BLOCKCHAIN is mainly used to record transaction data or other information, which is encrypted with hash functions and distributed among nodes" (4). The methodological design is non-experimental, as the variables were not manipulated;

instead, a prototype design was carried out through a study of various related backgrounds.

Regarding data collection, two processes were established, as detailed below:

2.1. Current Admission Processes (AS-IS)

This process described the standardized actors and aligned activities of the most representative universities in Metropolitan Lima, such as: Universidad Nacional Mayor de San Marcos, Universidad Nacional de Ingeniería, Universidad Nacional Federico Villareal, and Universidad Nacional Agraria La Molina.

2.2. Proposed Admission Processes (TO-BE)

Here, a proposal for the online admission process model was designed. This marked the innovation of the process by updating it with cutting-edge technology, improving stages and tasks (Table 1). Subsequently, a detailed analysis of the current situation of public universities in Lima, Peru, was conducted concerning their processes. This study allowed for evaluating key processes that need improvement, as a large portion of procedures is still performed manually. Therefore, this analysis established a robust foundation for the transition to a TO-BE process, supporting the formulation of a proposal that employs digital innovation to strengthen data integrity.

Table 1. Histogram of Selected Profiles

PHASES	ADMISSION PROCESS AS-IS	ADMISSION PROCESS TO-BE
APPLICANT SUPPORT	In this phase, activities are carried out to provide information to the applicant about the admission process. It involves (6) activities. (3) actors participate: Applicant, Assistant Staff, and Support Staff.	In this case, the "Applicant Support" phase will be renamed as "Applicant Registration". It involves (17) activities. (3) actors participate: Applicant, Admission Process Committee, and Admission System
PAYMENT FOR ADMISSION RIGHTS	This phase includes the activities that the applicant must follow to gain access to the admission rights. It involves (2) activities. (2) actors participate: Applicant and Bank Entity.	This phase includes the activities that the applicant must follow to be able to register for the admission process for the upcoming academic period of the higher education institution. It involves (4) activities. (3) actors participate: Applicant, Admission System, and Bank Entity.
APPLICANT REGISTRATION	In this phase, the applicant will register to take the admission exam according to the application modality. It involves (19) activities. (3) actors participate: Applicant, Support Staff, and IT Systems.	This phase includes all activities necessary for the correct registration of the applicant so that they can take their admission exam in the next phase. It involves (3) activities. (2) actors participate: Applicant and Admission System.
ADMINISTRATION OF THE ADMISSION EXAM	In this phase, the applicant will go through an evaluation process according to the application modality. It involves (12) activities. (4) actors participate: Applicant, Classroom Supervisor, Police Officer, and Admission Process Committee.	In this phase, the applicant will go through an evaluation process according to the application modality. It involves (5) activities. (2) actors participate: Applicant and Admission System.
RESULTS PROCESSING	In this phase, the results of the evaluations are processed according to the types of admission modality. It involves (4) activities. (1) actor participates: IT Systems.	Following the admission process to a higher education institution, once the applicants have taken the admission exam, the evaluations are graded. It involves (2) activities. (1) actor participates: Admission System.
RESULTS ISSUANCE	In this phase, the list of all applicants with satisfactory results in the admission exam is displayed. It involves (9) activities. (4) actors participate: Applicant, IT Systems, Admission Process Committee, and Academic Vice-Rector.	In this phase, the list of all applicants with satisfactory results in the admission exam is displayed. It involves (13) activities. (3) actors participate: Applicant, Admission System, Admission Process Committee, and Vice-Rector.

3. Results

Based on the findings of this study, Figure 1 shows the results obtained from a questionnaire applied to a sample of 50 respondents, consisting of IT collaborators and experts in the admission process at the universities analyzed.
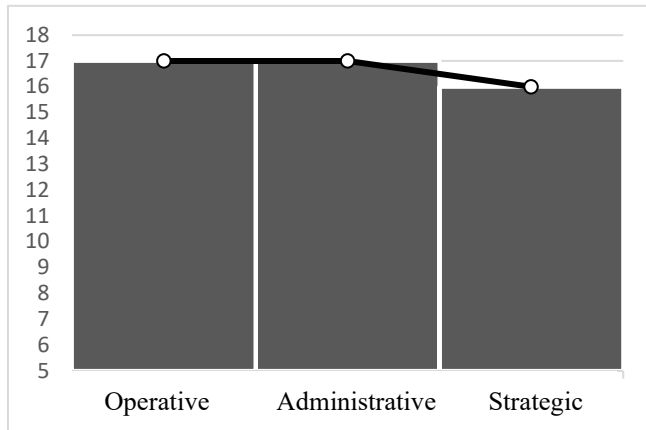

Figure 1. Histogram of Selected Profiles.

In figure 2, the following is the Normal Distribution of the data collected on the first pillar called "Cryptography" as evidence that it follows a normal distribution, allowing us to confirm that the change may affect the entire population. It is also important to note that it behaves similarly to the other defined pillars
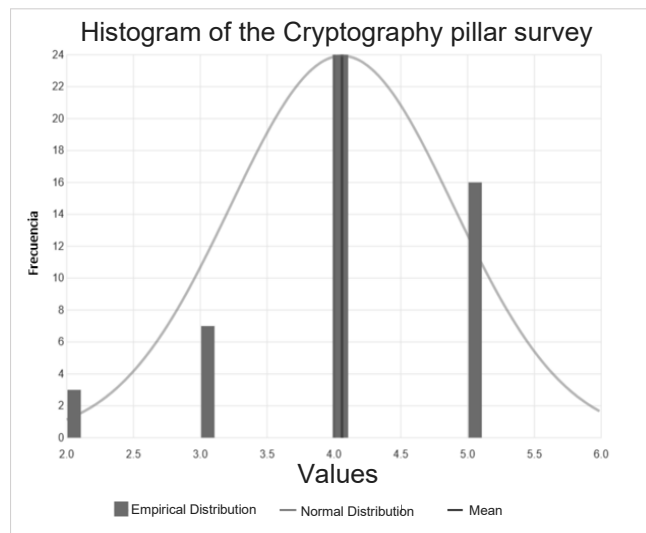

Figure 2. Histogram of surveys on the Cryptography pillar

Figure 3 visualizes the scores obtained in surveys conducted with the three defined profiles. The graph demonstrates and reaffirms that the averages exceed a

score of 3, with a maximum of 4.18, due to positions that rated with a score of 5 regarding the approval of applying cryptographic algorithms and the character size of the generated HASH chain. Similarly, regarding decentralized information management, the score of 4.12 is related to the support of a fully decentralized and distributed system like BLOCKCHAIN. Next, with Smart Contracts, the score of 3.47 reflects the approval of implementing Smart Contracts as part of digital innovation in admission processes, a characteristic inherent to BLOCKCHAIN. Finally, regarding immutability, the score of 3.41 is linked to the security felt by collaborators since BLOCKCHAIN guarantees information security.

Due to the average scores obtained by pillar and position, it can be stated that BLOCKCHAIN possesses innovative characteristics capable of meeting the information security needs of collaborators through a technological innovation reflected in an architectural model utilizing blockchain. Additionally, it can be asserted that collaborators belonging to the defined profiles and working in a public higher education institution fully support the use of cutting-edge and innovative technology, such as blockchain, which is present in the financial sector with a high impact on security and speed, as shown by Yang in his work (33; 20). Based on this, it can be concluded that the use of digital innovation through an information security architecture utilizing BLOCKCHAIN can enhance processes/dimensions according to the results obtained by each collaborator profile. In the Likert scale, the majority are satisfied, agreeing, or strongly agreeing with the implementation of such technology in the university selection process.
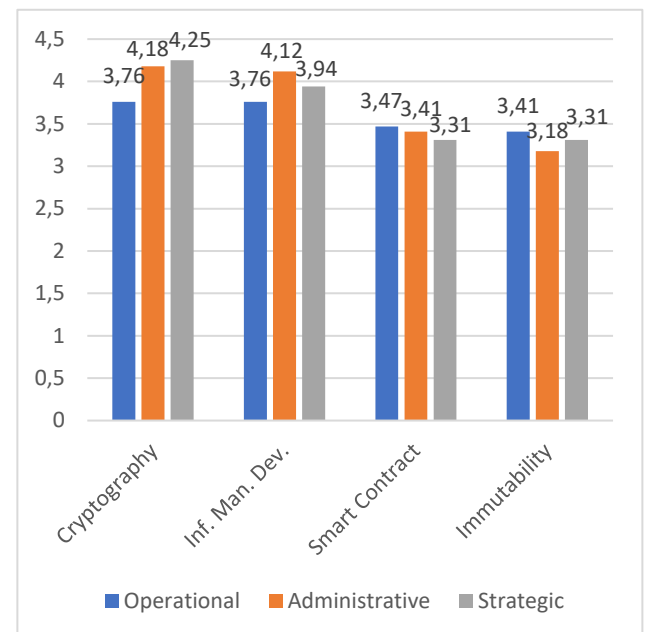

Figure 3. Average Scores Based on Pillars and Positions

Three job profiles were selected (strategic, administrative, and operational) based on their role in the organization. It is important to mention that the "Jarque-Bera" normalization test was used to apply descriptive tests. This test was employed to obtain the mean of the selected indicators in different dimensions, allowing the interpretation and visualization of improvements for the implementation of disruptive technology like BLOCKCHAIN. Additionally, the surveys considered four fundamental pillars driving technological security innovation: cryptography, decentralized information management, smart contracts, and immutability (see Table 2).

Table 2. Data to Normalize the Sample based on the Jarque-Bera Statistical Method

JARQUE - BERA		
N (SAMPLE SIZE)	50	
SKEWNESS	0.038	
KURTOSIS	-1.512	
DEGREES OF FREEDOM	2.0	
STATISTIC	**CRITICAL VALUE**	**P-VALUE**
CRITICAL VALUE	5.9914645471	0.0500000000
JARQUE-BERA STATISTIC	4.7776184550	0.0917388590

H0: The sample follows a normal distribution.

H1: The sample does not follow a normal distribution.

Since the P-value (0.0917) is greater than the significance level of 0.05, we fail to reject the null hypothesis (H0). This indicates that the sample likely follows a normal distribution.

The following is Table 2, which contains the data to be considered for normalizing the candidates, with the aim of ensuring that the sample represents the population. Since the P-value of the Jarque-Bera test is greater than the critical P-value, the null hypothesis (H0) is accepted, allowing for a normal distribution.

Given that there are only three roles (Strategic/Administrative/Operational) among the collaborators surveyed in the admission process, it is observed that they follow a Gaussian distribution, making it possible to represent all collaborators of the organization (Universities in Peru) in the survey conducted.

According to the average scores by pillar and job profile, it can be affirmed that BLOCKCHAIN possesses innovative characteristics capable of meeting the needs of collaborators regarding information security, supported by

technological innovation reflected in an architectural model utilizing blockchain. Moreover, it can be stated that collaborators belonging to the defined profiles and working in a public higher education institution fully support the use of cutting-edge and innovative technology like blockchain, as is done in the financial sector with a high impact on security and speed, as demonstrated by Yang in his work (33, 20). Furthermore, it can be concluded that implementing digital innovation through an information security architecture based on BLOCKCHAIN can improve processes and dimensions according to the results obtained by each collaborator profile. It is crucial to highlight that the Likert scale was used to evaluate the questionnaire, and the results showed a high level of satisfaction, evidenced by the collaborators' opinions, where they agreed or strongly agreed with the incorporation of this technology in the admission process. The creation of the eight phases that allowed the development of the data security architecture prototype using BLOCKCHAIN is also emphasized (Figure 4).
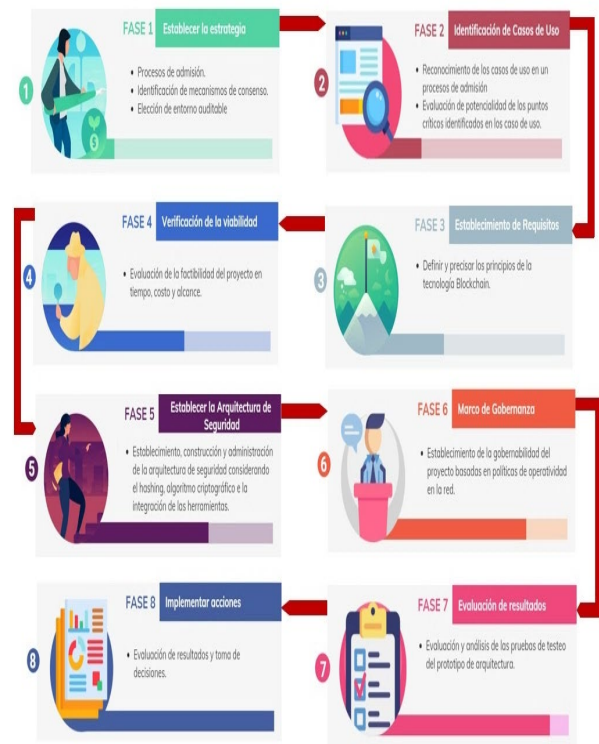

Figure 4. Phases of the Data Security Architecture Prototype Using BLOCKCHAIN

On the other hand, this study highlights the architectural proposal of an information security model that would allow for the implementation of BLOCKCHAIN technology in a public university (Figure 5).
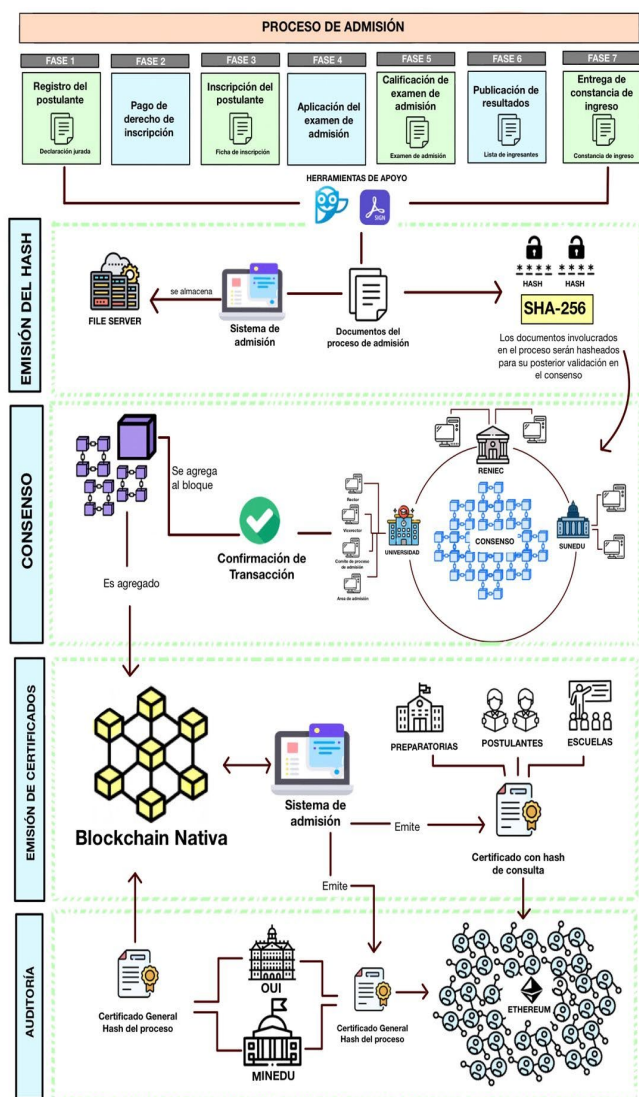
Figure 5. Data Security Architecture Model for the Admission Process Using BLOCKCHAIN

3.1. Proposal for an Information Security Architectural Model Using BLOCKCHAIN Technology

As a result of developing the TO-BE admission process, the architectural model for information security using BLOCKCHAIN technology was deployed, as shown in Figure 5, which is based on digital innovation aimed at the online admission process. According to the presented model, the following activities are described:

a) The HASH of the most critical documents belonging to the applicant will be obtained and then validated by a consensus integrated by previously established authorities such as RENIEC, the University, and SUNEDU. These entities will allow the establishment of legitimate transactions that will enter the University's BLOCKCHAIN.

b) The HASH is validated and accepted by the participating nodes in the consensus, and the generated block will be added to the native hybrid BLOCKCHAIN. The consensus will be carried out based on the Byzantine Fault Tolerance (PBFT) mechanism.

c) Through the admission system, the HASH of vulnerable documents in the process will be delivered, and it will also be published on the Ethereum platform, ensuring transparency of the validated data in the proposed native and hybrid BLOCKCHAIN. The BLOCKCHAIN network consists of the following nodes: the University itself, including the participation of the rector, vice-rector, admissions area, and the admissions committee, as well as the National Superintendence of University Education (SUNEDU) and the National Registry of Identification and Civil Status (RENIEC).

d) Once the necessary information has been entered and accepted into the blockchain through the admission system, certificates containing the HASH of the documents related to each applicant's admission process will be issued. This information will be accessible visually and informatively but not editable (25).

As a result of an exhaustive comparative analysis based on outstanding characteristics, the Ethereum platform was chosen for its prestige and scalability to be the medium where a HASH containing the auditable file of each applicant's admission process will be uploaded, which is typically conducted twice a year by each university. This aims to ensure transparency throughout the process and guarantee information security. The HASH will be made available to each entity and/or person who requires access to that information. It is also worth mentioning that large external entities involved in the process, such as the OUI and MINEDU, will have auditable access to the proposed native BLOCKCHAIN, where transaction consensus and admissions are carried out, as they are regulatory entities. This allows them to compare the audit report published on Ethereum to ensure the transparency and incorruptibility of the admission process. All this is thanks to digital innovation, which is currently challenging the traditional way of offering services, thus adding value to business processes (19). For this research, the focus is on strengthening the transparency and immutability of information in admission processes using an information security architectural model that utilizes BLOCKCHAIN.

Comparison of Effectiveness:
1. University of Nicosia (Cyprus) vs. the Research Work:

    The University of Nicosia implemented Blockchain technology for credential verification and admissions, ensuring secure and transparent documentation. However, this initiative focuses primarily on credentialing, rather than addressing the full admission process.

The research work specifically targets the entire university admission process, detailing each step from registration to results issuance. The use of Byzantine Fault Tolerance (PBFT) for secure consensus in data validation in the research adds an additional layer of security compared to the University of Nicosia's model, which emphasizes decentralization.

Comparison: The research work addresses the entire admission process, while the University of Nicosia's case focuses primarily on credential verification. The research work is broader in scope, incorporating additional security mechanisms throughout the entire admission lifecycle.

2. MIT Media Lab (USA) vs. Research Work:

MIT's use of Blockchain for digital diplomas ensures the authenticity of credentials, reducing fraud. While this addresses verification at a post-admission stage, it doesn't tackle the security of the admission process itself.

The research work addresses the admission process, specifically focusing on improving security during applicant registration and results issuance. It employs Blockchain for both data protection and fraud prevention.

Comparison: MIT's focus is on post-admission verification, while the research work covers the entire admission process, ensuring security from start to finish. Additionally, the use of smart contracts in the research work enhances automation and reduces human error, a focus not directly covered by MIT's model.

3. Estonian E-Residency Program (Estonia) vs. Research Work:

Estonia's E-Residency program uses Blockchain for digital identity verification, providing a secure system for accessing various services. The system is highly secure, but its focus is on identity management rather than the multi-step admission processes in higher education.

The research work goes beyond identity management by securing the entire admission process, ensuring data integrity from registration to results issuance.

Comparison: The Estonian model is effective for identity verification, but the research work provides an additional layer by securing sensitive data throughout multiple stages of the admission process, including fraud detection and document tampering prevention.

4. National University of Singapore (NUS) vs. Research Work:

NUS has explored Blockchain for academic credential verification and student record management, similar to MIT's approach. However, this focus is limited to the post-admission stage and does not address the admission process itself.

The research work emphasizes securing the entire admission workflow, from initial registration to final results issuance, offering a holistic solution that integrates Blockchain for ensuring security at every step.

Comparison: NUS focuses on managing academic records after admission, while the research work offers a comprehensive model that ensures security and data integrity throughout the entire admission process, with additional functionality through automated validation via smart contracts, which NUS does not fully cover.

4. Discussion

According to the research conducted, it is important to highlight that digital innovation involves the adoption of digital technologies integrated into business processes to add value not only to the organization implementing such processes but also to customers and end-users. Therefore, in the admission process, digital innovation in information security would add value by strengthening critical processes that have been compromised by attacks or fraud committed by cybercriminals, given the changing environment of today's market and society. This would be achieved by implementing technologies that enhance information security and protection systems. However, digitalization faces challenges, such as information privacy, where the goal is to significantly reduce concerns regarding the control of information and personal data, as large amounts of data are processed and stored. Additionally, the architectural design proposed in this research presents an opportunity for future studies, as it aims to ensure data and information communication. As digitalization advances, system interaction increases, leading to greater security challenges (30).

For this reason, Blockchain technology was chosen because it directly addresses the previously mentioned digitalization challenges in terms of security and privacy, as its working model provides disruptive features that enable a highly secure process in data and information transmission, transformation, and storage. Thus, an admission process model based on Blockchain represents, according to Pereira et al. (28), the optimization of processes through modeling, design, and prototyping of a Blockchain architecture. Consequently, this technology becomes essential in public universities to ensure information protection and enhance security in the admission process, allowing for more effective and efficient management. Additionally, it guarantees the provision of quality service based on data confidentiality, integrity, and availability. In this regard, Catalunya and Palacios (25) determined in their research the speed and efficiency of integrating technology into everyday aspects that have improvement opportunities, which would benefit from process optimization, especially safeguarding data integrity at a high-security level.

These results indicate that national universities in Peru need to upgrade their technological systems to a more innovative one to meet various internal and external needs,

streamlining and securing the integration of one of the most important processes: admission. Therefore, Pava et al. (27) consider that applying Blockchain technology facilitates and enables the proper management of information in a decentralized manner, optimizing resources and time. In this sense, national universities must adopt or update their technological platform to spaces that provide quick and integrated responses to each process, thus ensuring information security. According to Wang et al. (34), Blockchain technology, as a distributed ledger, is highly effective and will help overcome organizational challenges. Therefore, Blockchain technology is a very useful tool for improving decentralized information management in national universities, optimizing resources and time. Along these lines, Lucuy et al. (25) considered conducting an analysis and evaluation of Blockchain technology, which allowed them to determine the main

components to ensure the integrity and availability of information related to the electoral process. These results have a direct relationship with the research since, to achieve the admission process model based on Blockchain in national universities, an initial situational analysis of the technologies used by the most representative national universities in Metropolitan Lima was first conducted. From this diagnosis, this initial proposal for a Blockchain-based architectural model was developed, aimed at improving data security and immutability.

Table 3. Comparative Table of Similar Research Studies

Aspect	Research Work	Ali et al. [1]	Jangid & Patil [20]	Pérez Sempere & Sajardo Moreno [29]	Choi et al. [7]	Dai & An [10]
Focus Area	Digital innovation in university admission processes using Blockchain technology for security and integrity.	Blockchain-based models for student information systems (SIS).	General application of Blockchain in education processes, including credential verification.	Blockchain in document certification for creating equitable and transparent educational environments.	Blockchain for educational reform aligned with sustainable development goals.	Blockchain-based models for resource sharing in higher education institutions.
Process Scope	Specifically targets the admission process, detailing each step from applicant registration to results issuance.	Focuses on the decentralization and security of student records across different educational levels.	Broad focus on automating and securing educational processes, including admissions and records management.	Targets the certification and credentialing process with a focus on transparency and equitable access.	General focus on long-term educational reform and digital transformation.	Emphasizes resource sharing models with a focus on secure interoperability across institutions.
Security Mechanisms	Proposes Byzantine Fault Tolerance (PBFT) for secure consensus in admission data validation.	Highlights decentralization and data integrity but lacks detailed security mechanisms specific to admissions.	Discusses smart contracts and data integrity for overall educational processes.	Emphasizes transparency and prevention of tampering in document certification.	Focuses on security in the context of sustainable development but lacks admission-specific protocols.	Provides general architectural models but does not delve into process-specific security protocols like PBFT.

Application Level	Provides a practical, phased implementation model for integrating Blockchain into admission processes.	Theoretical discussion of Blockchain applications in SIS with potential adaptation to admission processes.	General framework for applying Blockchain across multiple educational processes, not specific to admissions.	Theoretical emphasis on transparency in education but lacks practical implementation details for admissions.	Focuses more on strategic educational goals than on specific admission processes.	Offers a broad resource-sharing model without specific focus on admission processes.
Unique Contribution	Tailored framework for the digital transformation of university admissions with clear steps and phases.	Emphasizes decentralized data storage for SIS with possible application to admissions.	Highlights smart contracts and data automation across educational processes.	Advocates for the equitable and transparent use of Blockchain in certification but does not address admissions directly.	Aligns Blockchain with long-term educational reform, focusing on broader digital innovation strategies.	Provides architectural guidance for Blockchain in education resource sharing but lacks admission-specific models.

Traditional university admission processes often present security and confidentiality challenges, including data manipulation, unauthorized access, identity fraud, and a lack of transparency in record management. Centralized databases are susceptible to cyberattacks and unauthorized modifications, which can compromise the integrity of student information. Additionally, the reliance on manual verification processes increases the risk of human error and delays in decision-making.

The improved solution leverages Blockchain technology to enhance security and data integrity in the admission process. Blockchain ensures that student records are securely stored in a decentralized and tamper-proof system, reducing the risk of unauthorized modifications. Cryptographic mechanisms safeguard data confidentiality, allowing only authorized users to access specific information. Moreover, the transparency of Blockchain technology enhances trust by providing an immutable and verifiable record of transactions, minimizing the possibility of fraud and identity misrepresentation.

The study establishes evaluation criteria based on key security factors such as data integrity, access control, transparency, and fraud prevention. A comparative analysis is conducted by reviewing existing research works, including those by Ali et al., Jangid & Patil, Pérez Sempere & Sajardo Moreno, Choi et al., and Dai & An. The results indicate that Blockchain-based solutions offer significant improvements in data security and reliability compared to traditional admission systems. The findings demonstrate that the proposed architectural model enhances the efficiency, confidentiality, and integrity of the admission process while addressing vulnerabilities identified in previous studies.

5. Conclusion

According to the research objectives, a security model based on BLOCKCHAIN technology has been successfully developed, promoting Digital Innovation and ensuring the trust, integrity, and authenticity of the data collected in the admission process. This model represents a significant contribution to the national universities of Peru, as it involves updating admission processes, integrating information, optimizing procedures, and guaranteeing data security. BLOCKCHAIN is an innovative technology that strengthens critical processes and protects information from cyberattacks. Universities must be open to change and constantly updated regarding information security measures to protect sensitive institutional data and ensure the trust of their collaborators. The success of this study requires the active participation of collaborators from strategic, administrative, and operational job profiles, who must be trained and ready to break paradigms and face environmental barriers.

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