SUSTAINABLE BUSINESS
INTERNATIONAL JOURNAL

Revista científica - ISSN 1807-5908
Avaliado pelo sistema Double Blind Review
Disponivel em https://periodicos.uff.br/sbijournal

PPGAd uff
Programa de Pós-Graduação em Administração - UFF

Empowering African Entrepreneurial Communities with Blockchain Proof-of-Stake Initiatives to Combat Inequality and Social Exclusion

Antonio Pesqueira
antonio_pesqueira@iscte-iul.pt
https://orcid.org/0000-0003-1530-6451

Revista científica - ISSN 1807-5908
Avaliado pelo sistema Double Blind Review
Disponivel em https://periodicos.uff.br/sbijournal

SUMMARY

This study investigates three blockchain-based initiatives empowering entrepreneurial communities in Africa, focusing on Cape Verde, Angola, and Nigeria. Utilizing a multiple case study approach, it explores the implementation of decentralized public Blockchain Technology (BT) and cryptocurrency platforms. These platforms, which operate on a proof-of-stake mechanism and are fully open source, aim to identify the characteristics of successful BT system implementation and the pivotal role of blockchain-aligned entrepreneurship.

The findings underscore BT's precision and effectiveness in managing entrepreneurship programs, facilitating real-time adaptation, and decision-making to address social and economic disparities. The study highlights BT's capacity to enhance operational efficiency and align business models with strategic goals, necessitating diverse skill sets for effective implementation. This innovative research offers valuable insights into how blockchain can rapidly integrate management, leadership, and execution capabilities into actionable strategies, ultimately empowering African entrepreneurs and fostering inclusive community development.

Keywords: Supply and Distribution, Big Data, Technology, Organization and Management, Emerging Capabilities

Revista científica - ISSN 1807-5908
Avaliado pelo sistema Double Blind Review
Disponivel em https://periodicos.uff.br/sbijournal

INTRODUCTION

African entrepreneurship addresses inequalities, fosters economic empowerment, and drives innovation. The academic discourse on African entrepreneurship has expanded significantly, encompassing topics like women's entrepreneurship, microfinance, poverty alleviation, international finance flows, entrepreneurship ecosystems, e-commerce, and social media networking. However, there is a pressing need for more research into advanced technological models like Artificial Intelligence (AI) and Blockchain Technologies (BT). These technologies have the potential to drive significant economic and social change, reduce inequalities, and address social exclusion through personal empowerment, job creation, and sustainable community development (di Prisco, Strangio, 2021; Arslan et al., 2022).

BT, in particular, holds promise for increasing financial inclusion by enabling secure, decentralized transactions. This can revolutionize financial access for entrepreneurs in remote or underserved areas, facilitating access to capital and financial services where traditional banking infrastructure is limited or nonexistent. The growing interest and investment in blockchain ventures in Africa underscore the continent's rising prominence in this field, with startups pioneering innovations in areas such as infrastructure, personal identification, record-keeping, and financial independence. Despite the transformative potential of blockchain, there is a need for more concrete examples and case studies demonstrating its practical benefits. Its applications in sectors like social impact, tokenization, non-fungible tokens (NFTs), energy, government, and education are becoming increasingly evident. The integration of BT with other advanced systems such as AI presents multifaceted challenges, particularly in sectors like

healthcare, which face unique regulatory and operational hurdles (Kant, Anjali, 2021; Kumar et al., 2023).

In addition, advanced management frameworks such as Dynamic Capabilities (DC) are essential for equipping African entrepreneurs to navigate these complexities. These frameworks support technology adoption, competitive advantage, and innovation management strategies, strengthening entrepreneurial communities by enhancing governance, human resource management, and operational risk management (Pesqueira et al., 2020; Randhawa, Wilden, Akaka, 2022).

This study aims to fill that gap by exploring the integration of blockchain in driving entrepreneurship initiatives across three African countries: Nigeria, Cape Verde, and Angola. It seeks to understand the synergistic effects of blockchain, identify critical skills for its effective implementation, and explore its role in facilitating real-time decision-making, collaboration, and governance in entrepreneurship projects. Beginning in late 2022, the study examines blockchain implementation in complex operational environments amidst business uncertainties and government challenges. It addresses issues such as high upfront costs, limited understanding of value chains, return on investment (ROI) concerns, public corruption, and political will for socio-economic development. The research underscores the importance of leveraging high-impact blockchain projects on public, open-source, decentralized platforms that build consensus through evidence of ownership.

This study contributes to the academic field by highlighting the interplay between blockchain systems and entrepreneurship initiatives within the African region. It emphasizes the importance of integrating blockchain within entrepreneurship frameworks for innovation and strategic development. By providing a comprehensive understanding of the synergistic use of blockchain in

enhancing entrepreneurship initiatives, the research identifies opportunities and challenges and highlights the intersection of technical expertise and ethical considerations. The study also explores unique opportunities for using advanced technologies to connect potential entrepreneurs in Europe and North America with their ancestral roots in Africa, fostering diverse entrepreneurial opportunities.

2. LITERATURE REVIEW

BT, characterized by its decentralized consensus, cryptographic security, and immutable record-keeping, has emerged as a transformative tool with the potential to address numerous challenges faced by African entrepreneurs. By enabling secure transactions, fostering trust, and ensuring data integrity, blockchain enhances transparency and reduces social exclusion in African nations. This literature review explores the multifaceted impact of blockchain on entrepreneurship in Africa, highlighting its potential to revolutionize business operations and promote inclusive growth. Blockchain's decentralized nature ensures that all transactions are recorded on an immutable ledger, enhancing transparency and reducing the possibility of fraudulent activities. In African economies, where trust in financial and governmental institutions may be limited, blockchain offers a secure and reliable platform for conducting business. The cryptographic security embedded in BT further ensures that data remains confidential and tamper-proof, thus fostering trust among stakeholders (Mavilia, Pisani, 2020; Mhlanga, 2023; Torongo, Toorani, 2023).

In the context of African entrepreneurship, blockchain addresses several critical issues, including scalability, privacy, and reliability. The introduction of smart contracts, a notable application of blockchain, automates contract execution.

These contracts are programmed to activate automatically upon the fulfillment of predefined conditions, streamlining business operations and enhancing accountability. This automation reduces the need for intermediaries, thereby lowering costs and increasing efficiency. The importance of security in the digital age cannot be overstated, especially as industries become increasingly reliant on technology. Blockchain's robust security protocols present a solution to growing concerns around data integrity and confidentiality. By providing a decentralized, immutable ledger, blockchain ensures that sensitive business information remains secure. This security is crucial for businesses that store and share data, protecting them from cyber threats and data breaches (Kang et al., 2023; Tanniru, Woo, Dutta, 2023).

BT's impact extends beyond the technological sphere, offering a pathway to address systemic challenges of inequality and social exclusion. By providing a secure and transparent platform, blockchain empowers African entrepreneurs, particularly those from marginalized communities, to access finance, markets, and resources. This inclusivity is vital for driving sustainable development and fostering economic growth (Igwe, et al., 2020; Kshetri, 2023; Zekiye, Özkasap, 2023).

In countries such as Cape Verde, Angola, and Nigeria, BT has the potential to create new job opportunities, empower underserved communities, and promote a more equitable future. The ability to conduct secure transactions without the need for traditional financial intermediaries opens up new avenues for economic participation, thus reducing social exclusion. The transformative impact of blockchain on the African continent is profound. By addressing critical issues such as inequality and social exclusion, blockchain can play a pivotal role in promoting sustainable development. Its potential to revolutionize African entrepreneurship should not be overlooked, as it offers innovative solutions to

longstanding challenges (Langley, Rodima-Taylor, 2022; Khan, 2023; Ochinanwata, Igwe, Radicic, 2023).

BT can facilitate access to financial services for small businesses and entrepreneurs, enabling them to participate more fully in the economy. This access is crucial for fostering inclusive growth, creating jobs, and improving living standards across the continent. Moreover, the transparency and security provided by blockchain can enhance accountability and reduce corruption, further contributing to sustainable development. BT holds significant promise for empowering African entrepreneurial communities. Its unique capabilities of decentralization, security, and transparency address key challenges such as inequality and social exclusion. By providing a secure and inclusive platform, blockchain can drive sustainable development and promote economic advancement. The potential of blockchain to revolutionize African entrepreneurship is immense, offering a pathway to a more equitable and prosperous future for all (Magistretti, Pham, Dell'Era, 2021; Mora et al., 2021; Remeikienė, Gaspareniene, 2023).

The literature review underscores the importance of continued research and investment in BT to harness its full potential in the African context. As blockchain continues to evolve, its role in shaping the future of African entrepreneurship and driving inclusive growth will undoubtedly become increasingly significant.

3. METHODOLOGICAL APPROACH

Employing a multi-case study methodology, this research explores the interplay between BT and entrepreneurship in Africa, aiming to contribute to the scholarly discourse and establish a coherent understanding of blockchain applications. The study's framework is designed to help organizations manage entrepreneurial

business assets effectively by improving control over data sources, provenance, traceability, availability, and the effectiveness of data sets for future use. Additionally, it seeks to illuminate how blockchain proof-of-stake initiatives can empower African entrepreneurial communities and address inequality and social exclusion (Yin, 2018; Magistretti, Pham, Dell'Era, 2021; Kshetri, 2023).

This research is guided by three central questions:

RQ1: How do blockchain technologies collectively support entrepreneurial initiatives across Africa?

RQ2: What essential skills and competencies are required to effectively implement blockchain in line with entrepreneurial goals?

RQ3: How does blockchain enable real-time adaptation and decision-making in projects that address inequality and social exclusion while aligning with entrepreneurial standards?

Using a multi-case study methodology, this research, spanning from late 2022 to October 2023, aims to create a blockchain-integrated thinking framework. This framework seeks to systematically manage entrepreneurial criteria in Africa for future endeavors and empower future initiatives through entrepreneurial management models. The research questions are designed to explore the dynamic interplay between blockchain technologies and their contribution to the effectiveness and progress of entrepreneurial programs. They aim to unravel the specific ways in which blockchain technologies optimize entrepreneurial outcomes, considering both technological elements and human behavioral factors. The second research question specifically seeks to identify and assess the critical skills and competencies essential for professionals to leverage blockchain in support of entrepreneurial goals effectively. This includes understanding the mix of domain-specific knowledge, technological acumen, and data governance

skills necessary for merging blockchain with entrepreneurial endeavors (Yin, 2018).

The third question focuses on the role of blockchain in enabling African businesses to quickly adapt and respond to evolving market conditions, regulatory changes, and technological advances. This aspect examines how blockchain technologies contribute to the agility and flexibility of organizations in managing projects that align with business objectives, particularly in real-time data processing and analysis.

The methodology chosen for this study facilitates deep insights into the complexity of the research questions through a purposive selection of multiple case studies. This approach allows for the examination of different organizational contexts to uncover interrelationships and provide detailed answers to the research questions. The rationale for selecting multiple case studies is to increase the external validity and generalizability of the findings, focusing on the implementation of blockchain in entrepreneurship programs across three different projects (Yin, 2018; Mora et al., 2021; Igwe, et al., 2020).

Additionally, a questionnaire distributed to 12 key executives and decision-makers complements this data and provides a more nuanced quantitative perspective. The qualitative data collected through interviews and document analysis is subjected to thematic analysis to extract insights on operational challenges, strategic entrepreneurial management approaches, and the impact of blockchain on decision-making processes. A cross-case synthesis is conducted to juxtapose the findings from the three projects, providing a holistic view of blockchain implementation in entrepreneurship programs.

The research focuses on three different projects from Nigeria, Cape Verde, and Angola, selected for their geographic diversity, commitment to advanced

blockchain practices, and operationalization of different blockchain technologies. Data collection includes internal company documents, reports, technical documents, interviews, and evaluations of data visualization dashboards for resource allocation and cost-effectiveness in entrepreneurial initiatives. A simple questionnaire is also used to gather feedback from stakeholders involved in the three projects, forming the basis of the quantitative data analysis.

The preparatory work for the case studies includes compiling a comprehensive list of functional, data, and business requirements that provide clarity on the escalating reporting requirements and the challenges faced by stakeholders in aggregating relevant information and assessing organizational capabilities.

4. RESULTS

4.1 Detailed Review of Project Initiatives and Outcome

4.2.1 Project 1 - Educational Mobile Platform

Project 1, titled "Educational Mobile Platform," is a pioneering initiative designed to educate African youth on the benefits and entrepreneurial opportunities presented by BT. The project aims to demystify blockchain through interactive learning modules available on a dedicated educational portal and a nascent mobile application. Targeting young people aged 16 to 28, the project guides participants from various African countries through the educational and professional landscape, focusing on enhancing their understanding of BT and its applications.

The platform, dedicated to blockchain education, has successfully implemented numerous programs and challenges, recently expanding its reach to diverse communities across Africa. This innovative application

Revista científica - ISSN 1807-5908
Avaliado pelo sistema Double Blind Review
Disponivel em https://periodicos.uff.br/sbijournal

serves as a skills-building social network, enabling future talent to gain knowledge, earn cryptocurrency, and contribute positively to society. Strategically designed to enhance the skills of young talent, the platform prepares them for future career opportunities, including coding for smart contracts and other key technological aspects. Beyond skills development, the project fosters a spirit of change by encouraging young people to address global challenges, ranging from environmental issues to mental health.

As a mission-driven social enterprise, the project has expanded its reach to nearly ten African countries, both francophone and anglophone, creating an ecosystem of partners. The goal is to empower youth through comprehensive blockchain education, covering auditing capabilities to smart contracts, using various content formats, including videos and speaker sessions. The project has achieved significant milestones, mobilizing young communities for tangible impact and providing insights into youth engagement with BT. The educational content, delivered in multiple languages (English, French, German, Portuguese, and other native dialects), highlights the vast applications of blockchain in everyday life and inspires innovative solutions for community betterment.

The project has developed a rich portfolio of educational materials in multiple languages and formats, contributed by African influencers, educators, and user-generated content from African youth. This collaborative effort involves diverse teams of young developers producing inclusive and educational video content, promoting a broader understanding and adoption of BT among young African communities.

Significantly, the program has received funding and support from European countries, particularly Swiss investors, and aligns with various Sustainable Development Goals (SDGs) such as zero poverty, quality education, gender equality, reducing inequalities, and partnerships for the goals. The project emphasizes co-design with youth and continuous adaptation through various feedback mechanisms such as student councils, community management teams, focus groups, and post-program surveys. This approach ensures the platform's relevance and effectiveness in fostering global leadership through research, innovation, and application of enabling technologies across industries and sectors.

The "Educational Mobile Platform" represents a comprehensive effort to equip African youth with the skills and knowledge necessary to harness the potential of BT. By combining interactive educational content, practical challenges, and a supportive community, the project aims to inspire a new generation of innovators capable of addressing both local and global challenges. Through strategic partnerships, diverse content delivery, and a focus on sustainable development, the initiative stands as a model for empowering young people and promoting technological literacy across the continent.

4.2.2 Project 2 - Medical Records Ownership Protocol and Marketplace

The second project examined in this study focused on implementing blockchain proof-of-stake technology to manage medical record ownership protocols. Central to this initiative was the goal of effectively managing ownership and access rights to medical records. This project aimed to empower healthcare entities in various African regions, including doctors, healthcare facilities, and patients, to manage medical records

Revista científica - ISSN 1807-5908
Avaliado pelo sistema Double Blind Review
Disponivel em https://periodicos.uff.br/sbijournal

through advanced identity management and encryption. A team of 11 developers created a rights and ownership enforcement platform that allowed users - patients, healthcare professionals, and facilities - to manage and audit their medical records. These records could then be shared in a decentralized exchange. One of the key features of this system is that it allows healthcare professionals to enter data into an electronic medical record (EMR) system and then provide controlled access to these records through a web portal or mobile application.

This protocol facilitates the management and auditing of medical records, making them shareable and interoperable in a decentralized, secure, private, and permissionless health information exchange (HIE). Smart contracts, a critical component of this system, ensure interoperability without compromising privacy and security. This platform has been tested and implemented in two African healthcare systems, demonstrating its effectiveness in protecting user access rights, enhancing transparency, and providing benefits to all participants in the healthcare ecosystem. In addition, the protocol integrates with various healthcare infrastructures, applications, and APIs, using zero-knowledge techniques for a comprehensive solution. This addresses the common scenario of medical record entry into health information systems, a process that raises numerous questions and concerns regarding access rights. Despite the proliferation of health systems and information sharing, successful management of these rights has been elusive, even in developed countries.

This project differs from traditional centralized identity management systems through the innovative use of smart contracts, BT, and zero-knowledge proofs to ensure the secure exchange of health data while maintaining privacy. In this system, the blockchain does not store the

actual medical records. Instead, it stores zero-knowledge proofs and selected metadata that verify the authenticity of the records.

Data exchange takes place at the infrastructure level, governed by various verification mechanisms outlined in the blockchain's consent model for accessing records. This approach provides the foundation for a medical record marketplace. Here, once user-centric record ownership and validation are established, the platform creates opportunities to incentivize participants, including users, pharmaceutical companies, and research institutions. This marketplace focuses on trading anonymized medical data for research purposes.

Key to any transaction in this marketplace is the need for consent, particularly from patients, before their data can be sold. Prospective buyers need to understand the nature of the records being offered, such as type and patient demographics, without premature access to the data. Transactions culminate with both parties agreeing to the sale, with the buyer receiving access only to anonymized records. These protocols are meticulously outlined in the project's framework.

The project incorporates Decentralized Identity (DID) to verify the eligibility of various stakeholders to own or access medical records. Patients prove their identity to claim rights to their records, often using government-issued IDs or credentials provided by a decentralized identity provider. The overall goal of this project is to empower healthcare facilities in African regions that lack data protection, privacy, and monetization opportunities.

An important aspect of this project is to enable patients to benefit financially from their data, creating new avenues for secure access to

health data. By providing a health technology infrastructure, nations can pursue sustainable development goals, including efficient service delivery and the promotion of well-being at all ages. Interviews conducted for this project highlighted its potential to achieve universal health coverage. This includes financial risk protection, access to quality health services, and affordable essential medicines, thereby improving coverage of basic health services. The platform also enables health facilities, providers, doctors, and patients to use health applications and participate in a decentralized health exchange. If successfully implemented, this project could generate countless transactions and significantly benefit the healthcare sector in Africa.

4.2.3 Project 3 - Decentralized, Healthcare Infrastructure and Web3 Decentralized Autonomous Organization (DAO)

Project 3, entitled "Decentralized Healthcare Infrastructure and Web3 Decentralized Autonomous Organization (DAO)", addresses the critical need for secure healthcare infrastructure and medical record systems in Africa. Led by two founders and a team of developers spread across various locations, including some European countries, the goal of this project is to provide African doctors and healthcare facilities with secure, interoperable health information systems, potentially on a citywide or nationwide scale. A notable aspect of this project is the incorporation of blockchain's decentralized finance (DeFi) capabilities, setting the stage for future applications in this space. A DAO, which is governed by computer-programmed rules and controlled by its members rather than a central authority, was a key component. This structure allows

for decentralized ownership where members are united by common goals and network incentives.

The significant achievement of the project is the creation of a secure healthcare infrastructure that paves the way for medical record systems that ensure regulatory compliance, data security, and interoperability in Africa. The integration of a blockchain proof-of-stake architecture has facilitated the development and deployment of health apps, significantly reducing development time. This platform also uses zero-knowledge proof cryptography, which allows a prover to confirm knowledge of information to a verifier without revealing the information itself. This addresses the challenges of scalability, privacy, and auditability. In addition, the project adapted the DAO model to create a truly decentralized organizational structure on top of the proof-of-stake blockchain ledger.

A critical element of this effort was a layer 2 blockchain solution that enhanced the network's consensus algorithm to create a secure, thrustless environment. This solution aims to increase throughput, reduce latency and storage requirements, and minimize costs.

The practical applications of the project are diverse, especially in African contexts such as Nigeria, where security and compliance in healthcare facilities are major concerns. Many healthcare facilities using Electronic Health Records (EHR) systems lack robust technology and Internet access, posing a risk to the security of patient data. This platform provided a much-needed solution by

offering electronic health records and standards for interoperability. It successfully integrated with multiple health systems and adhered to

Revista científica - ISSN 1807-5908
Avaliado pelo sistema Double Blind Review
Disponivel em https://periodicos.uff.br/sbijournal

industry-standard health information exchange protocols, creating a decentralized and secure infrastructure.

Achieving a fully decentralized, secure, and trusted healthcare infrastructure is a critical yet challenging goal in the healthcare sector, particularly in ensuring privacy and security while maintaining interoperability across multiple providers. The need to often share life-saving health information is balanced by the need to ensure that this sensitive information is shared only with authorized providers. The transparency, auditability, and immutability of the data exchange platform, whether government-led or privately initiated, are paramount.

The structure of the platform influences the level of confidence stakeholders have in the health information exchange (HIE). Despite recognition of the benefits of an HIE, privacy concerns remain. However, implementing an HIE is challenging, especially in emerging markets, due to hurdles such as standardization, interoperability, data security, privacy, integrity, identity assurance, risk management, and auditability. Even in developed countries, overcoming these barriers is still a work in progress. The benefits of this project include improving the quality and safety of patient care, enhancing patient education and engagement in their healthcare, providing clinical decision support tools, and improving patient safety. A blockchain-powered HIE could unlock the true value of interoperability by facilitating the creation of smart contracts and standardized information hubs accessible to authorized organizations. integration with existing systems of participating organizations.

Revista científica - ISSN 1807-5908
Avaliado pelo sistema Double Blind Review
Disponivel em https://periodicos.uff.br/sbijournal

4.2 Quantitative Assessment and Evaluation

In line with previous discussions, the data analysis methodology employed in this research sought to examine the collaborative dynamics of BT and its role in enhancing the effectiveness and progress of entrepreneurship programs. The primary objective of the quantitative data analysis was to enable the research team to determine the precise mechanisms by which blockchain optimizes entrepreneurship outcomes by collecting various insights and materials, specifically through developed dashboards and post-interview questionnaires. For the first research question, insights and materials were gathered, including the development of dashboards and consultations with IT data management teams. For the second, a five-question post-interview questionnaire was administered to understand the critical skills required for the successful implementation and execution of BT.

For the final research question, while the previous data collection methods remained relevant, the focus was on gaining qualitative data insights. The information extracted from the dashboards provided a comprehensive understanding of software development practices across the organizations. Agile methodologies and DC were critical in identifying key resources and competencies that contributed to competitive positioning in the market. Adherence to entrepreneurship standards was critical for effective governance, ensuring not only accountability and transparency but also efficient resource allocation in technological and environmental innovation. A robust blockchain culture was instrumental in strengthening entrepreneurship commitments and had a positive impact on public health outcomes. Environmental sustainability, particularly in supply chain management, emerged as a key concern, requiring strategies such as green transportation, optimized distribution routes, and energy-efficient cold chain systems. Also, digital transformation was essential to

Revista científica - ISSN 1807-5908
Avaliado pelo sistema Double Blind Review
Disponivel em https://periodicos.uff.br/sbijournal

maintain competitiveness and formed a core aspect of the project scope. While sustainability initiatives incurred short-term costs, their long-term benefits, particularly in mitigating unforeseen challenges, were significant. However, governance within the companies studied remained a critical factor in achieving effectiveness, sustainability, and minimal environmental impact.

4.3 Questionnaries

The questionnaire was an integral part of the case study, designed to gain a deeper understanding of pertinent data points related to the research questions, as well as to gauge project managers' perspectives on BT's performance in implementing entrepreneurship programs.

The questionnaire was conducted remotely via Zoom during the final 30-minute interview sessions with 12 participants, targeting individuals based on their organizational roles, responsibilities, and in-depth knowledge of relevant areas to ensure their ability to provide informed and reliable insights. This strategic selection aimed to capture key expert opinions, which are critical for research involving expert participants, and to minimize common survey biases such as the "volunteer effect. The five-question in-person questionnaire was part of the face-to-face interview, allowing for immediate clarification. This format was chosen for its cost-effectiveness, rapid data collection, and convenience compared to more extensive traditional questionnaires. The primary objective of the questionnaire was to explore perceptions of the role of blockchain and its impact on the success of entrepreneurship programs. It explored basic data correlations and suggested strategies for adopting BT, focusing on various entrepreneurship engagements. The questionnaire revolved around five core research questions covering topics such as respondents' roles, their views on

Revista científica - ISSN 1807-5908
Avaliado pelo sistema Double Blind Review
Disponivel em https://periodicos.uff.br/sbijournal

blockchain's contribution to the project, satisfaction with the project, criticality of blockchain techniques and models, and blockchain's role in empowering African entrepreneurship communities to address inequality and social exclusion. Responses were collected using a 5-point Likert scale, ranging from "strongly disagree" to "strongly agree," allowing for the quantification of categorical feedback.

The methodology of the questionnaire was straightforward and intended to supplement the study with additional data points, rather than being the central focus of the investigation. A breakdown of the 12 experts surveyed showed that the majority were from the first project team (42%), with smaller representations from projects 2 and 3, ensuring diverse professional perspectives from all the projects involved (table 1).

Table 1: Involved participants in questionnaires.

Involved founders, entrepreneurs, staffing members	N	%
Project 1	5	42%
Project 2	4	33%
Project 3	3	25%
Total	**12**	**100%**

Source: Created by the author

Key findings of the study include the successful implementation of BT in achieving entrepreneurship goals and demonstrating the effectiveness of blockchain proof-of-stake initiatives in addressing inequality and social exclusion. These results have several implications: they validate the integration of blockchain in these initiatives, indicate a shift towards more data-driven, agile organizational cultures in the region, and align people development with management principles, suggesting a trend towards enhancing individual capabilities in sync with organizational strategies. The chart below, presents a

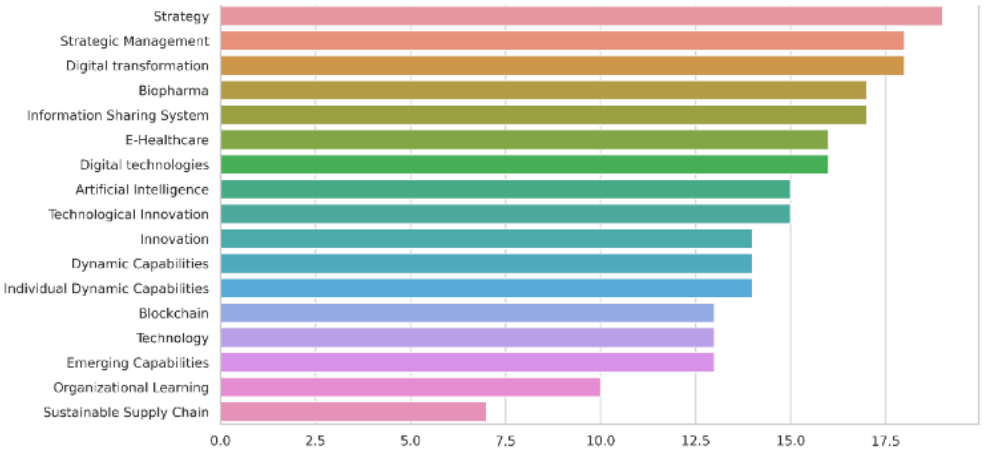
Revista científica - ISSN 1807-5908
Avaliado pelo sistema Double Blind Review
Disponivel em https://periodicos.uff.br/sbijournal

visualization that highlights the integral terms associated with empowering African entrepreneurial communities through blockchain proof-of-stake initiatives. This visualization is crucial in highlighting the complex interplay between different concepts and their overall relevance in addressing inequality and social exclusion (see Figure 1). At the heart of this analysis is the combined scoring metric, an amalgamation of the 'presence' and 'relevance' scores for each concept. The 'Presence' score indicates the frequency or prominence of the term in the discourse on blockchain and African entrepreneurship, while the 'Relevance' score reflects the perceived applicability and importance of the term in this context. The terms are carefully ranked, with those with the highest combined scores placed at the top of the chart. This ranking not only highlights the most salient terms but also provides an intuitive understanding of their relative importance. Terms with higher combined scores are central to discussions and strategies focused on leveraging blockchain technologies for economic and social empowerment in African communities.

In addition, the chart serves as visual evidence of the multifaceted nature of blockchain applications in addressing socio-economic challenges. It highlights terms that are not only prevalent in the discourse but are also considered highly relevant to achieving meaningful change. This dual focus is essential in identifying and prioritizing areas with the greatest potential for positive impact (figure 1).

Revista científica - ISSN 1807-5908
Avaliado pelo sistema Double Blind Review
Disponivel em https://periodicos.uff.br/sbijournal

Figure 1: Terms Ranked by Combined Score (Presence + Relevance)



Source: Created by the author

To provide a more comprehensive visual analysis of the features and functionalities associated with blockchain applications across sectors, the following three charts provide an overview of the importance of key BT functionalities, with each feature ranked based on its importance score. Higher scores indicate features that are considered more critical to the respective blockchain applications. This helps to identify which aspects are prioritized in these areas (see Figures 2, and 3). The following graphs then provide an overview of the contribution to inequality by key BT features and functionalities, with this visualization showing how each feature contributes to inequality. Features with higher ratings are those that, if not managed carefully, could potentially exacerbate inequality. These charts are essential for understanding the potential societal impact of these blockchain features.

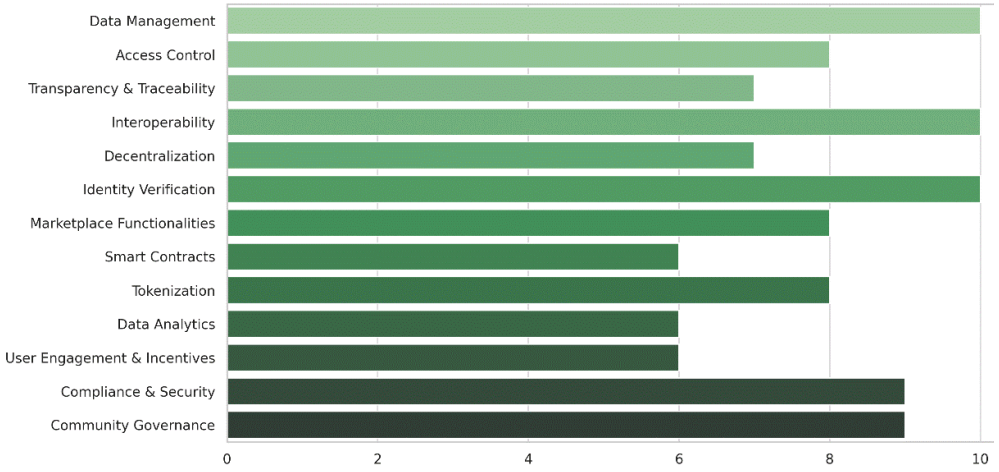
These visualizations provide a nuanced understanding of the multi-dimensional impacts of blockchain functionalities and guide stakeholders in addressing the critical balance between technological advancement and social justice. The series of bar graphs titled "Importance of Features/Functionalities," "Contribution to

Revista científica - ISSN 1807-5908
Avaliado pelo sistema Double Blind Review
Disponivel em https://periodicos.uff.br/sbijournal

Inequality by Features/Functionalities," and "Contribution to Social Exclusion by Features/Functionalities" provide a nuanced exploration of the multifaceted impacts of blockchain technologies in the context of African entrepreneurship. Together, these visualizations highlight the dynamic interplay between technological features and their socio-economic implications.

The following visualization supports the identification of key features that could drive innovation and growth in the African entrepreneurial sector (see Figure 2).

Figure 2: Contribution to Inequality by BT features and functionalities.

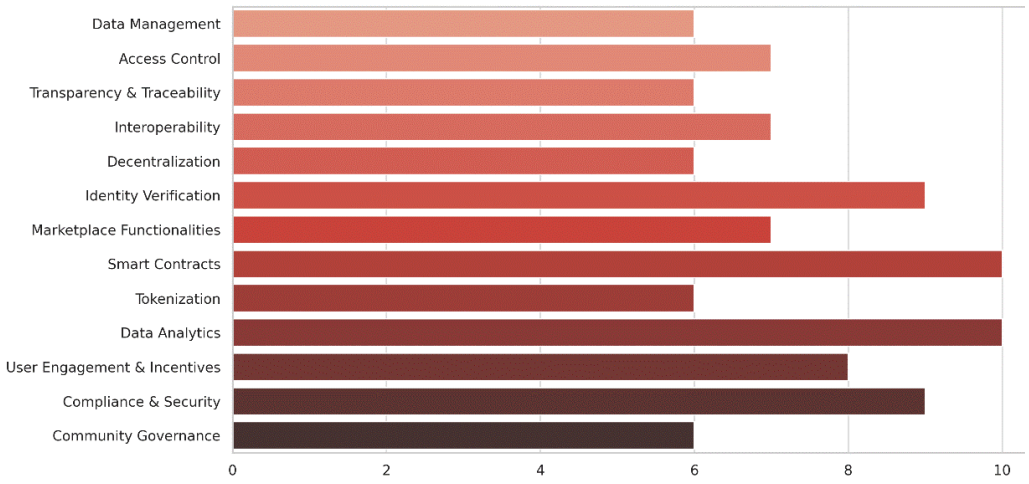


Source: Originated from the applied questionnaires.

Moving to the Contribution to Inequality by Features/Functionalities chart, a critical assessment of the potential risk of each blockchain feature in exacerbating inequality is presented. This chart is instrumental in highlighting the need for careful and equitable implementation of blockchain technologies. Features that score higher on this chart require careful management to ensure that their implementation does not inadvertently exacerbate existing socioeconomic disparities (see Figure 3).

Taken together, these charts provide a comprehensive and data-driven understanding of how different blockchain features can be leveraged and managed to promote equitable and inclusive growth within African entrepreneurial communities. They serve as a guide for policymakers, entrepreneurs, and stakeholders to make informed decisions that balance technological advancement with socio-economic equity and address the pressing challenges of inequality and social exclusion.

Figure 3: Contribution to social exclusion by BT features and functionalities.

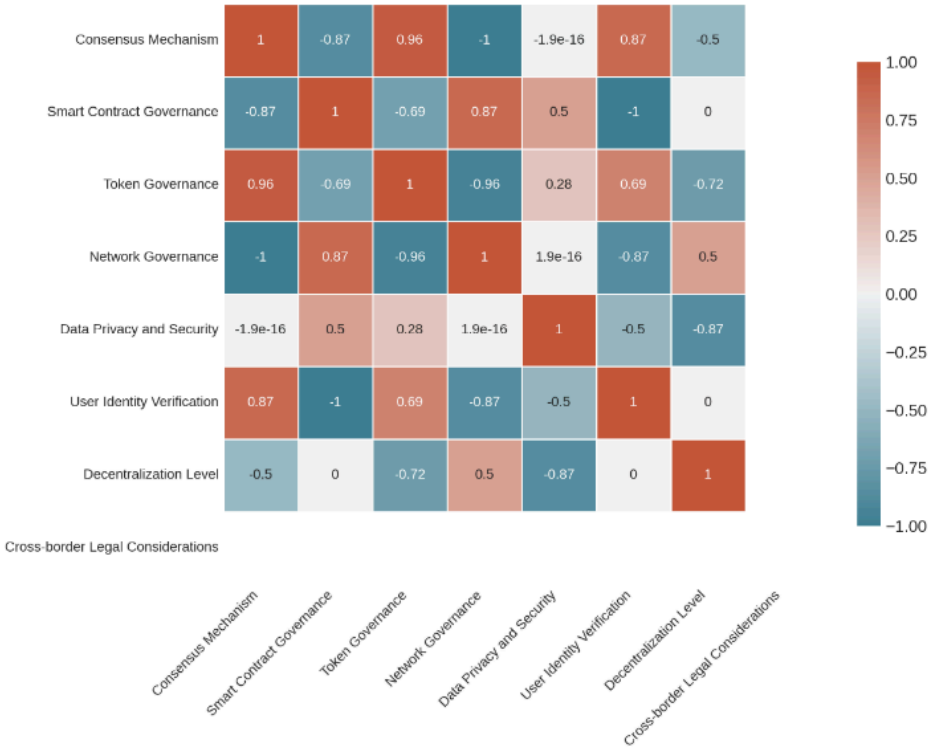


Source: Originated from the applied questionnaires.

The following heatmap highlights the interdependencies between key elements such as consensus mechanisms, smart contract governance, token governance, network governance, privacy and security, user identity verification, level of decentralization, and cross-border legal considerations (see Figure 6). One notable observation from the heatmap is the strong correlation between network governance and token governance. This finding underscores the critical role of cohesive governance structures in the effectiveness of blockchain systems.

Effective governance ensures that these systems are not only technologically sound but also equitable and inclusive, thereby promoting social and economic uplift.

Figure 6: Critical factors to the implementation of blockchain proof-of-stake initiatives in African entrepreneurial communities



Source: Originated from the applied questionnaires.

4.4 Dynamic Capabilities (DC) and Agile Principles

Through careful observation and interviews, it became clear that an informal but critical methodology existed within the project framework. The study then proceeded to analyze the critical role of Dynamic Capabilities (DC) in adapting and managing resources in response to evolving project requirements. For example, when projects required increased computing power for advanced

Revista científica - ISSN 1807-5908
Avaliado pelo sistema Double Blind Review
Disponivel em https://periodicos.uff.br/sbijournal

business analysis, these DCs enabled rapid and efficient reallocation of resources. In addition, DCs have been instrumental in fostering organizational learning and innovation-essential elements in the ever-evolving business landscape. These capabilities, embedded in a philosophy of continuous learning and adaptation, allowed for the seamless integration of new metrics or key performance indicators (KPIs) into existing operational structures. In the complex environment of the projects studied, the ability to make rapid strategic changes was essential to maintain sustainability and compliance. DC provided the strategic agility required for these rapid transitions, incorporating aspects of risk anticipation and management, which are particularly important for business metrics linked to governance and risk management.

Integrating agile methodologies with DC provided entrepreneurs with the agility, flexibility, and foresight needed to navigate the complex and rapidly changing landscape of entrepreneurship programs. Together, these methodologies provided organizations with operational resilience and strategic agility, ensuring consistent alignment with evolving entrepreneurial standards and stakeholder expectations. Interviews highlighted the importance of well-implemented blockchain infrastructure in aligning corporate goals with entrepreneurial objectives. As a result, project teams were able to articulate how DC and blockchain synergistically contribute to the effective execution of corporate programs.

The study also explored the transformative impact of Agile and Scrum methodologies in deploying blockchain for these initiatives. It examined multiple perspectives, including managerial and executive insights, as well as other organizational competencies critical to the implementation process. In an era of technological disruption and changing societal norms, the cognitive skills of leaders are becoming increasingly important. As agents of change, entrepreneurs

Revista científica - ISSN 1807-5908
Avaliado pelo sistema Double Blind Review
Disponivel em https://periodicos.uff.br/sbijournal

must be able to identify external opportunities and adapt to constant change, especially in systems undergoing significant transformation.

The following table provides an overview of the critical dimensions and collected areas of importance that underscore the potential of blockchain proof-of-stake initiatives in empowering African entrepreneurial communities, particularly in countries such as Cape Verde, Angola, and Nigeria. It highlights how these technologies can combat inequality and social exclusion by providing new avenues for economic participation and innovation in these regions.

In the effort to empower African entrepreneurial communities through blockchain proof-of-stake initiatives, addressing the data dimension is paramount to combating inequality and social exclusion. The volume of data underpins the breadth of information captured, which can provide a solid foundation for transparent and equitable blockchain transactions. The management of unstructured data is critical to ensure that diverse forms of information, such as community engagement and transaction records, are effectively leveraged (as seen in Table 2).

Table 2: Connected dimensions and variables connected with observed projects.

Dimension	Variable
Domain Knowledge	Decision Making
	Healthcare and Pharmaceutical
	Patient and/or HCPs Data Analysis Understanding
	Product/Compliance Data Analysis
	Data Privacy and Legal
	Business Models
	Industry-specific processes knowledge
Skills	Data Visualization
	Prescriptive Analytics
	Data Processing and Governance
	Descriptive Analytics
	Data Science Understanding
	Software Engineering / Programming
	Data Quality Management
	Distributed File Systems
	Systems Architecture and Integration
	Web/Cloud Computing
	Databases Management
Competencies	Leadership
	Creativity
	Adaptation
	Problem-Solving
	Communication
	Collaboration
	Strategic Thinking
	Learning Agility
	Continuous Improvement
	Digital Literacy
	Adaptability

Source: Originated from observation and interviews.

These capabilities in entrepreneurship programs represent a novel approach to managing complexity and meeting diverse stakeholder expectations. Agile and Scrum methodologies are also critical to the delivery of entrepreneurship initiatives. Their structures provide the speed and flexibility essential in the

ever-changing regulatory environment. These methodologies enhance collaboration and communication across organizational teams, which supports effective decision-making. The adoption of DC, Agile, and Scrum methodologies equip these companies with a flexible, efficient management approach to entrepreneurship initiatives. This framework enables them to stay ahead of regulations, exceed stakeholder expectations, and transform entrepreneurship compliance from a daunting task into a strategic asset.

5. CONCLUSIONS

This research provides insights into blockchain's role in empowering African entrepreneurship communities through proof-of-stake initiatives, using a multi-case analysis of three African-based companies to examine its impact on entrepreneurship programs. The findings set the stage for future research to explore the changing dynamics of blockchain, particularly in the context of entrepreneurship initiatives across industries. The methodological approach and practical application depth of this study establish a benchmark for subsequent research, highlighting the potential of blockchain and DC in promoting sustainable and responsible practices.

The research identified blockchain as a critical enabler in developing resilient entrepreneurship and providing competitive advantage. The study highlights the critical function of blockchain systems in evolving entrepreneurship programs. By implementing specific methodologies in conjunction with DC, individuals aligned their development processes with broader organizational goals. This integration led to significant improvements in performance, operational efficiency, and decision-making within entrepreneurship programs, contributing to the effective empowerment of African entrepreneurial communities.

Revista científica - ISSN 1807-5908
Avaliado pelo sistema Double Blind Review
Disponivel em https://periodicos.uff.br/sbijournal

One of the key findings is the practical application of development cooperation within the management and executive levels of organizations. Here, blockchain went beyond its theoretical roots and was actively implemented to strengthen leadership buy-in and ensure comprehensive management of entrepreneurship programs. This practical application was instrumental in navigating the complex interplay of technology, process, and human factors. The synergistic relationship between blockchain and DC emerged as a critical factor in tailoring blockchain systems to meet the diverse needs of entrepreneurship programs. Focusing on specific environmental performance metrics, such as climate change and pollution, highlighted the industry's impact on public health and well-being, underscoring the ethical and practical need to integrate these aspects into entrepreneurship programs.

The research has several implications for the African region. It demonstrates the effectiveness of a layered, integrated approach to entrepreneurship program management that involves cross-functional teams and aligns strategies at multiple organizational levels. The active involvement of senior leadership signals a shift towards a more data-driven and agile strategic decision-making culture. Moreover, the promotion of innovation labs within these companies highlights the importance of continuous innovation and adaptability in achieving entrepreneurship goals.

This study contributes to the academic field by thoroughly examining the integration of blockchain within the entrepreneurship framework in the industry. It provides valuable insights for industry practitioners, policymakers, and academics, advocating for a more integrated and agile approach to managing entrepreneurship programs. The findings pave the way for future studies to explore the evolving landscape of blockchain and DC, particularly regarding entrepreneurship initiatives in other industries. Future research could also explore

the long-term impact of these integrations on organizational performance and sustainability.

REFERENCES

Arslan, A., Buchanan, B. G., Kamara, S., & Al Nabulsi, N. (2022). Fintech, base of the pyramid entrepreneurs and social value creation. Journal of Small Business and Enterprise Development, 29(3), 335-353.

di Prisco, D., & Strangio, D. (2021). Technology and financial inclusion: a case study to evaluate potential and limitations of Blockchain in emerging countries. Technology Analysis & Strategic Management, 1-14.

Igwe, P. A., Odunukan, K., Rahman, M., Rugara, D. G., & Ochinanwata, C. (2020). How entrepreneurship ecosystem influences the development of frugal innovation and informal entrepreneurship. Thunderbird International Business Review, 62(5), 475-488.

Khan, K. A. (2023). Unlocking the Power of Technology: A New Era of Financial Inclusion in the Industrial Revolution 4.0. In Financial Inclusion Across Asia: Bringing Opportunities for Businesses (pp. 17-32). Emerald Publishing Limited.

Kshetri, N. (2023). Facilitation of Entrepreneurial Activities. In Blockchain in the Global South: Opportunities and Challenges for Businesses and Societies (pp. 57-82). Cham: Springer Nature Switzerland.

Langley, P., & Rodima-Taylor, D. (2022). FinTech in Africa: an editorial introduction. Journal of Cultural Economy, 15(4), 387-400.

Mavilia, R., & Pisani, R. (2020). Blockchain and catching-up in developing countries: The case of financial inclusion in Africa. African Journal of Science, Technology, Innovation and Development, 12(2), 151-163.

Mhlanga, D. (2023). Block Chain for Digital Financial Inclusion Towards Reduced Inequalities. In FinTech and Artificial Intelligence for Sustainable Development: The Role of Smart Technologies in Achieving Development Goals (pp. 263-290). Cham: Springer Nature Switzerland

Mora, H., Mendoza-Tello, J. C., Varela-Guzmán, E. G., & Szymanski, J. (2021). Blockchain technologies to address smart city and society challenges. Computers in Human Behavior, 122, 106854.

Ochinanwata, C., Igwe, P. A., & Radicic, D. (2023). The institutional impact on the digital platform ecosystem and innovation. International Journal of Entrepreneurial Behavior & Research.

Remeikienė, R., & Gaspareniene, L. (2023). Effects on the Economic and Sustainable Development and on the Poverty and Social Inequality. In Economic and Financial Crime, Sustainability and Good Governance (pp. 205-234). Cham: Springer International Publishing.

Kang, J., Wen, J., Ye, D., Lai, B., Wu, T., Xiong, Z., ... & Xie, S. (2023). Blockchain-empowered Federated Learning for Healthcare Metaverses: User-centric Incentive Mechanism with Optimal Data Freshness. IEEE Transactions on Cognitive Communications and Networking.

Kant, N., & Anjali, K. (2021). Blockchain Technology: A Strategic Resource. In Blockchain for Healthcare Systems (pp. 1-15). CRC Press. 13

Kumar, M., Raj, H., Chaurasia, N., & Gill, S. S. (2023). Blockchain inspired secure and reliable data exchange architecture for cyber-physical healthcare system 4.0. Internet of Things and Cyber-Physical Systems.

Tanniru, M. R., Woo, C., & Dutta, K. (2023). A Conceptual Model to Share Resources and Align Goals: Building Blockchain Application to Support Care Continuity Outside a Hospital. Journal of Risk and Financial Management, 16(4), 247.

Torongo, A. A., & Toorani, M. (2023). Blockchain-based Decentralized Identity Management for Healthcare Systems. arXiv preprint arXiv:2307.16239.

Zekiye, A., & Özkasap, Ö. (2023). Decentralized Healthcare Systems with Federated Learning and Blockchain. arXiv preprint arXiv:2306.17188.

Magistretti, S., Pham, C. T. A., & Dell'Era, C. (2021). Enlightening the dynamic capabilities of design thinking in fostering digital transformation. Industrial Marketing Management, 97, 59-70. 17

Pesqueira, A., Sousa, M. J., & Rocha, Á. (2020). Big data skills sustainable development in healthcare and pharmaceuticals. Journal of Medical Systems, 44(11), 1-15.

Randhawa, K., Wilden, R., & Akaka, M. A. (2022). Innovation intermediaries as collaborators in shaping service ecosystems: The importance of dynamic capabilities. Industrial Marketing Management, 103, 183-197. 25

Yin, R. K. (2018). Case study research and applications (Vol. 6). Thousand Oaks, CA: Sage.

SUSTAINABLE BUSINESS
INTERNATIONAL JOURNAL

Revista científica - ISSN 1807-5908
Avaliado pelo sistema Double Blind Review
Disponivel em https://periodicos.uff.br/sbijournal

PPGAd uff
Programa de Pós-Graduação em Administração - UFF

Artigo submetido ao SBIJournal em 11/06/2024.

1a rodada de avaliação concluída em 05/07/2025.

Double-blind review

Aprovado para publicação em 07/07/2025.