Application of blockchain technology in performance incentive of sports employees: decentralization and trust mechanism

Aplicación de la tecnología blockchain en la incentivación del rendimiento de los empleados deportivos: descentralización y mecanismo de confianza

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Abstract

Introduction: Traditional incentive systems in sports organizations often lack transparency, reducing motivation and trust. Blockchain technology offers a decentralized, automated approach to performance incentives, enhancing fairness and accountability. This study examines its impact on performance, trust, and fairness perception in sports organizations.
Objective: To assess the effect of blockchain-based incentives on employee performance, trust, fairness perception, and adoption challenges.
Methodology: A six-month experimental study was conducted with 150 sports employees, divided into an experimental group (blockchain-based incentives via smart contracts) and a control group (traditional subjective evaluations). Performance metrics, trust perception scores, and fairness indices were analyzed using pre-test/post-test comparisons, ANOVA, and multiple regression models.
Results: The blockchain-based system significantly improved performance (KPIs +25.4%, attendance +17.6%, efficiency +21.3%, $p < 0.01$). Trust and fairness perception increased by 18.4% and 30.6%, respectively. However, 23% of participants reported challenges in adapting to smart contracts and payroll integration.
Discussion: Blockchain-based incentives outperformed traditional systems, reinforcing transparency's role in motivation. While trust and fairness improved, usability challenges highlight the need for structured implementation.
Conclusion: Blockchain-driven incentives optimize performance management in sports organizations through fair, automated, and bias-free reward distribution. Future research should explore long-term adoption, hybrid models, AI-driven analytics, and ethical considerations.

Keywords

Blockchain; performance incentives; decentralization; trust mechanism; sports employees; smart contracts; transparency.

Resumen

Introducción: Los sistemas tradicionales de incentivos en las organizaciones deportivas suelen carecer de transparencia, lo que reduce la motivación y la confianza. La tecnología blockchain ofrece un enfoque descentralizado y automatizado para los incentivos de rendimiento, mejorando la equidad y la rendición de cuentas. Este estudio examina su impacto en el rendimiento, la confianza y la percepción de equidad en las organizaciones deportivas.
Objetivo: Evaluar el efecto de los incentivos basados en blockchain en el rendimiento, la confianza, la percepción de equidad y los desafíos para su adopción por parte de los empleados.
Metodología: Se realizó un estudio experimental de seis meses con 150 empleados deportivos, divididos en un grupo experimental (incentivos basados en blockchain mediante contratos inteligentes) y un grupo de control (evaluaciones subjetivas tradicionales). Se analizaron las métricas de rendimiento, las puntuaciones de percepción de confianza y los índices de equidad mediante comparaciones pre-test/post-test, ANOVA y modelos de regresión múltiple.
Resultados: El sistema basado en blockchain mejoró significativamente el rendimiento (KPI +25,4%, asistencia +17,6%, eficiencia +21,3%, $p < 0,01$). La confianza y la percepción de equidad aumentaron un 18,4% y un 30,6%, respectivamente. Sin embargo, el 23% de los participantes reportaron dificultades para adaptarse a los contratos inteligentes y la integración de la nómina.Discusión: Los incentivos basados en blockchain superaron a los sistemas tradicionales, reforzando el papel de la transparencia en la motivación. Si bien la confianza y la equidad mejoraron, los desafíos de usabilidad resaltan la necesidad de una implementación estructurada.Conclusión: Los incentivos basados en blockchain optimizan la gestión del rendimiento en las organizaciones deportivas mediante una distribución de recompensas justa, automatizada y sin sesgos. Las investigaciones futuras deberían explorar la adopción a largo plazo, los modelos híbridos, el análisis basado en IA y las consideraciones éticas.

Palabras clave

Blockchain; incentivos de rendimiento; descentralización; mecanismo de confianza; empleados deportivos; contratos inteligentes; transparencia.

Introduction

Background and Rationale

Effective performance incentive systems are essential for sports organizations, as motivation, transparency, and fairness in reward distribution directly impact employee engagement and overall performance. However, traditional incentive structures in sports management often suffer from subjective evaluations, centralized decision-making, and opaque reward mechanisms. These issues contribute to employee dissatisfaction, disputes over performance assessments, and diminished trust in organizational leadership (MacIntyre, 2017; Dragos, 2019).

The limitations of traditional incentive models stem from their reliance on intermediary-driven assessments, which are prone to bias and inefficiencies. Many organizations lack standardized, data-driven mechanisms to evaluate employee contributions objectively. This has led to increasing calls for technological interventions that can enhance fairness, accountability, and operational efficiency in performance-based rewards (Wibisono et al., 2024).

Blockchain technology has emerged as a promising solution to these challenges by introducing decentralization, transparency, and trust into incentive mechanisms (Casino et al., 2019). As a distributed ledger system, blockchain records transactions in an immutable and verifiable manner, ensuring tamper-proof data integrity while eliminating the need for intermediaries (Zheng et al., 2017).

In the sports industry, blockchain can be directly applied to performance incentive systems by replacing traditional bonus structures with smart contract-based reward mechanisms (Han et al., 2022). For example, player or employee bonuses can be automatically triggered based on predefined metrics such as match attendance, training hours, coaching feedback, or individual key performance indicators (KPIs). These contracts ensure that rewards are disbursed fairly, immediately, and without manual intervention. Additionally, blockchain allows athletes, coaches, and supporting staff to access transparent records of performance-based compensation, reducing disputes and enhancing trust across organizational hierarchies.

In the context of employee incentives, blockchain enables the implementation of smart contracts self-executing agreements that distribute rewards automatically based on predefined performance criteria. This significantly reduces human bias, mitigates fraud risks, and ensures timely and transparent compensation, thereby transforming performance-based incentive structures in sports organizations (Xuan et al., 2020).

The increasing role of technology in contemporary sports management underscores the relevance of blockchain in modernizing incentive structures. Bibliometric analyses indicate a growing trend toward integrating digital solutions, including AI-driven performance evaluations and blockchain-enabled financial transactions, into various operational domains in sports organizations (Sanabria-Navarro et al., 2023). While industries such as finance, healthcare, and supply chain management have successfully integrated blockchain to address problems of data manipulation, transactional opacity, and efficiency bottlenecks, the sports industry remains at a nascent stage of adoption (Caetano et al., 2024). For instance, in supply chain logistics, blockchain has led to a 40% reduction in fraud and operational delays (Tian, 2017), and in healthcare, it has improved patient data security and interoperability (Agbo et al., 2019). Despite these demonstrated benefits, sports organizations have yet to systematically test blockchain's potential to enhance performance-based human resource systems.

To date, sports-related blockchain applications have primarily focused on fan tokens, ticketing, and merchandise authentication. However, its application in internal management—specifically performance incentive systems for sports employees—has not been empirically validated. This presents a critical gap where decentralized reward systems could address longstanding issues of fairness, subjectivity, and inefficiency.

Despite its potential, blockchain adoption in sports organizations faces significant barriers, including technological complexity, regulatory compliance, and user acceptance (Puthal et al., 2018). Many sports organizations, particularly smaller entities, lack the infrastructure to implement blockchain-based systems effectively. Additionally, regulatory uncertainties regarding smart contract enforceability and data

protection raise concerns about widespread adoption. Understanding these barriers is crucial to formulating practical strategies for blockchain integration in sports management.

Research Problem and Gap

Existing studies have explored blockchain's role in enhancing transparency and trust in financial transactions (Rijal & Saranani, 2023) and improving incentive models in technology firms (Chhibber et al., 2024). In industries such as fintech and logistics, empirical evidence has shown that blockchain improves transactional speed, reduces fraud, and minimizes administrative overhead. For example, blockchain-based incentive models in fintech have resulted in a 28% increase in performance alignment and a 35% reduction in payroll errors (Chhibber et al., 2024).

However, there is a notable gap in empirical research on its impact within sports employee management. The incentive structures in sports organizations differ from those in corporate settings due to the unique performance assessment metrics used, such as game statistics, physical conditioning, and subjective coach evaluations. These factors make it essential to examine whether blockchain-based incentive models can effectively address fairness concerns while maintaining operational efficiency.

Moreover, while some blockchain-driven HR models have been piloted in tech-based industries, their applicability in sports organizations remains largely theoretical (Wijaya et al., 2024). The lack of systematic evaluations of blockchain-driven incentives on sports employees' performance, trust perception, and motivation presents a critical research gap. Addressing this gap is necessary to determine the feasibility and effectiveness of decentralized incentive mechanisms in sports management.

Aim and Objectives

This study aims to examine the impact of blockchain technology on performance incentives in sports organizations, with a particular focus on decentralization and trust mechanisms. Specifically, it seeks to:

1. Evaluate the effect of blockchain-based incentives on sports employees' performance metrics, including attendance, efficiency, and key performance indicators (KPIs).
2. Assess the role of blockchain in enhancing trust, fairness, and transparency in incentive distribution.
3. Identify challenges and barriers associated with the adoption of blockchain-based performance incentive systems in sports organizations.
4. Provide recommendations for optimizing blockchain-driven incentive models in sports management.

Significance of the Study

This study contributes to the growing body of research on blockchain applications in human resource management, offering empirical insights into its viability in sports organizations. By analyzing blockchain's role in trust-building, decentralized reward mechanisms, and performance enhancement, this research provides valuable recommendations for sports managers, policymakers, and blockchain developers seeking to integrate decentralized technologies into employee incentive structures.

Given the increasing emphasis on governance principles in shaping sports management policies, this study aligns with broader efforts to enhance accountability, efficiency, and decision-making processes in sports entities (Caetano et al., 2024). Moreover, by addressing adoption challenges and regulatory considerations, this research lays the groundwork for future blockchain-driven innovations in human resource management within the sports sector.

Method

Research Design

This study employs a quasi-experimental mixed-methods design, integrating quantitative performance assessments with qualitative insights to evaluate the effectiveness of blockchain-based performance incentive systems for sports employees. A pre-test and post-test design was implemented over a six-

month intervention period, aligning with prior research indicating that performance-based incentive systems require multiple competitive cycles to yield measurable effects.

A quasi-experimental approach was selected due to ethical and logistical constraints that prevented full randomization, ensuring ecological validity in real-world sports organizations. This design allows for robust comparisons while maintaining the integrity of the intervention within professional sports settings.

Participants

A total of 150 sports employees were selected using criterion-based purposive sampling from professional clubs, federations, and sports management organizations in China. The inclusion criteria ensured a comparable baseline in experience and familiarity with performance-based incentive systems. A power analysis confirmed that the sample size was adequate for statistical significance.

Table 1. Sample Distribution by Role

Role	Number of Participants	Percentage (%)
Athletes	60	40%
Coaches	45	30%
Administrative Staff	45	30%
Total	150	100%

Inclusion Criteria

- Minimum of two years of professional experience in sports organizations.
- Prior exposure to non-blockchain performance-based incentive systems.
- Willingness to participate in a blockchain-based rewards system for six months.
- No prior negative experiences with blockchain or cryptocurrency-related technologies.

Blockchain-Based Incentive System Implementation

The blockchain-powered incentive system was developed using Ethereum-based smart contracts and tokenized rewards to enhance fairness and transparency. The system was integrated with existing performance tracking platforms to ensure seamless data recording.

Table 2. Key Features of Blockchain-Based Incentive System

Feature	Description
Decentralized Performance Tracking	Performance metrics were automatically recorded on a blockchain ledger to ensure accuracy and prevent manipulation.
Tokenized Rewards	Digital tokens were awarded proportionate to performance metrics, redeemable for financial bonuses, training opportunities, or sponsorship benefits.
Smart Contracts	Predefined rules automatically executed incentive payments based on transparent, predefined criteria.
Immutable Transactions	All performance evaluations and rewards were recorded immutably, eliminating the risk of data tampering.

Data Collection and Measures

Quantitative Data

- Performance Metrics: Pre- and post-intervention data were collected on key performance indicators (KPIs) such as training hours, competition performance (match statistics), and administrative task efficiency. Data were recorded using automated tracking software linked to the blockchain system.
- Trust Perception Scale (TPS): The Trust Perception Scale (TPS) was administered at two time points: before the implementation of blockchain-based incentives (pre-test) and after the six-month intervention (post-test). This allowed for a comparative analysis of changes in perceived transparency, fairness, and trust. The instrument, adapted from prior studies on trust in digital financial systems, demonstrated high internal consistency (Cronbach's alpha = 0.89) before use.

Qualitative Data

- Semi-structured Interviews: Conducted with 20 purposively selected participants (representing all role categories) to explore perceptions of decentralization, trust, and efficiency improvements. Participant selection continued until data saturation was reached. Interview questions were based on the literature on organizational incentives and blockchain adoption challenges.
- Thematic Analysis Coding: Qualitative responses were analyzed using NVivo software, with inter-rater reliability assessed at 0.87 using Cohen's Kappa.

Data Analysis

- Paired-Sample t-Tests: Used to measure significant differences in performance metrics and trust perception scores before and after blockchain implementation. Normality tests (Shapiro-Wilk) were conducted to ensure parametric assumptions were met.
- Regression Analysis: A multiple regression model examined the effect of blockchain-based transparency on motivation and engagement, controlling for confounding variables such as age, prior incentive experience, and familiarity with blockchain technology.
- Thematic Analysis: Qualitative data were coded inductively and deductively to identify key themes related to adoption challenges, perceived benefits, and trust mechanisms. Thematic coding followed Braun & Clarke's (2006) six-phase framework.

Reliability and Validity Considerations

Quantitative Measures

- Internal consistency and test-retest reliability were confirmed for all survey instruments.
- Statistical assumptions were verified to ensure the robustness of the analysis.

Qualitative Measures

- Investigator triangulation was applied to reduce bias in thematic coding.
- Member checking was used to validate interpretations with selected participants.

Intervention Fidelity

- Regular system audits ensured that blockchain-based rewards were distributed as per predefined criteria, minimizing implementation inconsistencies.
- Performance tracking data were cross-validated with independent records.

Ethical Considerations

This study adhered to institutional ethical guidelines, with informed consent obtained from all participants. Data privacy was ensured through encrypted storage, and participants had the option to withdraw at any stage without penalty. The study was approved by the University Research Ethics Committee.

This methodology ensures a rigorous and replicable approach to evaluating blockchain-based performance incentives in sports organizations. By integrating quantitative performance analysis with qualitative user perceptions, the study aims to provide comprehensive insights into the impact of decentralization and trust mechanisms on motivation and efficiency.

Results

Quantitative Findings

Performance Improvement

Table 3. Pre-Test and Post-Test Performance Metrics by Overall and Role-Specific Efficiency Scores

Performance Indicator	Pre-Test Mean (SD)	Post-Test Mean (SD)	% Change	p-value	Effect Size (d)	95% CI
Overall Efficiency Score	72.4 (±5.6)	87.8 (±4.9)	+21.3%	<0.001	2.85	[1.90, 3.80]
Attendance Rate	79.6 (±6.1)	93.7 (±5.4)	+17.6%	0.002	2.10	[1.25, 2.95]
Key Performance Indicators (KPIs)	65.2 (±7.3)	81.8 (±6.5)	+25.4%	<0.001	2.55	[1.65, 3.45]
Athletes (Efficiency Score)	70.5 (±5.2)	90.3 (±4.7)	+28.1%	<0.001	3.10	[2.05, 4.15]
Coaches (Efficiency Score)	73.1 (±5.5)	86.4 (±5.0)	+18.2%	0.003	2.35	[1.45, 3.25]
Administrative Staff (Efficiency Score)	74.8 (±5.9)	86.7 (±5.3)	+15.9%	0.005	2.00	[1.10, 2.90]

Table 3 presents a comparative analysis of pre-test and post-test performance metrics following the implementation of a blockchain-based incentive model. All performance indicators demonstrated statistically significant improvements, underscoring the efficacy of blockchain-enabled rewards in enhancing operational effectiveness.

Overall Efficiency Score: The mean overall efficiency score increased from 72.4 (±5.6) to 87.8 (±4.9), reflecting a 21.3% improvement ($p < 0.001$, $d = 2.85$). This large effect size indicates a substantial impact of blockchain incentives on general workplace productivity. It suggests that employees responded positively to transparent, verifiable rewards tied directly to measurable outcomes.

Attendance Rate: The average attendance rose from 79.6% to 93.7%, representing a 17.6% improvement ($p = 0.002$, $d = 2.10$). This finding supports the hypothesis that blockchain-based systems enhance punctuality and commitment, likely due to the immediacy and fairness of smart contract-driven incentives.

Key Performance Indicators (KPIs): The KPI scores rose from 65.2 to 81.8 (+25.4%, $p < 0.001$, $d = 2.55$), marking the strongest gain among aggregated performance metrics. This confirms that aligning incentives with individual KPIs within a decentralized framework enhances task-specific engagement and goal alignment.

Role-Based Classification

Athletes: Demonstrated the most substantial improvement in efficiency (+28.1%, $p < 0.001$, $d = 3.10$). The high responsiveness may be attributed to the objective nature of athletic performance metrics, which align well with smart contract automation.

Coaches: Showed an 18.2% improvement ($p = 0.003$, $d = 2.35$). This moderate effect suggests that while coaching effectiveness can be measured, it's partially subjective nature may temper the impact of blockchain-based rewards.

Administrative Staff: Exhibited a 15.9% gain ($p = 0.005$, $d = 2.00$). The smaller improvement likely reflects the complexity and indirect measurability of administrative contributions. Nonetheless, the results still highlight meaningful gains.

The findings demonstrate that blockchain-based incentive systems deliver measurable, statistically significant, and role-sensitive performance improvements in sports organizations. The consistently large effect sizes (Cohen's $d > 2.0$) across roles and metrics suggest a strong motivational impact of decentralized, automated reward mechanisms. However, variations in role-based improvements underscore the importance of tailoring performance indicators to fit specific job functions. Future studies should explore longitudinal impacts and possible external influences, such as prior exposure to digital incentive systems, to validate the durability and generalizability of these results.

Trust and Perceived Fairness

The Trust Perception Scale (TPS) showed a statistically significant increase in confidence toward the blockchain-based system.

Table 4. Trust Perception Scale (TPS) Scores

Metric	Pre-Test Mean (SD)	Post-Test Mean (SD)	% Change	p-value	Effect Size (d)
Transparency	3.6 (±0.7)	4.7 (±0.5)	+30.6%	<0.001	1.78
Fairness Perception	3.8 (±0.6)	4.5 (±0.4)	+18.4%	<0.001	1.37
System Trust	3.5 (±0.8)	4.6 (±0.5)	+31.4%	<0.001	1.85

The results presented in Table 4 reflect significant improvements in trust perception following the implementation of blockchain-based incentives. Specifically, the Transparency score increased by 30.6%, Fairness Perception improved by 18.4%, and System Trust rose by 31.4%, all with p-values indicating strong statistical significance ($p < 0.001$). These changes suggest that blockchain's transparent and decentralized nature plays a crucial role in fostering trust among employees, aligning with previous studies that emphasize the importance of clear and verifiable reward structures (Rijal & Saranani, 2023).

Discussion of Findings

- Transparency: The substantial increase in transparency (30.6%) indicates that blockchain's immutable ledger and transparent transaction system significantly enhance employees' perceptions of openness in the reward process. This aligns with the core features of blockchain technology, which ensure that all actions are recorded and verifiable, reducing ambiguity and potential bias in reward distribution.
- Fairness Perception: A notable increase in fairness perception (+18.4%) suggests that blockchain helps mitigate feelings of unfairness in performance evaluations, a common challenge in traditional incentive models. This finding is particularly important in sports organizations, where subjective assessments can often lead to disputes and disengagement. The perception of fairness is critical for maintaining employee motivation and satisfaction.
- System Trust: The high increase in system trust (+31.4%) further supports the role of blockchain in building confidence in the incentive system. Employees are more likely to trust a system that they perceive as transparent and immutable. This is critical in motivating employees, as trust in the reward system directly influences their level of engagement and effort.

Classification of Each Finding

- Transparency and System Trust: Both metrics exhibited the largest gains, highlighting blockchain's impact on creating a more open and trustworthy reward system.
- Fairness Perception: While also significantly improved, the smaller increase in fairness perception compared to transparency and system trust may reflect inherent challenges in reshaping employee perceptions of fairness through technology alone.

These findings confirm that blockchain-based incentive systems significantly enhance transparency, fairness, and trust within sports organizations, which in turn can lead to greater employee engagement and improved motivation. The regression analysis further solidified the importance of perceived fairness as a key predictor of motivation, explaining 38% of the variance in motivation levels. Moving forward, future studies should examine the long-term effects of blockchain on trust and performance, as well as explore potential strategies for addressing any residual concerns regarding fairness and system trust.

Qualitative Insights

A thematic analysis of 20 in-depth interviews identified three major themes, with NVivo-based coding reliability (Cohen's Kappa = 0.87) ensuring inter-rater consistency.

1. Transparency and Decentralization

A majority of participants (85%) praised blockchain's transparency in reward allocation, highlighting improved trust and accountability:

"Before blockchain, incentives felt arbitrary. Now, every effort is documented, and rewards are justified." – Athlete, 29 years old

However, coaches expressed concerns that performance tracking may not fully capture qualitative contributions such as mentorship and strategic decision-making, suggesting the need for hybrid assessment models integrating subjective evaluations.

2. Adoption Challenges

Despite general satisfaction, 23% of participants reported adaptation difficulties, primarily among:

- Older employees (45+ years): Struggled with smart contract logic.

- Administrative staff: Encountered payroll integration issues, necessitating manual adjustments.

Notably, younger employees adapted more seamlessly, highlighting a generational gap in blockchain literacy.

3. Long-Term Viability

While most participants recognized blockchain's potential for sustained motivation, 57% suggested regulatory and operational refinements, including:

- Equitable token valuation mechanisms to prevent inflationary risks.
- Training programs (supported by 70% of respondents) to improve digital literacy.

These findings strongly support the effectiveness of blockchain-based incentives in enhancing performance, trust, and transparency. However, role-based variations and adoption challenges suggest the need for customized implementation strategies. Future studies should examine long-term engagement trends, regulatory safeguards, and real-time performance tracking enhancements to optimize blockchain-based incentive frameworks for sports organizations.

Discussion

Summary of Key Findings

This study investigated the application of blockchain technology in performance incentive systems for sports employees, focusing on decentralization and trust mechanisms. The findings demonstrated significant improvements in performance metrics, trust perception, and fairness perception after blockchain implementation:

1. Performance Enhancement: Efficiency scores increased from a pre-test mean of 72.4 (SD = 5.6) to a post-test mean of 87.8 (SD = 4.9), reflecting a 21.3% improvement. Attendance rates improved from 79.6 (SD = 6.1) to 93.7 (SD = 5.4) (+17.6%), and key performance indicators (KPIs) rose from 65.2 (SD = 7.3) to 81.8 (SD = 6.5) (+25.4%) after six months of blockchain-based incentives.
2. Trust and Transparency: The Trust Perception Scale (TPS) scores improved significantly across all dimensions, particularly in system fairness (+18.4%, from 3.8 to 4.5) and transparency (+30.6%, from 3.6 to 4.7).
3. Role-Specific Differences: Athletes exhibited the highest performance improvements (+28.1%), followed by coaches (+22.7%) and administrative staff (+15.9%). This suggests that blockchain incentives are more impactful in performance-driven roles, whereas administrative tasks may require tailored adaptation strategies.
4. Adoption Challenges: While the blockchain system improved incentive distribution, 23% of participants reported difficulties in adapting to digital incentives, particularly concerning smart contract mechanisms and integration with existing payroll systems.

These results support blockchain's potential as a decentralized, transparent, and efficient solution for performance incentives in sports organizations, despite adoption barriers that require further consideration. Notably, the observed performance gains align with self-determination theory, wherein transparency in rewards enhances intrinsic motivation (Ruiz-Mora & Guerrero-Navarro, 2018).

Comparison with Previous Studies

The findings align with existing literature on blockchain's role in incentive systems but also highlight unique contributions specific to the sports industry.

Performance Enhancement: Our results are consistent with Vignesh & Prasad (2022), who found that blockchain-based reward systems increased employee motivation by 19% in the corporate sector. However, our study demonstrated a greater improvement (21.3%) in the sports domain, suggesting that sports employees may be more responsive to transparent, data-driven incentives. In contrast, Damo et

al. (2025) reported only a 10-12% increase in performance using traditional digital incentives, emphasizing blockchain's superiority in enhancing motivation through immutable performance tracking.

Trust and Transparency: Prior research by Rijal & Saranani (2023) emphasized the role of blockchain in increasing trust in financial transactions. Our study extends this argument to non-financial incentives, demonstrating that perceived fairness and trust improved by over 18%. Compared to Chhibber et al. (2024), who found that blockchain improved trust in peer-to-peer reward systems in tech firms, our study suggests that the impact of blockchain on trust may be even stronger in industries where subjective performance evaluations were previously a concern. Additionally, transparency in performance incentive structures aligns with corporate social responsibility principles in sports organizations, reinforcing the ethical dimension of blockchain applications (Ruiz-Mora & Guerrero-Navarro, 2018).

Role-Specific Differences: Our findings revealed that athletes experienced the highest performance increases, whereas administrative staff exhibited the lowest gains. This suggests that performance-based incentives are more effective in direct, quantifiable roles (e.g., athletes), whereas administrative employees may require alternative motivational strategies. These role-based variations align with Mookherjee, (2013), who emphasized that incentive effectiveness varies across hierarchical and operational roles in organizations.

Adoption Challenges: Studies by Masa'd et al., (2024) indicated that 24% of employees in blockchain-based HR systems faced adoption difficulties, aligning closely with our study's 23% challenge rate. This suggests that while blockchain enhances transparency, its usability remains a key barrier to widespread adoption. Furthermore, our findings suggest that administrative staff faced greater integration challenges than athletes and coaches, which aligns with organizational change resistance theories (Bavaresco et al., 2024).

Overall, while prior research has explored blockchain incentives in various industries, this study provides the first empirical evidence of its impact in the sports sector, confirming its effectiveness while identifying sector-specific challenges.

Implications of the Findings

These results have significant implications for sports organizations, policymakers, and technology developers looking to integrate blockchain into performance incentives.

- For Sports Organizations: Blockchain-based incentives enhance performance and trust, making them a viable alternative to traditional subjective bonus systems. Implementation requires comprehensive digital training for employees to overcome initial adoption barriers (Bavaresco et al., 2024).
- For Policymakers: Regulatory frameworks should be established to govern token valuation and integration with payroll systems, ensuring fair and stable compensation. Compliance mechanisms are necessary to prevent potential misuse or inequitable reward distribution.
- For Blockchain Developers: There is a need for customized smart contracts that integrate seamlessly with existing HR and payroll platforms. User-friendly blockchain interfaces should be developed to reduce complexity and facilitate widespread adoption among non-technical users.

Limitations of the Study

While this study provides valuable insights into the application of blockchain-based incentives in sports organizations, several limitations should be acknowledged, as these factors could impact the generalizability and depth of the results:

- Sample Size and Generalizability: The study involved 150 sports employees from select organizations, which may limit the generalizability of the findings to a broader range of sports industries. A larger sample size, encompassing diverse types of organizations and employees, would enhance the external validity of the findings. Future research should include multi-country and multi-sport samples to assess the scalability of blockchain-based incentives across different sports contexts and cultural settings.
- Short-Term Evaluation: The study assessed blockchain's impact over a six-month period, which may not capture the long-term effects of the technology on performance, trust, and motivation.

It is possible that the initial improvements seen in the post-test may reflect short-term gains rather than sustained changes in employee behavior. Longitudinal studies examining blockchain's effectiveness over one to three years would provide more comprehensive insights into the sustainability of trust, motivation, and the impact of blockchain adoption on sports organizations' performance.

- Potential Bias in Self-Reported Data: Trust and fairness perceptions were evaluated through self-reported measures, which can be prone to response bias or social desirability bias. Although subjective perceptions are valuable in assessing trust and motivation, future research should incorporate objective data from blockchain transactions, such as smart contract execution and real-time performance metrics, to validate the self-reported findings.

Future Research Directions

Building on the findings of this study, future research could focus on several key areas to deepen our understanding of blockchain-based incentive systems in sports organizations:

1. Longitudinal Impact Analysis: Investigating the long-term effects of blockchain-based incentive systems over an extended period (e.g., one to three years) would offer a clearer picture of how blockchain influences sustained trust, motivation, and performance improvements.
2. Comparative Analysis of Blockchain Models: Research comparing private (enterprise) blockchain models with public blockchain systems would shed light on whether different blockchain architectures impact performance outcomes or adoption rates in sports organizations.
3. Hybrid Incentive Models: Future studies could explore hybrid models that integrate blockchain incentives with traditional performance reward systems, combining the benefits of blockchain's transparency with the familiarity and flexibility of conventional incentive structures.
4. Integration with AI & Biometric Tracking: Investigating the combination of blockchain with AI-driven performance analytics and wearable biometric devices could lead to more accurate and data-driven evaluations of employee performance, further enhancing the transparency and fairness of incentive distribution.
5. Regulatory and Ethical Considerations: Future research should also focus on the legal and ethical challenges associated with blockchain adoption in employee incentive systems, particularly concerning the tokenization of rewards and the privacy implications of using blockchain in HR systems.

Conclusions

This study explored the application of blockchain technology in performance incentive systems for sports employees, focusing on its decentralization and trust mechanisms. Through empirical investigation, we found that blockchain-based incentive models significantly enhance performance, trust, and transparency within sports organizations. The results indicated that key performance indicators (KPIs) increased by 25.4%, attendance rates improved by 17.6%, and efficiency scores rose by 21.3%. Additionally, trust perception increased significantly, with fairness perception improving by 18.4% and transparency by 30.6%. These findings confirm the role of blockchain in fostering decentralized, verifiable, and bias-free performance assessments, supporting the principles of self-determination theory.

A comparative analysis with previous studies confirmed that blockchain-based incentives outperform traditional digital reward systems, particularly in industries where subjective performance assessments have been a persistent challenge. However, adoption barriers remain, with 23% of participants experiencing difficulties adapting to smart contract-based payroll systems, particularly due to technological complexity and integration challenges, with administrative staff facing the highest resistance. Role-specific variations highlight that blockchain incentives are most effective in performance-driven roles such as athletes and coaches, whereas administrative roles require additional adaptation strategies. These findings underscore the necessity for simplified blockchain interfaces, targeted digital training programs, and regulatory clarity to facilitate adoption. Additionally, hybrid incentive models, combining

blockchain rewards with traditional performance bonuses, may help mitigate resistance while maintaining transparency.

While this study highlights the potential of blockchain-based incentives, several gaps remain. Longitudinal research is needed to assess the sustainability of performance and trust improvements over time. Additionally, the role-specific variations in performance gains suggest a need for studies that explore how blockchain can be tailored for different employee roles, particularly administrative staff. Integration challenges, such as compatibility with payroll systems, also require further investigation to enhance adoption. Future research should examine the effectiveness of different blockchain models (e.g., private vs. public) and explore the legal and ethical implications of using blockchain in compensation, including fairness and compliance with labor laws.

Key Takeaways and Future Outlook

1. Performance Enhancement: Blockchain-based incentive models significantly improve key performance indicators, attendance, and efficiency while fostering trust and transparency. Performance improvements are most pronounced in direct performance-driven roles.
2. Trust and Motivation: Employee motivation improves when performance-based rewards are verifiable, decentralized, and free from subjective bias. Transparent reward allocation aligns with self-determination theory, reinforcing intrinsic motivation.
3. Adoption Challenges: Barriers such as smart contract complexity and digital literacy gaps must be addressed through comprehensive training and user-friendly interfaces. Administrative personnel require specialized onboarding programs to enhance adoption rates.
4. Regulatory Considerations: Establishing compliance frameworks is essential to ensure fair token valuation, payroll integration, and long-term stability of blockchain-based compensation models. Hybrid incentive approaches should be explored to balance transparency with familiarity, reducing resistance among employees.

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