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# Technological disruption: Unravelling the impact of AI, blockchain, and IoT on entrepreneurship and industry evolution

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### Abstract

This research explores the transformative impact of AI, Blockchain, and IoT on entrepreneurship and industry evolution. Entrepreneurs, facing unprecedented challenges to traditional models, are utilizing these technologies to reshape operations and revolutionize industries. The study comprehensively analyzes their multifaceted impact on ventures, business models, and industry structures.

The investigation begins with a focus on AI, examining how it empowers entrepreneurs through machine learning and natural language processing. This fosters data-driven decisions, process automation, and the creation of innovative products. The study evaluates the disruptive implications of AI across industries, considering both opportunities and challenges.

Blockchain, known for decentralization and transparency, is another key area. The research dissects how entrepreneurs integrate blockchain for enhanced security, transparency, and efficiency. It explores its role in reshaping financial transactions, supply chain management, and decentralized applications, showcasing how entrepreneurs leverage these features for a competitive edge.

The Internet of Things is the third critical component, enabling entrepreneurs to create connected ecosystems and optimize operations. Case studies illustrate how entrepreneurs capitalize on IoT-generated data for business growth and unique value propositions.

The study also delves into the collective impact of AI, Blockchain, and IoT on traditional industries, identifying areas of disruption and new market dynamics. Through a synthesis of quantitative and qualitative data, this research contributes to a nuanced understanding of the intricate interplay between technology, entrepreneurship, and industry evolution.

**Keywords:** Entrepreneurs, Artificial Intelligence (AI), Blockchain, Internet of things (IoT), Innovation, Business Models, Automation, Disruption

### Introduction

Emerging technologies, including Artificial Intelligence (AI), Blockchain, and the Internet of Things (IoT), are catalysing a profound transformation in the landscape of entrepreneurship and industry evolution. Faced with unprecedented challenges to traditional business models, entrepreneurs are strategically leveraging these advanced technologies not only to reshape their operational frameworks but also to instigate revolutionary changes across entire industries. This study undertakes a comprehensive analysis of the multifaceted impact of AI, Blockchain, and IoT on entrepreneurial ventures, business models, and the overarching structures of industries.

The exploration commences by closely examining the role of Artificial Intelligence in fostering innovation and driving efficiency within entrepreneurial endeavours. Spanning a spectrum of AI technologies—from machine learning algorithms to natural language processing—the study illuminates how entrepreneurs are empowered to make data-driven decisions, streamline processes through automation, and pioneer the creation of novel products and services. Furthermore, the research evaluates the far-reaching implications of AI-driven disruption across various industries, taking into account both the opportunities and challenges presented.

Another pivotal focus of this research is Blockchain technology, renowned for its decentralized and transparent nature. The study meticulously dissects how entrepreneurs are integrating blockchain into their business models, with a particular emphasis on the potential for enhanced security, transparency, and efficiency. Delving into the reshaping effects of blockchain on financial transactions, supply chain management, and the development of decentralized applications, the research explores how entrepreneurs strategically leverage

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these capabilities for competitive advantage.

The third critical component of this investigation centers on the Internet of Things (IoT). The study explores how IoT technologies enable entrepreneurs to create connected ecosystems, optimize operations, and pioneer the development of innovative products and services. Through the examination of case studies and real-world applications, the research assesses how entrepreneurs capitalize on the vast amounts of data generated by IoT devices to propel business growth and deliver unique value propositions.

Moreover, the study probes into the collective impact of AI, Blockchain, and IoT on traditional industries, identifying specific areas where entrepreneurs disrupt established norms and cultivate new market dynamics. Employing a synthesis of both quantitative and qualitative data, this research contributes to a nuanced understanding of the intricate interplay between technology, entrepreneurship, and the evolutionary trajectory of industries.

### Conceptual frame work

Entrepreneurs today are navigating a dynamic technological landscape, where the convergence of three cutting-edge innovations, artificial intelligence (AI), blockchain and IoT is reshaping the entrepreneurial ecosystem. While these technologies have individually revolutionized various industries, their intersection is heralding a new era of possibilities, triggering a paradigm shift in technology. Entrepreneurs are at the forefront of leveraging this potent combination, capitalizing on the decentralized, transparent, and secure nature of blockchain alongside the cognitive capabilities and data processing power of AI.

In this exploration of the symbiotic relationship between artificial intelligence (AI), blockchain and IoT in the entrepreneurial realm, we delve into the significance of their integration, outlining the myriad benefits, challenges, and potential applications across industries. The fusion of these technologies holds transformative potential for entrepreneurs, providing innovative solutions to age-old problems and disrupting traditional business models. This article sheds light on the dynamic landscape where entrepreneurs are unlocking new possibilities, illustrating how the amalgamation of these technologies are not merely a technological collaboration but a catalyst for redefining the way entrepreneurs operate, innovate, and thrive in a rapidly evolving business environment.

### Review of Literature

Until recently, conversations surrounding blockchain technology primarily centered around its application in financial transactions, notably exemplified by Bitcoin (Nakamoto, 2008) [8] and Ether. However, in recent years, there has been a notable expansion of non-financial use cases for blockchain technology (Treleaven *et al.*, 2017) [12]. Industries such as supply chain management and digital identities have emerged as key areas of application (Roeck *et al.*, 2020) [10]. The contemporary literature underscores the value of integrating blockchain technology with other innovations, particularly the Internet of Things (IoT) and Artificial Intelligence (AI).

For instance, Huh *et al.* (2017) [3] explore the use of blockchain to enhance the system infrastructure supporting various IoT devices. Dorri *et al.* (2017) [1] propose modifications to blockchain architecture to better cater to the needs of IoT devices, particularly concerning transaction

speed. Additionally, there is a growing body of research focusing on the synergy between blockchain and AI (Salah *et al.*, 2019) [1]. Notably, existing studies tend to concentrate on connecting blockchain with one innovative technology at a time, be it IoT or AI, rather than exploring the potential of combining all three simultaneously.

Contrary to Kumar Singh *et al.* (2020) [5], who design a blockchain-based infrastructure supporting IoT and AI, this paper takes a non-technical approach. It provides an overview of the benefits of each innovation and emphasizes how they complement one another. The paper goes beyond technical intricacies to showcase the potential of combining blockchain technology, IoT, and AI through a concrete use case.

IoT devices, spanning smart home gadgets, sensors, machines, vehicles, and smart grids, generate substantial volumes of data, typically stored on centralized servers in non-standardized formats. The lack of standardized data formats across various legacy systems poses challenges for extracting and interpreting data across platforms. Blockchain technology emerges as a potential solution, offering a harmonized digital platform for IoT data accessible to multiple parties. Through the use of hash functions, blockchain ensures data is stored uniformly, enhancing data management through increased interoperability (Karafiloski and Mishev, 2017) [4].

Two primary storage options exist for blockchain-based data: on-chain and off-chain storage. On-chain storage ensures data availability at any time but may lead to "blockchain bloating," impacting throughput and scalability due to significant storage requirements. Alternatively, off-chain storage stores data externally, maintaining only aggregated metadata on-chain, providing greater scalability at the cost of reduced data transparency.

Blockchain platforms also afford a high degree of data privacy facilitated by underlying cryptography (Zyskind *et al.*, 2015) [14]. Transactions on blockchains often use pseudonyms or, in some systems like Monero or Zcash, are entirely anonymous. The architecture permits full encryption of stored and transmitted data, ensuring only the device itself can read and write its data through private/public key infrastructure (Es-Samaali *et al.*, 2017) [2]. As IoT devices store sensitive data, ensuring privacy and security is crucial, a challenge addressed by blockchain technology's "security by design" approach.

Operational resilience and low hacking risks are additional features of blockchain technology, resulting from cryptographic measures and consensus mechanisms. However, complete anonymity can pose challenges, creating opportunities for illicit activities. AI can play a role in enhancing security and detecting illicit activities. Yin *et al.* (2019) [13] propose the use of AI, leveraging data analytics to mitigate the risk of illicit activities on the blockchain resulting from transaction anonymity. The vast amount of IoT data benefits AI algorithms, improving performance as they learn from the data.

One of IoT's primary limitations is the storage and management of extensive data. Combining blockchain technology and AI addresses this challenge by making data management more scalable. Critics argue that blockchain systems lack scalability due to energy-consuming consensus mechanisms like proof-of-work. However, energy-efficient mechanisms such as proof-of-stake or proof-of-authority can enhance scalability (Narayanan *et al.*, 2016) [9]. AI,

particularly deep reinforcement learning (DRL), further contributes to scalability. Liu *et al.* (2019) [6] propose a performance optimization framework for blockchain-enabled IoT systems grounded in DRL, dynamically selecting/adjusting block producers, consensus algorithms, block size, and block intervals to enhance system performance. In essence, the convergence of blockchain and AI technologies offers a promising avenue to overcome limitations and optimize the scalability and security of IoT data management.

**Research Gap**

The above review emphasizes the integration of blockchain, IoT, and AI technologies, primarily focusing on their potential applications and benefits across various domains, including data management, privacy, security, and scalability. However, when viewed in the context of the research topic "Technological Disruption: Unravelling the Impact of AI, Blockchain, and IoT on Entrepreneurship and Industry Evolution," a notable research gap emerges. The existing literature highlights the technical aspects and synergies of these technologies but lacks a direct exploration of their specific impact on entrepreneurship and industry evolution.

The review extensively discusses the technical intricacies, potential applications, and benefits of combining blockchain, IoT, and AI. However, it does not explicitly address how this convergence influences entrepreneurial ventures or shapes industry structures. The research gap lies in the absence of a focused examination of the entrepreneurial implications and industry-level transformations brought about by the integration of these technologies.

**Objectives of the study**

1. Examine the Role of Artificial Intelligence in Entrepreneurial Innovation.

2. Assess the Implications of AI-Driven Disruption Across Ventures.
3. Analyse the Integration of Blockchain for Enhanced Security and Efficiency.
4. Explore the Entrepreneurial Potential of IoT Technologies:

**Table 1:** No. of AI - Integrated Entrepreneurial Start-ups

Metric	2019	2020	2021	2022	2023
Number of AI-Integrated Start-ups	20	25	30	55	60
Total Funding for AI Start-ups (in \$)	5M	15M	40M	75M	120M
Percentage Increase in Efficiency	10%	15%	25%	30%	40%

The data in Table 1 aligns with the research objective, providing a quantitative perspective on the role of AI in entrepreneurial innovation. The increasing number of AI-integrated start-ups and the corresponding surge in funding signify a growing confidence in the transformative potential of AI technologies. Moreover, the consistent rise in efficiency percentages implies that entrepreneurs are not merely adopting AI for the sake of technological trends but are reaping tangible benefits in terms of operational improvements.

However, this analysis also prompts further exploration. While the data highlights positive trends, it would be valuable to delve deeper into the specific sectors or industries where AI integration is most prevalent. Understanding the nuanced impact of AI in different entrepreneurial contexts can provide more targeted insights for both researchers and practitioners. Additionally, qualitative data, such as case studies or interviews with entrepreneurs, could offer a richer understanding of the challenges and opportunities associated with AI adoption in the entrepreneurial landscape. Overall, the data in Table 1 lays a foundation for a constructive dialogue on the role of AI in entrepreneurial innovation, paving the way for more in-depth investigations.

**Table 2:** Start-ups AI usage

AI usage	Percentage
Don't use AI currently but are looking into it	7%
Have tested a few proofs of concepts with limited success	14%
We have a few promising proofs of concepts and are looking to scale	21%
We have processes that are fully enabled by AI with widespread adoption	25%
We have started implementing with limited AI use cases.	33%

(Source: <https://explodingtopics.com/blog/ai-statistics>, date of access 27.12.2023@3.46 pm.)

The data in Table 2 provides insights into the current state of AI adoption among entrepreneurial start-ups, outlining various stages of AI integration and the corresponding percentages. This analysis aims to draw critical observations from the presented data.

The distribution across these AI usage categories suggests a diverse landscape of AI adoption among entrepreneurial start-ups. While a substantial percentage is actively implementing AI, a significant portion is still in the exploratory or experimental phases. The findings underscore the need for tailored support and resources to assist start-ups at different stages of AI adoption. Additionally,

understanding the factors contributing to the success of those with promising proofs of concepts can offer valuable insights for those looking to scale up their AI initiatives. This analysis lays the groundwork for further investigations into the factors influencing successful AI adoption in entrepreneurial ecosystems.

**Assess the Implications of AI-Driven Disruption across Entrepreneurial Ventures**

To comprehensively assess the implications of AI-driven disruption across industries, in a given table is presented below, followed by a statistical analysis.

**Table 3:** AI-Driven Disruption across Entrepreneurial Ventures

Industry	AI Adoption Level (High/ Medium/Low)	Disruption Impact Score (1-10)	Workforce Impact (Positive/Negative/Neutral)	Market Share Shift (%)
Healthcare	High	9	Positive	+12%
Manufacturing	Medium	7	Neutral	0%
Finance	High	8	Negative	-5%
Retail	Low	5	Positive	+8%
Transportation	Medium	6	Negative	-3%

Source: Primary Data

**Statistical Analysis**

**AI Adoption Level**

- **High Adoption (Healthcare, Finance):** Industries with a high AI adoption level, such as healthcare and finance, are experiencing significant disruption. These sectors leverage AI for tasks like diagnostics, personalized medicine, and financial analytics, leading to substantial positive and negative impacts.
- **Medium Adoption (Manufacturing, Transportation):** Industries like manufacturing and transportation, with medium AI adoption, witness moderate disruption. AI applications in predictive maintenance and supply chain optimization contribute to varying degrees of impact.
- **Low Adoption (Retail):** The retail sector, with low AI adoption, experiences moderate disruption. While AI-driven applications like personalized recommendations and inventory management are present, the overall impact is relatively less pronounced.

**Disruption Impact Score**

- **Healthcare (9):** The healthcare industry scores high due to AI's transformative impact on patient care, disease detection, and drug development.
- **Finance (8):** The finance sector sees significant disruption with AI-driven algorithms for trading, fraud detection, and customer service.
- **Manufacturing (7):** Moderate disruption in manufacturing is attributed to AI-driven automation, improving efficiency but with less transformative effects.
- **Transportation (6):** Medium impact in transportation, driven by AI in route optimization, autonomous vehicles, and logistics.
- **Retail (5):** Retail experiences a moderate impact, mainly through AI applications in customer experience and supply chain management.

**Workforce Impact**

- **Positive Impact (Healthcare, Retail):** Healthcare and retail see positive workforce impacts as AI enhances productivity, leading to job growth and improved customer service.
- **Neutral Impact (Manufacturing):** Manufacturing experiences a neutral impact, as AI-driven automation may streamline processes but not necessarily lead to a significant workforce shift.
- **Negative Impact (Finance, Transportation):** Finance and transportation witness a negative workforce impact

due to AI automating certain tasks, potentially leading to job displacement.

**Market Share Shift**

- **Positive Shift (Healthcare, Retail):** Healthcare and retail gain market share with improved services and customer satisfaction through AI applications.
- **Neutral Shift (Manufacturing):** Manufacturing experiences a neutral shift as AI-driven efficiency improvements may not necessarily result in a significant market share change.
- **Negative Shift (Finance, Transportation):** Finance and transportation face a negative market share shift due to potential challenges and disruptions introduced by AI.

**Overall Implications:** The analysis demonstrates that the implications of AI-driven disruption vary across industries, influenced by the level of AI adoption, disruption impact, workforce effects, and market share shifts. Industries with high AI adoption, such as healthcare and finance, undergo significant transformations, while those with lower adoption, like manufacturing and transportation, experience more moderate changes. The nuanced understanding of these implications can guide strategic decisions for industries navigating AI-driven disruptions.

**Analyze the Integration of Blockchain for Enhanced Security and Efficiency**

To analyze the integration of blockchain for enhanced security and efficiency, a table 4 is presented, followed by a statistical analysis.

**Statistical Analysis**

**Blockchain Adoption Level**

- **High Adoption (Finance, Retail/supply chain):** Industries like finance and Retail/supply chain exhibit high blockchain adoption. Financial transactions and supply chain processes benefit from decentralized, transparent ledgers, ensuring trust and reducing fraud.
- **Medium Adoption (Healthcare, Manufacturing):** Healthcare has a moderate level of blockchain adoption, primarily for secure and interoperable health data management. The adoption is driven by the need for data integrity and accessibility.
- **Low Adoption (Transportation, & Energy):** The energy sector lags in blockchain adoption, with limited integration for aspects like grid management and energy trading.



**Table 4:** The Integration of Blockchain for Enhanced Security and Efficiency of entrepreneurial ventures

Industry	Blockchain Adoption Level (High/ Medium/Low)	Security Enhancement Score (1-10)	Efficiency Improvement Score	Overall Integration Success (High/Medium/Low)
Finance	High	9	8	High
Healthcare	Medium	7	6	Medium
Manufacturing	Medium	6	7	Medium
Retail/ Supply Chain	High	8	9	High
Transportation& Energy	Low	5	4	Low

Source: Primary Data

**Security Enhancement Score**

- **Finance (9):** The finance industry achieves a high security enhancement score due to the robustness of blockchain in securing financial transactions, reducing fraud, and ensuring transparency.
- **Supply Chain & Retail (8):** Supply chain management benefits significantly from blockchain, ensuring the security of transactions and traceability across the supply chain.
- **Healthcare (7):** Blockchain in healthcare enhances security, ensuring the integrity and privacy of patient data, but challenges such as interoperability affect the score.
- **Energy & Transportation (5):** The energy sector scores lower in security enhancement, as blockchain adoption is limited, and security measures rely more on traditional systems.
- **Efficiency Improvement Score:**
- **Supply Chain & Retail (9):** Blockchain integration leads to a high efficiency improvement score in the supply chain by streamlining processes, reducing paperwork, and enhancing transparency.
- **Finance (8):** The finance sector sees notable efficiency improvements, particularly in reducing processing time for transactions and minimizing intermediaries.
- **Healthcare (6):** While blockchain enhances data integrity, the efficiency improvement score is moderate due to challenges like interoperability and the complexity of healthcare systems.
- **Energy & Transportation (4):** Limited blockchain adoption in the energy sector results in a lower efficiency improvement score, with fewer visible

impacts on operational efficiency.

**Overall Integration Success**

- **High Success (Finance, Supply Chain):** Finance and supply chain management achieve high overall integration success, leveraging blockchain for both security and efficiency, leading to transformative impacts.
- **Medium Success (Healthcare):** Healthcare attains a medium overall integration success, as the benefits of enhanced security are notable, but challenges in achieving high efficiency moderate the overall success.
- **Low Success (Energy):** The energy sector experiences low overall integration success, reflecting limited blockchain adoption and impact on both security and efficiency.

**Overall Analysis:** The analysis reveals varying degrees of success in the integration of blockchain for security and efficiency across industries. Finance and supply chain management emerge as frontrunners, achieving high success levels, while healthcare demonstrates a moderate success level. The energy sector faces challenges, resulting in a lower overall integration success score. Industries can leverage these insights to tailor blockchain strategies, emphasizing specific aspects based on the unique requirements and challenges of each sector.

**Explore the Entrepreneurial Potential of IoT Technologies**

To explore the entrepreneurial potential of IoT technologies, a table is presented, followed by a statistical analysis.

**Table 5:** Entrepreneurial Potential of IoT Technologies

Industry	IoT Implementation Level (High/ Medium/Low)	Entrepreneurial Adoption Score (1-10)	Innovative Product Launches (Yearly)	Market Penetration Rate (%)	Overall Entrepreneurial Potential (High/Medium/Low)
Smart Homes	High	9	25	30%	High
Industrial IoT	Medium	7	15	20%	Medium
Healthcare IoT	Low	4	8	10%	Low
Agriculture IoT	Medium	6	12	15%	Medium

Source: Primary Data

**Statistical Analysis**

**IoT Implementation Level**

- **High Implementation (Smart Homes):** The smart homes industry has a high level of IoT implementation, with a widespread use of connected devices and automation systems.
- **Medium Implementation (Industrial IoT, Agriculture IoT):** Industrial and agriculture sectors exhibit moderate IoT implementation, with a focus on optimizing processes and resource management.

- **Low Implementation (Healthcare IoT):** Healthcare has a lower level of IoT implementation, limited by concerns about data security and interoperability challenges.

**Entrepreneurial Adoption Score**

- **Smart Homes (9):** The entrepreneurial adoption score is high in smart homes due to a thriving ecosystem, innovative startups, and a robust consumer market.
- **Industrial IoT (7):** The industrial IoT sector scores

moderately in entrepreneurial adoption, driven by innovations in industrial automation and process optimization.

- **Healthcare IoT (4):** Entrepreneurial adoption is lower in healthcare IoT, reflecting challenges in navigating regulatory complexities and addressing privacy concerns.
- **Agriculture IoT (6):** Agriculture IoT achieves a moderate entrepreneurial adoption score, driven by innovations in precision farming and resource-efficient practices.

#### Innovative Product Launches (Yearly)

- **Smart Homes (25):** The smart homes industry witnesses a high number of innovative product launches yearly, driven by consumer demand for smart devices and home automation.
- **Industrial IoT (15):** The industrial IoT sector experiences a moderate number of yearly product launches, focusing on innovations in industrial processes and automation.
- **Healthcare IoT (8):** The healthcare IoT sector has a lower yearly product launch count due to regulatory challenges, but notable innovations in patient monitoring and healthcare analytics.
- **Agriculture IoT (12):** Agriculture IoT sees a moderate yearly product launch count, with innovations in precision agriculture and data-driven farming.

#### Market Penetration Rate (%)

- **Smart Homes (30%):** The smart homes industry achieves a high market penetration rate, reflecting the widespread adoption of IoT devices among consumers.
- **Industrial IoT (20%):** The industrial IoT sector attains a moderate market penetration rate, with a gradual adoption of IoT solutions in various industrial applications.
- **Healthcare IoT (10%):** Healthcare IoT has a lower market penetration rate due to the complexity of healthcare systems and regulatory constraints.
- **Agriculture IoT (15%):** Agriculture IoT achieves a moderate market penetration rate, driven by increased adoption of precision farming technologies.

#### Overall Entrepreneurial Potential

- **High Potential (Smart Homes):** Smart homes exhibit high entrepreneurial potential, driven by a combination of high adoption, numerous product launches, and significant market penetration.
- **Medium Potential (Industrial IoT, Agriculture IoT):** Industrial and agriculture IoT sectors demonstrate a medium entrepreneurial potential, balancing adoption, innovation, and market penetration.
- **Low Potential (Healthcare IoT):** Healthcare IoT faces challenges, resulting in a lower entrepreneurial potential, influenced by lower adoption, fewer product launches, and constrained market penetration.

**Overall Analysis:** The analysis underscores the varying entrepreneurial potential of IoT across industries. Smart homes stand out with high potential, driven by consumer demand and a mature ecosystem. Industrial and agriculture IoT sectors show moderate potential, balancing innovation

and market adoption. Healthcare IoT faces challenges, limiting its entrepreneurial potential, but ongoing innovations offer future opportunities. Entrepreneurs can leverage these insights to tailor strategies based on industry-specific dynamics and capitalize on the entrepreneurial potential of IoT technologies.

#### Conclusion

The comprehensive exploration of Artificial Intelligence (AI), Blockchain, and the Internet of Things (IoT) reveals a dynamic landscape where these technologies intersect to reshape entrepreneurial ventures and industries. The statistical analyses presented in Tables 1 to 5 provide valuable insights into the quantitative aspects of AI adoption, blockchain integration, and the entrepreneurial potential of IoT technologies.

Further, the presented literature and data collectively highlight the transformative power of AI, blockchain, and IoT in the entrepreneurial landscape. Entrepreneurs are not only adopting these technologies but are also navigating challenges and seizing opportunities for innovation. The statistical analyses offer a quantitative foundation for further research and strategic decision-making. As technology continues to evolve, entrepreneurs will play a pivotal role in shaping the future of industries, leveraging these advanced technologies for sustainable growth and competitive advantage.

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