The Impact of AI, Blockchain, IoT, and 5G on Business Model Innovation and Internationalization in the Financial Sector

Maximilian Bogner

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René Bohnsack and Cláudia Antunes Marante

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Abstract

Advanced digital technologies such as Artificial Intelligence (AI), Blockchain, the Internet of Things (IoT), and 5G are impacting business models internationally, particularly in the finance sector. These technologies influence value creation, delivery, and capture through increased operational efficiencies, financial security, and global interconnectivity. While existing literature discusses their impacts, literature addressing their synergetic impact is limited. This thesis addresses this gap by investigating how these technologies collectively impact business models and internationalization in the financial sector.

A qualitative research approach involving semi-structured interviews with experts was used to assess the real-world application of these technologies. The findings suggest that automation driven by AI facilitates internationalization, Blockchain improves transaction security and regulatory compliance, IoT assists with operational effectiveness, and 5G technology enables real-time communication globally. However, challenges in the form of regulatory uncertainty, cybersecurity risks, and infrastructural limitations hinder a broader adoption.

This study contributes to the literature by reinforcing the role of advanced digital technologies business model innovation and demonstrating the interconnected effects of AI, Blockchain, IoT, and 5G on global markets. The research also provides practical insights for businesses and policymakers, emphasizing the need for regulatory clarity, workforce training, and cybersecurity investment. Future research should explore long-term implementation strategies and how advanced digital technologies can further enhance business model innovation in the financial sector. Organizations can gain a competitive advantage by strategically adopting and integrating these technologies in an increasingly digital and globalized world.

Keywords: Business Model Innovation, Artificial Intelligence, Blockchain, Internationalization, Digital Transformation

Title: Advanced Digital Technologies and Business Model Innovation: Exploring AI, Blockchain, IoT, and 5G in International Financial Markets

Author: Maximilian Bogner

Sumário Executivo

A utilização de tecnologias digitais avançadas, como Inteligência Artificial (IA), Blockchain, Internet das Coisas (IoT) e 5G, impacta modelos de negócio internacionais, especialmente no setor financeiro. Essas tecnologias influenciam a criação, entrega e captura de valor por meio de maior eficiência operacional, segurança financeira e interconectividade global. Embora a literatura discuta os seus impactos individuais, há uma lacuna sobre o seu impacto sinergético. Esta tese investiga como estas tecnologias afetam coletivamente a inovação do modelo de negócio e a internacionalização no setor financeiro.

Foi utilizada uma abordagem qualitativa, com entrevistas semiestruturadas para avaliar a aplicação dessas tecnologias. Os resultados indicam que a automatização impulsionada pela IA facilita a internacionalização, a Blockchain melhora a segurança das transações, a IoT otimiza a eficiência operacional e o 5G possibilita a comunicação global em tempo real. No entanto, desafios como incerteza regulatória, riscos de cibersegurança e limitações infraestruturais dificultam a adoção ampla.

Este estudo contribui para a literatura ao reforçar o papel da inovação do modelo de negócio e demonstrar os efeitos interligados da IA, Blockchain, IoT e 5G nos mercados globais. Também fornece insights práticos para empresas e formuladores de políticas, destacando a necessidade de clareza regulatória, treinamento da força de trabalho e investimento em segurança cibernética. A investigação futura deve explorar estratégias de implementação e o impacto dessas tecnologias na transformação digital do setor financeiro, permitindo às organizações obter vantagem competitiva num mundo digitalizado.

Palavras-chave: Inovação do Modelo de Negócio, Inteligência Artificial, Blockchain, Internacionalização, Transformação Digital

Título: Tecnologias Digitais Avançadas e Inovação de Modelos de Negócio: Explorando IA, Blockchain, IoT e 5G nos mercados financeiros internacionais

Autor: Maximilian Bogner

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List of Abbreviations	
AI	Artificial Intelligence
BMI	Business Model Innovation
IoT	The Internet of Things
5G	Fifth-Generation Mobile Network
GDPR	General Data Protection Regulation
SPSS	Statistical Package for the Social Sciences
DeFi	Decentralized Finance
BMC	Business Model Canvas
SME	Small Medium Enterprise

Introduction

In a period defined by technological innovations and globalization, organizations are increasingly adopting advanced digital technologies to remain competitive and foster innovation (Horvat et al., 2024). Digital technologies such as Artificial Intelligence (AI), Blockchain, the Internet of Things (IoT), and 5G are transforming industries by fundamentally altering business models, improving operational efficiency, and expanding global market reach (Dana et al., 2022). These technologies optimize processes and transform how organizations create, deliver, and capture value in global markets (Gretzinger et al., 2024).

The financial sector, in particular, has experienced significant transformation due to these digital technologies (Rane et al., 2023). AI-driven automation enables improved decision-making and predictive analytics, Blockchain ensures secure and transparent transactions, IoT enables real-time data collection and operational insights, and 5G facilitates seamless connectivity and accelerated data processing (Charles et al., 2023; Dana et al., 2022). Together, all these technologies form the foundation of digital transformation for international business models, enabling businesses to scale up operations, improve efficiency, and adapt to changing environments (Omrani et al., 2022).

However, adopting these technologies entails several challenges. Regulatory uncertainty, cybersecurity threats, infrastructural constraints, and implementation costs are key challenges to broad adoption (Dwivedi et al., 2021). The dynamics between these technologies and their implications for business models are critical for organizations that seek to leverage advanced digital technologies to achieve growth and competitiveness in global markets.

This thesis explores the impact AI, Blockchain, IoT, and 5G have on business models, focusing on their synergistic impact on value creation, delivery, and capture in the finance sector by answering the research question

> ***"How are advanced digital technologies reshaping business models in the context of global markets in the financial sector "?***

Through a critical analysis of industry experts alongside relevant literature, this thesis provides an overview of these technologies' synergetic impact on business models and internationalization and presents both the opportunities and challenges of their adoption.

Literature Review

This literature review examines how advanced digital technologies like Artificial Intelligence (AI), Blockchain, the Internet of Things (IoT), and 5G reshape business models in an international context. As globalization adds complexity to business operations, companies adopt these technologies to enhance efficiency, security, and customer-oriented services (Bond & O'Byrne, 2014). These innovations disrupt traditional business models by optimizing value creation, delivery, and capture across global markets (Zhang et al., 2023).

For example, AI enhances risk management and personalization through predictive insights, while Blockchain ensures secure transactions and financial transparency (Casey et al., 2018). On the other side, IoT drives operational efficiency with data-driven insights (Ikevuje et al., 2024), and 5G accelerates connectivity for banking and trading (Pereira et al., 2022). Collectively, these technologies create new opportunities for value creation and business model innovation, reinforcing their role in global business transformation (Ancillai et al., 2023).

Business Model Innovation (BMI)

Business Model Innovation (BMI) is a key driver for achieving competitive advantage and long-term success in today's rapidly evolving business environment (Snihur & Bocken, 2022). It involves continuously reconfiguring how a company creates, delivers, and captures value in response to changing market conditions and customer demands (Osterwalder & Pigneur, 2010). As industries become more digitalized, BMI has gained increasing importance, particularly in global markets where companies face complex business and regulatory challenges (Bohnsack et al., 2013; Vaska et al., 2021).

A key enabler of BMI is digital transformation, which is crucial for organizations aiming to implement emerging technologies that enhance operational efficiency and strategic adaptability (Hanelt et al., 2020). Digital transformation, according to Hanelt et al. (2020), is the use of digital technologies for enhancing or redefining business models, business processes, and organizational structures. Technologies like AI, Blockchain, IoT, and 5G enable businesses to overcome challenges related to geography, infrastructural constraints, and regulatory frameworks (Raja, 2021). By leveraging these technologies, organizations can simplify processes, optimize decision-making, and respond more effectively to customer expectations in an international context (Raja, 2021). Hence, digital transformation is crucial

for organizations looking to develop their business models and stay competitive in an increasingly digital environment.

One common framework for analyzing BMI is the Business Model Canvas, developed by Osterwalder and Pigneur (2010). This framework breaks business operations into core elements, revealing how organizations conceive and alter business models. Although the BMC consists of many components, this study will focus on three key aspects only: value creation, value delivery, and value capture, as they are the most relevant to this research in understanding the impact advanced technologies have on international business models.

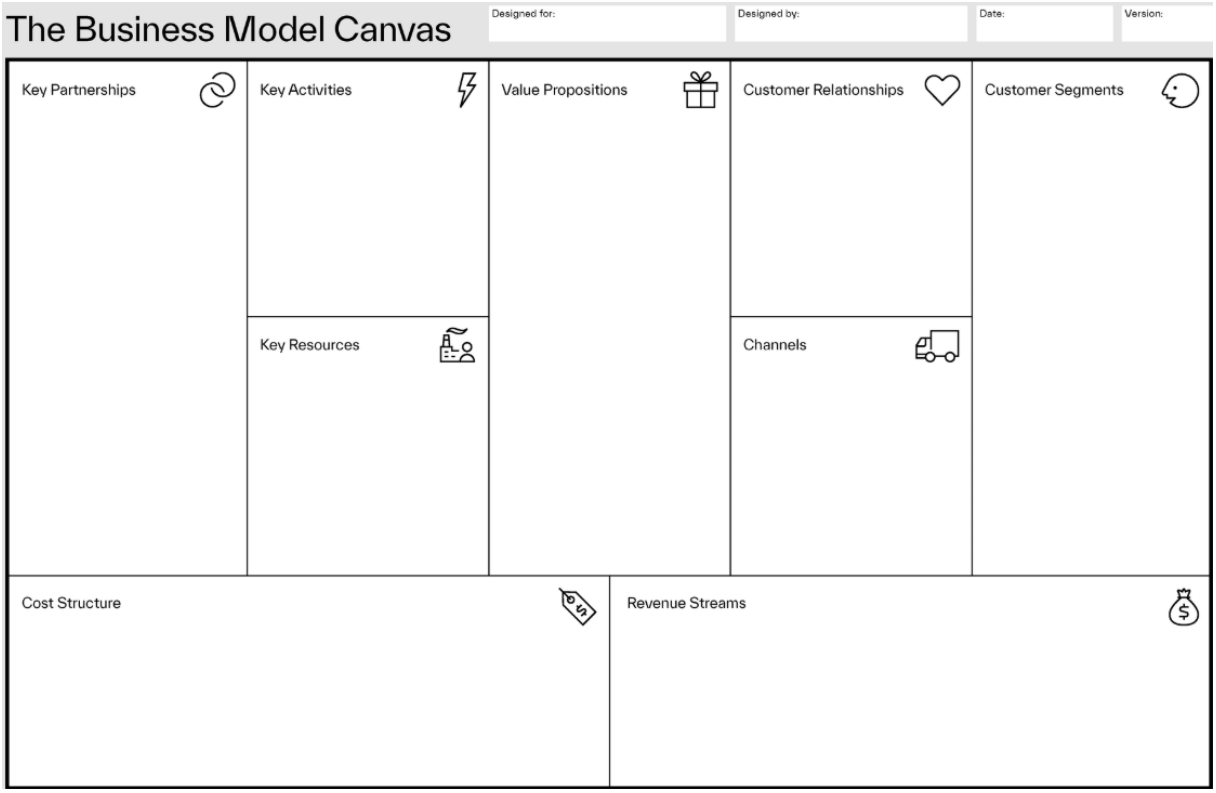

Figure 1 Business Model Canvas

Value creation focuses on delivering innovative solutions that enhance customer experiences (Climent & Haftor, 2020). Value delivery looks at how products or services are delivered to customers, including distribution channels and interaction points (Ancillai et al., 2023). Lastly, value capture refers to how companies translate their offerings into revenue and profitability through different pricing approaches, cost structure, and customer retention (Ancillai et al., 2023). Such elements apply to businesses in every context, whether at the local or global level and support organizations' understanding of what is required in global markets (Bohnsack et al., 2020).

For instance, AI enhances value creation by enabling predictive insights and personalized financial services (Åström et al., 2022). IoT plays an essential role in value delivery through real-time data applications, such as wearable technologies, that improve processes in the insurance business (Dana et al., 2022). Blockchain technology secures value capture by ensuring safe and transparent cross-border transactions, while 5G technology enhances connectivity, thus allowing seamless operations in different markets (Dana et al., 2022; Pereira et al., 2022).

Understanding the intersection of advanced digital technologies and BMI is essential for organizations aiming to gain a competitive advantage in an increasingly digitalized environment (Bresciani et al., 2021). The following section will explore how AI, Blockchain, IoT, and 5G collectively reshape BMI components, fostering innovation and growth across industries (Ancillai et al., 2023).

Impact of Digital Technologies on Business Models

In today's fast-changing digital environment, advanced technologies like Artificial Intelligence (AI), Blockchain, the Internet of Things (IoT), and 5G are redefining traditional business models and reshaping how companies create, deliver, and capture value internationally (Ancillai et al., 2023). These innovations offer unique capabilities, from real-time data processing and automation to secure, decentralized transactions and enhanced connectivity, enabling businesses to operate more efficiently (Khan et al., 2022). As industries continue to embrace digitalization, these technologies collectively drive innovation, enhance operational efficiency, and strengthen competitive advantage in global markets. This section explores how AI, Blockchain, IoT, and 5G technologies impact business models.

Artificial Intelligence (AI)

Artificial Intelligence (AI) is a technology capable of performing highly complex tasks that typically require human intelligence, often exceeding human capabilities in speed and accuracy (Kelly et al., 2022). The development of AI has significantly reshaped international business models, enabling companies to operate more efficiently and remain competitive in global markets (Farayola et al., 2023). Unlike traditional business models, which rely on manual programming and human intervention, AI-driven models can autonomously adapt to rapidly changing market conditions, allowing organizations to adjust to industry trends (Farayola et al., 2023).

AI enhances value creation by generating predictive insights into consumer behavior and enabling personalized financial services (Åström et al., 2022). This allows businesses to respond rapidly to evolving customer needs and market changes. For instance, autonomous AI-driven business models continuously learn from vast datasets, identifying patterns and optimizing strategies without requiring manual updates (Sjödin et al., 2021).

AI also plays a significant role in value delivery as it improves the detection of fraudulent transactions by identifying unusual transaction patterns in real time (Adijat Bello et al., 2021). This approach significantly reduces incidences of fraud and improves financial security, hence fostering higher consumer trust and satisfaction through more reliable services (Zanke, 2023)

Besides preventing fraudulent activities, AI is central to value capture because it successfully improves operational efficiency, protects revenue streams, and reduces costs (Adijat Bello et al., 2021). By enabling automation and predictive analytics, AI supports organizations to expand their operations and enhance profitability while aligning with regulatory requirements (Sjödin et al., 2021).

The continuous growth and adaptability of AI-based business models enable organizations to sustain a competitive advantage in global markets (Kemp, 2023). However, with business processes optimized by AI, international companies experience critical challenges in achieving secure, transparent, and efficient transactions. Blockchain technology can be used to effectively address such problems by securing data, creating trust, and enhancing the decentralization of financial and operational transactions (Morkunas et al., 2019).

Blockchain Technology

Blockchain technology is a decentralized ledger that records transactions across a network of computers (Morkunas et al., 2019). It relies on cryptographic techniques and methods to capture and secure data. No single entity controls the entire ledger because every transaction is encrypted and connected to the one before, creating a chronological "chain" dispersed throughout the network. This configuration ensures high security and resilience against unauthorized changes (Tripathi et al., 2023).

Blockchain technology is essential in value creation, significantly enhancing transparency and trust in international trade and financial transactions by eliminating intermediaries and transaction costs (Schlecht et al., 2021). Additionally, Blockchain facilitates smart contracts, which allow agreements to be carried out autonomously and securely, and decentralized

finance (DeFi), making it possible for people to directly access peer-to-peer financial services without using conventional banks or financial intermediaries (Casey et al., 2018).

Building on Blockchain's role in value creation, it also plays a vital role in value delivery by streamlining processes and ensuring operational efficiency (Bai et al., 2024). Its decentralized nature enables secure and efficient financial transactions by removing intermediaries and reducing delays (Schlecht et al., 2021). Additionally, smart contracts facilitate the instant execution of agreements, automating transaction processes and enhancing operational performance (Tian et al., 2022).

Besides improving transaction processes and enhancing transparency in financial transactions, Blockchain also revolutionizes value capture by introducing innovative revenue models and reducing costs. Additionally, by supporting DeFi, Blockchain enables individuals to access peer-to-peer financial services, lowering transaction fees and increasing market accessibility (Casey et al., 2018).

Overall, Blockchain technology makes cross-border transactions more efficient and effective, and IoT complements it by allowing real-time data transfer and interconnectivity (Fu et al., 2021). Together, the two technologies make it possible for organizations to manage, track, and optimize assets and operations globally.

Internet of Things (IoT)

The Internet of Things (IoT) is a communication model that embeds intelligence in interconnected devices to communicate, share real-time data, perform predictive actions, and enhance operational efficiency (Dineshreddy & Gangadharan, 2016). It is a global system that integrates physical and virtual objects with digital infrastructure, enabling seamless information exchange. With the ongoing growth in internet-connected devices, IoT applications are progressively expanding across different industries, including finance, manufacturing, and supply chain management (Chataut et al., 2023).

IoT enhances value creation by enabling businesses to create data-driven solutions and optimize resources effectively. In the finance sector, for example, banks can use IoT devices to track assets in real-time, improving predictions and risk assessments. This capability allows organizations to develop more efficient and proactive service offerings (Palmaccio et al., 2020).

Expanding on its role in value creation, IoT also enhances value delivery by providing security and operational efficiency in financial transactions. IoT-powered fraud detection systems, for instance, use location data from devices like smartphones to verify transaction authenticity. This real-time verification process ensures secure, seamless, and reliable financial services while minimizing customer risks (Haaker et al., 2021).

Beyond value creation and value delivery, IoT also plays a pivotal role in value capture. IoT enables businesses to leverage globally interconnected devices to optimize productivity and reduce operational inefficiencies. By streamlining data collection and analysis, IoT enhances profitability and helps companies' lower costs while sustaining revenue streams (Baruah et al., 2019).

IoT enables instant information exchange, and its effectiveness is further enhanced using 5G technology, which provides the speed, reliability, and bandwidth required to support vast networks of communicating devices (Esenogho et al., 2022).

Fifth – Generation Mobile Network (5G)

5G is the fifth-generation mobile network technology that offers high-speed connectivity, ultra-low latency, and the ability to support a significant number of connected devices simultaneously (Dangi et al., 2021). Since its introduction in 2019, the adoption of 5G has risen, with over two billion people using its enhanced connectivity. Its impact extends across industries, improving real-time communication, automation, and data processing efficiency.

5G technology enhances value creation by significantly shortening transaction and trading cycles. Its high-speed data processing capabilities enable banks to collect and analyze user behavior data in real-time, paving the way for AI-powered banking services (Dolgui & Ivanov, 2021). For instance, automated finance assistants powered by AI and enabled by 5G can provide real-time financial advice (Forge & Vu, 2020).

Building on 5G's value creation, 5G impacts value delivery significantly by enhancing instant data processing and secure transactions. Its role in payment innovation, such as QR code-based transactions and contactless authentication methods, improves financial security and streamlines service accessibility (Tian et al., 2019).

Furthermore, 5G transforms value capture by lowering operational costs and enhancing efficiency. With its fast, seamless connectivity, institutions can scale customer-oriented services, fostering greater trust and long-term engagement (Patwary et al., 2020).

Overall, AI, Blockchain, IoT, and 5G are reshaping international business models, driving efficiency, security, and innovation. Together, these technologies provide a transformative foundation for companies navigating increasingly digital and rapidly changing business environments.

Impact of Technologies on Internationalization

In today's globalized economy, internationalization has become an essential part of organizations seeking to achieve sustainable growth and remain competitive (Reim et al., 2022). However, expanding into global markets presents complex challenges, including regulatory differences, supply chain inefficiencies, and communication barriers (Menzies et al., 2024). To navigate these complexities, businesses increasingly leverage advanced digital technologies such as AI, Blockchain, IoT, and 5G, which enhance the ability to create, deliver, and capture value internationally (Vaska et al., 2021). These technologies simplify market entry, optimize supply chain operations, and facilitate seamless cross-border communication, making them vital to modern business models. Furthermore, their integration aligns closely with BMI, enabling organizations to reconfigure their strategies and operations to remain competitive in global markets (Reim et al., 2022).

The ability of AI to facilitate market entry is one of the most significant contributions of the technology to internationalization (Menzies et al., 2024). AI-powered predictive analytics provide businesses with detailed insights into consumer behavior, allowing them to adjust their strategies to global markets (Bond & O'Byrne, 2014). Unlike traditional market research methods, AI can autonomously analyze evolving consumer demands and adjust business models in real-time, ensuring businesses remain agile in a fast-changing global environment (Farayola et al., 2023). This adaptability is particularly crucial in industries where consumer behavior is dynamic and influenced by regional factors.

Besides market entry, AI also plays a significant role in supply chain management, an essential component of international business success (Menzies et al., 2024). AI-driven forecasting models enable businesses to optimize cross-border logistics, predict inventory disruptions, and improve demand planning, enhancing operational efficiency (Sharma et al., 2022). With global supply chains facing increasingly unpredictable changes due to economic and geopolitical tensions, AI helps organizations anticipate potential disruptions and respond accordingly, ensuring timely deliveries and cost-effective distribution strategies (Menzies et al., 2024).

While AI enhances adaptability and efficiency, Blockchain technology complements it by strengthening security, trust, and transparency in international trade (Guo & Yu, 2022). Initially associated with cryptocurrencies, Blockchain is widely seen as a vital integration in traditional business operations to streamline cross-border transactions and enforce regulatory compliance (Habib et al., 2022). By eliminating intermediaries, Blockchain reduces transaction costs and ensures transparency, making it particularly valuable in industries that require strict regulatory oversight, such as finance and healthcare (Hooper & Holtbrügge, 2020).

One of Blockchain's most transformative applications is its ability to support smart contracts, which automate and secure international agreements (Taherdoost, 2023). Unlike traditional contracts that require intermediaries, smart contracts self-execute based on predefined conditions, making cross-border business interactions faster and more efficient (Zheng et al., 2019). Additionally, Blockchain's ledger enhances traceability in supply chains, ensuring compliance with international quality standards and strengthening customer trust.

Blockchain's capability to secure transactions and ensure trust is further enhanced when complemented with the Internet of Things (IoT), making real-time acquisition and automation possible. Inter-device connectivity across global borders by IoT enables organizations to control and manage assets effectively globally, enhancing the efficiency in logistics and enabling better-informed decision-making (Sahoo et al., 2024). For example, IoT-powered smart tracking systems allow companies to monitor shipment conditions in real-time, reducing losses due to delays, theft, or damage. Additionally, IoT supports dynamic inventory management, ensuring that businesses can adapt to localized market needs while maintaining efficient global supply chains (Neagu et al., 2019).

However, the full potential of IoT in international business models is only realized with the support of 5G technology, which provides the high-speed, low-latency connectivity needed for seamless global operations (Pons et al., 2023). In finance, logistics, and manufacturing industries, 5G enables real-time data exchange, significantly improving the responsiveness and functionality of IoT applications (Tao et al., 2020). For example, financial institutions rely on 5G to facilitate instant, secure transactions across global markets, while logistics companies use it to enable real-time route optimization and fleet management. Additionally, 5G removes geographical limitations, allowing businesses to expand into new markets while maintaining standardized, high-efficiency operations worldwide (Fjellström et al., 2023).

In conclusion, advanced digital technologies serve as key enablers of internationalization by enhancing value creation, delivery, and capture in global markets. AI facilitates data-driven market entry and supply chain optimization, Blockchain strengthens trust and security in cross-border transactions, IoT enhances real-time monitoring and decision-making, and 5G ensures seamless, high-speed connectivity across global networks. Together, these technologies transform how businesses expand and compete internationally, aligning with BMI principles to drive global success. However, while these technologies provide significant opportunities for organizations, their adoption entails several challenges and barriers (Dwivedi et al., 2021). The following section will explore the challenges and barriers that organizations experience when implementing these technologies.

Challenges and Barriers of Technology Adoption

As businesses try to adopt and integrate AI, Blockchain, IoT, and 5G into their operations to enhance global competitiveness, they face significant challenges in adopting these technologies (Dwivedi et al., 2021). Regulatory constraints, infrastructure limitations, and cybersecurity risks present major challenges, particularly for industries handling sensitive data or operating across multiple jurisdictions. These challenges slow adoption and limit the full potential of advanced digital technologies in international business models. Overcoming these obstacles is essential for companies to fully leverage advanced digital technologies and successfully compete in global markets (Al-Emran & Griffy-Brown, 2023).

AI is a data-driven technology that heavily relies on large datasets to train algorithms and generate insights (Kumar et al., 2024). However, strict data privacy regulations, such as the European General Data Protection Regulation (GDPR), limit data collection and processing (Sartor & Lagioia, 2020). For international companies, the need to comply with different privacy laws in different jurisdictions can lead to operational difficulties, thus reducing the ability of AI to provide timely consumer insights (Huang et al., 2024).

In addition to regulatory challenges, AI adoption requires substantial infrastructure investments (Barsha & Munshi, 2023). AI systems demand significant computational resources, cloud computing, and data storage, which pose a major challenge for businesses in regions lacking advanced technological infrastructure (Cottier et al., 2024). For Small and Medium Enterprises (SMEs) aiming to internationalize, high costs associated with the implementation of AI deployment, such as acquiring machine learning hardware and securing

reliable cloud services, can create financial barriers, preventing them from competing with larger organizations (Iyelolu et al., 2024).

Besides infrastructure, AI systems are also vulnerable to cyberattacks, whereby other parties manipulate input data to generate false or misleading outputs (Camacho, 2024). For industries like finance and healthcare, where data accuracy is critical, these risks raise concerns about trust and regulatory compliance (Chang et al., 2020).

Similarly, while Blockchain technology provides enhanced security, transparency, and efficiency in international business, its adoption also faces significant challenges (Habib et al., 2022). Regulatory challenges remain a primary concern, particularly because Blockchain is closely associated with decentralized finance and cryptocurrencies (Guo & Yu, 2022). Both governments and financial institutions struggle to develop standardized regulatory frameworks, thus leading to confusion and complexity in compliance (Yeoh, 2017). As a result, many international organizations are unwilling to fully implement Blockchain into their business processes, fearing potential legal exposure and compliance gaps (Malhotra et al., 2021).

Infrastructure is another obstacle, as Blockchain requires significant computational power to operate effectively (Habib et al., 2022). Implementing Blockchain solutions for businesses in regions with poor digital infrastructure becomes challenging. Furthermore, Blockchain networks' high energy consumption, especially that of proof-of-work consensus algorithms, increases ecological concerns and leads to additional environmental laws (Sedlmeir et al., 2020).

Despite its reputation for security, Blockchain is not immune to cyber threats (Chatziamanetoglou & Rantos, 2024). A "51% attack" occurs when a single entity controls over half of the network's computing power, allowing it to alter transaction records and compromise the system's integrity (Aponte-Novoa et al., 2021). Such risks make businesses hesitant to use Blockchain for critical financial and logistics operations, especially in data-sensitive industries like banking and supply chain management (Islam et al., 2021).

While Blockchain faces several challenges, IoT presents its own regulatory, infrastructural, and cybersecurity constraints (Zikria et al., 2021). One major concern is data privacy, as IoT devices collect vast amounts of personal and location-based data. With increasing concerns about consumer data protection, companies must ensure compliance with regulations like GDPR while maintaining IoT's ability to deliver actionable insights (Kagita et al., 2021).

Additionally, IoT depends on extensive network connectivity, which is challenging in less developed countries. IoT devices cannot provide real-time monitoring and automation without a reliable high-speed internet connection, which significantly limits their effectiveness in global supply chain management (Miazi et al., 2016).

Security threats pose another constantly occurring issue. IoT devices often lack strong encryption and authentication procedures, making them vulnerable to cyber-attacks. As IoT networks expand, businesses must invest in cybersecurity infrastructure to prevent data breaches and operational disruptions (Kagita et al., 2021). For industries handling sensitive consumer data, such as healthcare and financial services, the risk of unauthorized access remains a critical barrier to IoT adoption.

Although 5G technology is expected to revolutionize global connectivity, its adoption comes with challenges related to regulation, infrastructure costs, and cybersecurity risks (Sullivan et al., 2021). Government regulations on telecommunications standards remain a key barrier, as concerns about national security risks associated with 5G infrastructure have led some countries to implement strict deployment policies (Taheribakhsh et al., 2020). This geopolitical factor has influenced which companies and providers are allowed to roll out 5G networks, leading to fragmented adoption across different regions.

Infrastructure investment presents another significant challenge, as 5G requires extensive deployment of base stations, fiber-optic networks, and cell towers (Israr et al., 2020). In developing countries, governments and businesses may struggle to finance such large-scale infrastructure projects, delaying widespread 5G adoption (Sargam et al., 2023).

Furthermore, as 5G increases connectivity across a broader range of devices, it also expands the potential attack surface for cybercriminals (Sullivan et al., 2021). The integration of 5G into global operations necessitates stronger cybersecurity protocols, yet many businesses lack the technical expertise and regulatory clarity to secure their networks adequately (Mohan et al., 2022).

The adoption of AI, Blockchain, IoT, and 5G offers great potential for international business. However, these challenges must be taken into consideration (Al-Emran & Griffy-Brown, 2023). Regulatory constraints cause complexity in meeting compliance standards in different jurisdictions, thus slowing adoption and reducing efficacy (Guo & Yu, 2022). Infrastructure deficiencies, particularly in developing countries, further restrict implementation, as AI, Blockchain, and IoT require advanced technological foundations, while 5G demands

substantial investment (Sullivan et al., 2021). Additionally, cybersecurity risks pose growing threats because AI can be manipulated, Blockchain is exposed to attacks, and IoT and 5G are expanding the surface for cyber threats (Sullivan et al., 2021). Addressing these challenges is crucial for businesses to fully realize the potential of advanced digital technologies and maintain a competitive advantage in global markets.

Context and Identified Gaps

After exploring how advanced technologies impact value creation, value delivery, and value capture in international business models, it is evident that significant gaps exist in the current literature. While much attention has been paid to the individual impacts of AI, Blockchain, IoT, and 5G on financial operations, understanding their synergetic impact is limited (Charles et al., 2023). Addressing these gaps could contribute to realizing the technology's full potential in transforming international business models in the financial sector. This section highlights the areas that require additional research, highlighting the importance of a comprehensive approach to their integration and cumulative impact.

The finance industry is profoundly transforming as advanced technologies like AI, Blockchain, IoT, and 5G reshape traditional business models and operational processes (Diener & Špaček, 2021). With growing demands for secure, efficient, and personalized services, financial institutions increasingly adopt these technologies to maintain a competitive advantage and meet fast-changing customer needs (Shafiee et al., 2023). However, a critical gap exists in understanding how these technologies collectively influence international business models in the financial sector. This gap is particularly significant when considering their combined potential for transforming value creation, delivery, and capture across an international context. Addressing this limitation is essential to advancing research and practice in the financial industry.

Currently, studies like Morkunas et al. (2019) and Dineshreddy and Gangadharan (2016) often focus on the individual impact of AI in predictive analytics, automation, and fraud detection, Blockchain's role in secure transactions and decentralized finance, IoT's applications in operational efficiency, and 5 G's improvements in connectivity and data transfer speeds. However, limited research has evaluated how these technologies impact international business models in the financial sector. Such gaps hinder the development of diverse strategies that financial institutions can adopt to leverage these technologies effectively across global markets (Subburayan et al., 2024). This section identifies key gaps in the literature,

emphasizing areas that require further research to fully realize the potential of digital transformation in finance.

According to Rane et al. (2023), the merger of Blockchain and AI could drive significant shifts in the financial landscape. Blockchain ensures security and transparency through its decentralized ledger, while AI provides predictive insights and analytics that enable better decision-making (Kumar et al., 2019). Together, these technologies offer opportunities to revolutionize financial services regarding security, transparency, and consumer insights (Casey et al., 2018). For example, AI could analyze real-time market data while Blockchain's smart contracts automate self-executing agreements. This combination could reduce manual intervention and enhance the efficiency and accuracy of financial transactions. As Blockchain stores extensive datasets on its ledger, AI algorithms can extract valuable insights to improve market-specific decisions in risk management, investments, and customer services. This intersection of technologies has immense potential for reshaping international financial models, yet it remains underexplored.

When considering 5G technology, its ability to provide real-time data transfer and vast networks of interconnected devices creates a robust infrastructure for other technologies like AI and IoT to thrive. For instance, 5G can enhance mobile banking experiences by enabling AI-powered financial assistants to deliver real-time insights, support fraud detection, and improve customer service (Attaran, 2021). However, while studies acknowledge 5 G's potential in improving connectivity and data transfer, research on how this foundational technology amplifies the collective impact of AI, Blockchain, and IoT on global financial strategies is still in its infancy.

In general, although much research has been conducted on the individual impact of each technology on international business models in the financial sector, there is limited research on their synergetic effects. Further studies should investigate how these technologies can be integrated to create substantial strategies for international operations. For example, combining Blockchain's security protocols with AI's analytical capabilities and IoT's real-time data inputs could revolutionize risk assessment models and cross-border financial transactions. Practical frameworks for implementing these combined technologies need to be evaluated to guide financial institutions in leveraging their collective potential effectively.

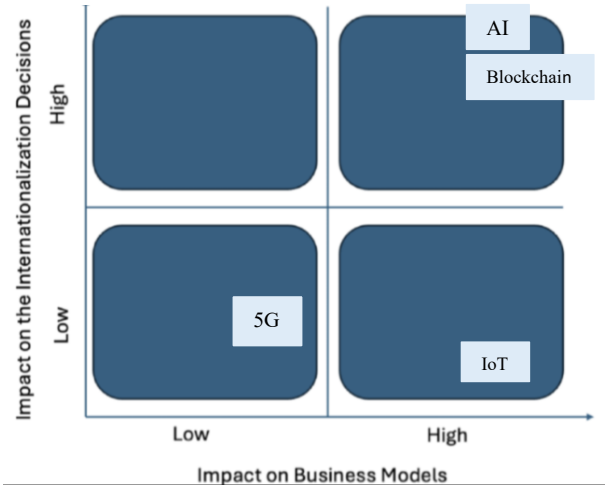

Figure 2 How Emergent Technologies Reshape Business Models in an International Context – Literature Perspective

Figure 2 illustrates the literature's perspective on AI, Blockchain, IoT, and 5G's impact on business models and internationalization. Literature (Farayola et al., 2023; Sjödin et al., 2021; Åström et al., 2022) views AI and Blockchain as key drivers for internationalization and impact on business models, while IoT is seen as highly transformative for business models, with limited impact on internationalization due to regional infrastructure constraints (Haaker et al., 2021; Neagu et al., 2019; Palmaccio et al., 2020). Similarly, 5G is considered an enabler rather than a direct driver, supporting connectivity rather than reshaping business models (Attaran, 2021; Dolgui & Ivanov, 2021; Patwary et al., 2020).

Methodology

The prevailing research methodology is qualitative (Mulisa, 2021). While quantitative methods focus on numerical data and statistical analysis, qualitative approaches enable an in-depth exploration of complex topics through subjective experiences and interpretative analysis. This study adopts a qualitative approach, using semi-structured interviews and thematic analysis to explore the impact of advanced digital technologies on business models and internationalization.

The qualitative method was chosen for three reasons. Firstly, analyzing advanced digital technologies in an international context requires an in-depth understanding of evolving complexities, which is best achieved through exploratory qualitative research (Grzeszczyk, 2018; Mulisa, 2021). Secondly, qualitative interviews provide deeper insights that structured surveys may not capture, allowing for a better understanding of stakeholder perspectives

(Grzeszczyk, 2018). Lastly, this approach focuses on interpreting practical experiences and analyzes the processes through which AI, Blockchain, IoT, and 5G impact business models and internationalization rather than solely quantifying results (Langenegger & Ambühl, 2017; Mulisa, 2021). By adopting qualitative research, this study captures the complexities and synergies of these emerging technologies, ensuring an understanding of their impact in an international business context.

Research Design

This research uses a qualitative research design to examine the role of advanced digital technologies in shaping international business models. Considering that the integration of AI, Blockchain, IoT, and 5G involves interdependent factors across various business functions, a qualitative methodology allows for a more context-driven analysis, particularly within the financial sector. Emphasizing the experiences and perspectives of industry experts, allowed this study to provide valuable insights into how businesses are adapting to technological advancements in global markets.

Unlike solely quantitative approaches, which rely on measurable data points, qualitative research provides an in-depth exploration of strategic decision-making, operational challenges, and the synergies among multiple technologies (Islam et al., 2021). This approach is particularly relevant when investigating business model innovation, as it enables researchers to assess not only technological adoption but also the human and organizational factors influencing implementation.

The research design incorporates semi-structured interviews to ensure that discussions aligned with the study's objectives while allowing participants to share insights based on their expertise. This flexibility ensures that emerging themes are explored, contributing to a more comprehensive understanding of the subject matter. Respondents were not required to provide explanations for every aspect of the technologies but rather share their experiences and perceptions. This ensured a structured yet adaptable approach to data collection, allowing for emergent themes to be explored as the research progressed.

Primary data was obtained through in-depth interviews with experts from the financial and technological sectors. The discussions focused on three core areas: the impact of these technologies on business models, their influence on value creation, delivery, and capture in international contexts, and the challenges and opportunities associated with their adoption in global operations.

Data Collection

Interview Design

A qualitative approach was identified as the most appropriate for this research, as the integration of multiple digital technologies within business models remains an emerging area of study. The research examines not only the individual impact of AI, Blockchain, IoT, and 5G but also their synergetic effects, making qualitative data collection particularly effective for understanding these synergies. The data collection relied on qualitative interviews to investigate the technological impact on business models and internationalization, specifically within the financial sector. To ensure a representative sample, experts with diverse roles and expertise in finance and digital transformation were selected. A total of fifteen interviews were conducted, each lasting between thirty to sixty minutes. To ensure saturation, both code saturation and meaning saturation, where no new themes emerged, and existing themes were fully developed (Hennink et al., 2016). The semi-structured format ensured consistency while allowing for spontaneous discussions that further developed the findings (Adeoye-Olatunde & Olenik, 2021). The interview questions were identified to align with the study's research objectives, ensuring that all relevant aspects were covered systematically.

To maintain focus and consistency, the interview guide was structured into four key sections, each tailored to a specific research objective. The first section gathered information on participant backgrounds, including their professional experience, expertise, and familiarity with advanced digital technologies. The second section explored the role of AI, Blockchain, IoT, and 5G in international business models, providing insights into their applications and limitations. The third section addressed the challenges and opportunities associated with the adoption of these technologies, highlighting both the barriers to implementation and the potential benefits for businesses. The final section examined the combined impact of multiple technologies, assessing their integration into financial services and their role in international business models.

Considering the outline of research, interviews were conducted virtually to allow for the inclusion of respondents from different geographic locations. This method allowed for the inclusion of views from different environments and marketplace contexts, thus strengthening the outcomes of the study.

Sampling and Target Participants

Interviewee	Position	Company	Experience	Country
I1	Risk Services	PwC	2 years	Turkey
I2	IAM Consultant	Rabobank	2 years	Netherlands
I3	Consultant	The World Bank	2 years	France
I4	Risk Consulting	EY	3 years	Germany
I5	Exotic Derivatives Sales	Marex	1 year	United Kingdom
I6	Wealth Management	Rothschild	2 years	Germany
I7	Financial Services	Capgemini Invent	3 years	Switzerland
I8	Business Analyst	froots	1 year	Austria
I9	Financial Services	Metis	1 year	Switzerland
I10	Value Advisor	SAP	2 years	Netherlands
I11	Financial Services	Google	2 years	South Korea
I12	Sales	Trade Ideas	4 years	Germany
I13	Private Equity	PJT Partners	3 years	United Kingdom
I14	Financial Services	Fenergo	3 years	Netherlands
I15	Financial Services	Banxware	4 years	Germany

Figure 3 List of Interviewees

Participants were chosen based on their expertise with advanced digital technologies and their knowledge of the financial industry. By targeting experts who have knowledge of AI, Blockchain, IoT, and 5G in financial operations, this study ensures that findings are both relevant and practically applicable. The sample included experts from financial institutions such as banks and investment firms, technology providers specializing in digital transformation, and consultants and analysts with expertise in international business strategies.

To ensure the relevance of responses, a purposive sampling strategy was employed (Andrade, 2020). This approach allowed for the selection of participants who possessed knowledge or experience directly related to the research topic. By incorporating perspectives from multiple industry stakeholders, the study captures a comprehensive view of how businesses across financial industries are leveraging these technologies. A total of fifteen interviews were conducted, reaching a point of saturation where additional interviews were unlikely to provide new insights.

Data Analysis

To systematically analyze the data collected from interviews, a thematic analysis was conducted. This method was chosen to identify patterns, trends, and key themes within participant responses (Squires, 2023). The thematic analysis provided a structured approach to making sense of qualitative data while allowing for flexibility in exploring emerging themes.

The analysis was carried out in four phases: *Initialization*, *Construction*, *Rectification*, and *Finalization* (Vaismoradi et al., 2016). Firstly, during *Initialization*, all the audio recordings were transcribed and compared carefully for accuracy. The meaning units were marked, and initial codes were given to corresponding sections, ensuring consistency across answers. Additionally, reflective notes were developed to note critical observations during the process. Secondly, the *Construction* phase consisted of systematic coding of transcripts using SPSS software, whereby comparable responses were clustered, and, through comparison, reoccurring themes were established. Subsequently, the codes were labeled and further elaborated upon, allowing for the emergence of higher-order categories that correspond to the emphasis of the study on the impact of AI, Blockchain, IoT, and 5G on value creation, delivery, and capture.

Thirdly, in the *Rectification* phase, themes that emerged were checked against existing literature and theory frameworks for validity and reliability. Both immersion and distancing were used at this phase, where themes were strictly tested against the research objectives, as well as confirming that the patterns identified were stable and an accurate reflection of participant experiences. Lastly, the *Finalization* phase was concerned with the task of interpreting these findings into a coherent story, ensuring that the outcomes entail meaningful insights into how advanced digital technologies are affecting international business models in the financial sector.

By developing connections between existing research and technological innovation, this study highlights the impact of AI, Blockchain, IoT, and 5G on international business models in the financial sector. This structured method adds to the validity of the research as it ensures a transparent and systematic thematic analysis.

Ethical Considerations

To ensure research standards, the findings evolved around research validity that entails maintaining reliability, validity, and ethical integrity. Reliability guarantees replicable findings while validity guarantees accurate measurement of the intended subject (Sumrin & Gupta, 2021). Ethical standards guarantee participant rights, confidentiality, and transparency (Pietilä et al., 2019). In this section, the way these standards were upheld in this research is explained.

Reliability is the term used when discussing how consistently a technique measures something (Sumrin & Gupta, 2021). The measurement is reliable if the same technique achieves the same result. There are different types of reliability, such as Test-retest reliability, Interrater reliability, and Internal consistency. To ensure reliability in this project, the same methods are applied consistently. For instance, the interviews conducted were all based on the same questions. Additionally, when the research was conducted, the interviews were performed under the same circumstances.

Validity is the term used when discussing how accurately a technique measures what is intended to be measured (Sumrin & Gupta, 2021). High validity means it produces results corresponding to real characteristics, properties, and variations in the physical world. Different types of validity can be estimated, such as Construct, Content, and Criterion. To ensure validity in this project, appropriate methods of measurement were chosen. Additionally, appropriate sampling methods can be used to select subjects in order to produce valid and generalizable results (Ahmed, 2024).

Ethical considerations are a group of principles that guide the research (Pietilä et al., 2019). Ethical considerations aim to protect participants' rights, ensure research validity, and maintain academic integrity. One should consider several ethical issues, such as voluntary participation, informed consent, anonymity, confidentiality, potential harm, and results communication. This project focuses on voluntary participation, confidentiality, and results communication. All participants joined the interview process voluntarily and were free to withdraw from the study at any given point. Identifying details about the participants were removed to fulfill confidentiality, and they received the interview transcripts as part of the result communication.

Findings

The following findings section presents insights from semi-structured interviews conducted with industry experts to explore the impact of advanced digital technologies like AI, Blockchain, IoT, and 5G on international business models in the financial sector. These insights are organized across three primary business model areas: value creation, value delivery, and value capture, providing knowledge of how these technologies together and individually impact business models internationally in the financial sector.

This section also highlights these technologies' transformative potential and discusses their integration challenges, opportunities, and synergies. Examining the experts' experiences and viewpoints provides a comprehensive overview of the technologies' impact on business models, providing practical and theoretical insights consistent with the study's research goals. Challenges, such as technological adaptability, regulatory constraints, and cross-technology collaboration, are explored to contextualize the technologies' role in fostering digital transformation in global markets.

This analysis provides a clearer understanding of the synergy between advanced digital technologies and business model innovation, especially in the fast-changing financial sector environment.

The Role of AI in Business Model Transformation

AI's impact on business model transformation extends beyond automation. As (I1) highlighted:

"Strategic AI applications help companies redefine their international growth strategies by enabling real-time decision-making and adaptation to global market trends."

Experts have recognized the integration of AI as a key driver of efficiency and automation. Many interviewees (I1, I3, I4, I13) emphasized AI's role in enhancing internationalization and efficiency. As (I3) highlighted, *"AI-powered automation allows us to expand into new markets without significantly increasing operational costs, making internationalization more feasible."* (I5) emphasized AI's role in predictive analytics, stating, *"AI has transformed the way we operate. Automating repetitive tasks allows us to allocate our workforce towards higher-level strategic planning."* This was further supported by (I4), who highlighted AI's role in predictive analytics, stating, *"AI-driven data analytics allows us to anticipate customer*

behavior with remarkable accuracy. We adjust our pricing dynamically based on real-time insights."

AI-driven insights can further support businesses by enhancing decision-making processes and facilitating internationalization. By leveraging AI-driven insights, businesses can enhance decision-making and simplify internationalization by adjusting to changing customer demands. This is supported by (I11), who states:

"Actually, I think digital technologies are revolutionizing business models by putting a strong focus on enhancing customer satisfaction and enabling faster and data-driven decision-making through AI."

Besides automation and predictive analytics, AI is also valuable in enhancing customer interactions. Several interviewees (I9, I11, I7) noted that AI-powered chatbots and virtual assistants improve customer service by providing real-time responses and reducing response times. As (I11) highlighted:

"Our AI-driven support system has transformed how we handle customer queries. Customers receive instant assistance, while human agents can focus on more complex issues that require personal interaction."

This suggests that AI is not just a tool for improving efficiency but also reshaping how businesses engage with their customers, ultimately improving satisfaction and loyalty.

However, while AI is seen as an essential tool for enhancing business processes, some interviewees (I10, I4) pointed out the challenges and complexities of integrating AI within systems, requiring substantial investment in infrastructure and staff training. As (I4) stated:

"One of the biggest challenges companies face is incorporating AI into traditional IT frameworks. It's not just about buying AI solutions—it requires a complete change of how data is managed and processed."

Others (I8, I15) emphasized the risks associated with over-reliance on AI for decision-making, particularly when handling sensitive financial data. As expert (I8) warned, *"AI is great at processing data, but it still lacks the intuition and contextual understanding of a human decision-maker. It should support, not replace, executive judgment."* Correspondingly,

(I6) mentioned the issue surrounding ethical implications *"Bias in AI models can be a major issue. If the data used to train AI is flawed, it can reinforce inequalities rather than eliminate them."* These insights suggest that while AI presents a strong opportunity for innovation, its implementation must be carefully managed to ensure that human oversight remains a critical part of decision-making processes.

Blockchain for Secure Transactions and Financial Transparency

The role of Blockchain in financial services has developed over the years, as stated by (I6) *"Both Rothschild & Co and Deutsche Bank have significantly integrated Blockchain to streamline international operations, reducing settlement times and increasing transparency."*

This shows that Blockchain technology has been recognized as a key enabler for cross-border transactions and regulatory compliance. This is further supported by (I12), who noted, *"Blockchain eliminates the complexity of cross-border payments by providing a secure and transparent transaction system, which is crucial for expanding into new financial markets."* Another interviewee (I9) explained, *"With Blockchain, we can maintain a tamper-proof audit trail that aligns with global financial regulations, making cross-border operations more seamless."* Interviewees (I5, I9) in the financial sector highlighted the growing use of Blockchain-based smart contracts in reducing transaction costs and eliminating intermediaries. As (I5) states, *"Blockchain-enabled smart contracts have completely changed how we handle agreements. By cutting out middlemen, transactions are faster and significantly cheaper."*

Beyond financial applications, Blockchain is being explored for use in supply chain transparency, ensuring that products are tracked from initial production to delivery. As one expert (I12) noted, *"Blockchain provides a digital ledger that enhances transparency in our supply chain. Every stage of production can be verified, reducing fraud and increasing trust."* This highlights Blockchain's potential in addressing ethical concerns such as sourcing, particularly in industries where supply chain transparency is crucial.

However, regulatory concerns remain a significant issue for broader Blockchain adoption; as experts (I12) explained, *"The biggest challenge is compliance. Blockchain transactions are not yet fully recognized by financial regulators, which limits their use in mainstream banking."* Moreover, security concerns persist, with another respondent (I6) stating,

"Blockchain provides transparency, but it also requires businesses to rethink how they handle security and data management." Some interviewees (I10, I12) also raised concerns about the environmental impact of Blockchain mining, particularly for energy-intensive networks such as Bitcoin. As (I12) highlighted, *"We need more sustainable Blockchain solutions. Right now, the energy consumption is too high for many businesses to justify."* These challenges underline the necessity for clear regulatory frameworks, ongoing technological advancements, and sustainable practices to ensure Blockchain's long-term implementation.

IoT and 5G for Real-Time Data and Connectivity

The role of IoT and 5G in enabling seamless global operations and optimizing international supply chains was a recurring theme in the interviews. As (I2) discussed the evolving role of IoT and 5G in supporting global digital ecosystems:

"So it's basically about how 5G enables a real-time business environment, which is crucial for companies operating across multiple regions." Another expert (I11) pointed out, *"IoT-enabled tracking allows us to manage supply chains efficiently across multiple countries, ensuring reliability and reducing costs."*

Another expert (I12) emphasized the role of 5G in creating a more connected business landscape, stating, *"5G technology provides the high-speed infrastructure necessary for seamless real-time operations, which is especially valuable when expanding globally."* Several participants (I11, I7) highlighted how IoT has transformed supply chain visibility by enabling continuous tracking of assets and products. (I11) explained, *"IoT has given us great visibility into our supply chain. We now track products in real-time, ensuring smoother operations and better demand planning."* The ability to analyze vast amounts of data in real-time allows companies to optimize processes and make more informed decisions.

However, cybersecurity remains a concern, with one interviewee (I8) noting, *"AI-powered systems collect vast amounts of sensitive data. If this information is compromised, it could be catastrophic for both companies and customers."* As businesses increase their reliance on IoT and 5G, they must also invest in cybersecurity measures to prevent data breaches and ensure compliance with data protection regulations.

Strategic Considerations for Implementation

Based on these results, organizations aiming to successfully implement digital technologies should embrace a phased approach, thus ensuring the availability of necessary infrastructure and skills before full implementation. As (I3) points out, *"There is the motivation and the ambition to deploy those technologies in partner countries, but depending on the country context, this is simply not possible since the basic infrastructure is lacking."* Beyond infrastructural needs, coordination with regulatory organizations is important, as institutions need to engage with policymakers to establish clearer legal frameworks for adopting artificial intelligence and Blockchain technologies. The need for regulations for adopting such technologies is immense; as (I5) notes, *"Data protection regulations, particularly the GDPR in the European Union, significantly impact how Barclays operates globally with these technologies."* Hence, the collaboration between organizations and policymakers is vital for a broader adoption of these technologies.

However, regulatory challenges alone are not the only challenge organizations should prepare for but also their workforce. Training must be implemented as a part of the digital transformation strategy so that employees can remain confident with evolving technologies. Training initiatives should focus on AI-driven analytical tools, Blockchain security protocols, and compliance with regulatory guidelines to equip employees with the necessary skills to effectively manage technological change.

A structured and consistent rollout of these technologies minimizes potential risks and enables firms to adjust strategies based on early outcomes. Interactions with regulatory authorities are necessary, and companies must work with policymakers to develop more accurate legal frameworks for implementing artificial intelligence and Blockchain technologies.

A proactive approach to compliance initiatives will mitigate legal risks in various jurisdictions. However, as compliance has become a more complex topic, organizations must consider the challenges arising from these complexities. As (I5) states:

"Electronic trading has increased the complexity of compliance and regulation. Investment banks and their global markets teams now face stringent regulations such as MiFID II in Europe and the Volcker Rule in the U.S., which govern the use of proprietary trading algorithms, data usage, and market transparency".

With increasing reliance on digital technologies, cybersecurity must remain a priority. Organizations must invest in building a robust security infrastructure to minimize data privacy risks, particularly regarding AI-based analytics and IoT-based services. Improving cybersecurity controls will build customer trust, protect sensitive business data, and enhance compliance with global data protection laws.

Companies must also prioritize change management to support the long-term implementation of advanced digital technologies. Initiating strategies and continuous workforce training are necessary to ensure employees' competitiveness against technological advancements. Investment in digital and professional development initiatives will enhance the employee's ability to use new technologies efficiently. Organizations should leverage AI-driven insights to further develop internationalization and global operations strategies. Predictive analytics and AI-powered decision support tools can provide actionable, data-driven suggestions for expanding into new markets.

Overall, the interviews suggest that while AI, Blockchain, IoT, and 5G adoption have significant challenges, organizations that overcome the complexities could gain competitive advantages. The interviews also highlighted the implications of strategic planning, regulatory adaptation, and security as the most important factors for making these technologies contribute positively to business model innovation. As digital technologies evolve, organizations must adjust continuously to remain competitive.

Discussion

The findings of this study highlight the transformative impact of digital technologies on international business models, particularly in the financial sector. AI, Blockchain, IoT, and 5G serve as key enablers of business model innovation by redefining value creation, value delivery, and value capture. These insights align with existing literature, confirming that digital transformation reshapes global business practices (Osterwalder & Pigneur, 2010). However, this study extends prior research by emphasizing the synergetic effects of these technologies and their role in facilitating internationalization, regulatory compliance, and operational efficiency.

In the context of BMI, AI, Blockchain, IoT, and 5G impact three business model core elements: Value Creation, Value Delivery, and Value Capture. AI enables value creation through automation and predictive analytics, while Blockchain enhances value capture through increased financial security and transaction efficiency. IoT and 5G support value delivery by optimizing global supply chains and facilitating better connectivity. This chapter discusses the influence of these technologies on business models and internationalization in the financial sector, along with relevant regulatory and operational issues.

The Role of Digital Technologies in Business Model Innovation

The integration of AI, Blockchain, IoT, and 5G can be vital in reshaping business model structures by redefining operational efficiencies, financial transactions, and customer interactions. This study emphasizes the argument that these technologies improve organizational efficiency and provide businesses with the tools necessary for sustainable and competitive advantage (Ancillai et al., 2023).

The interviews confirmed that AI has emerged as a key technology in business model innovation by automating processes, enhancing decision-making, and personalizing customer experiences. The interviews further confirmed that AI-driven automation allows firms to scale international operations efficiently by reducing costs and improving adaptability (I5, I3). This is consistent with Åström et al. (2022), who argue that AI impacts value creation by enabling predictive insights and data-driven decision-making. Additionally, AI enhances value capture by optimizing pricing models and mitigating financial risks, aligning with prior findings that AI-driven fraud detection improves financial security (Zanke, 2023).

While AI enhances value creation and capture, its full implementation requires a cohesive strategy. Organizations should examine the risk of over-reliance on AI, particularly in decision-making processes. Experts (I10, I8) pointed out that the challenges of adapting traditional systems and regulatory constraints suggest balanced implementation strategies to ensure that the introduction of AI is in alignment with technological advancement and organizational objectives.

While AI is crucial in automating decision-making and financial security, Blockchain complements it by enhancing transaction transparency and efficiency.

Blockchain technology has been widely recognized for enhancing transaction security, transparency, and efficiency in cross-border operations (Hooper & Holtbrügge, 2020). The interview findings align, as experts emphasized Blockchain's potential to simplify international payments and regulatory compliance (I12, I9). This confirms the literature suggesting that Blockchain eliminates intermediaries and reduces transaction costs through decentralized finance (Casey et al., 2018). However, while Blockchain improves value delivery by enabling smart contracts and real-time auditing, regulatory uncertainty remains a major challenge to adoption. These concerns align with Yeoh (2017), who highlights the legal frameworks that hinder broader blockchain implementation. Overall, Blockchain technology makes cross-border transactions more efficient and effective; IoT and 5G complement it by allowing real-time information, interconnectivity, and enhanced data transmissions (Fu et al., 2021)

IoT and 5G are crucial in optimizing global supply chains and enhancing connectivity. These technologies contribute to value delivery through real-time tracking, improving operational efficiency, and reducing disruptions in international logistics (I11). This is consistent with research by Neagu et al. (2019), which highlights the role of IoT in facilitating data-driven decision-making. Moreover, 5G enhances value creation by enabling ultra-fast data transmission, critical for financial services and real-time trading (I2, I12). While these technologies offer significant advantages, security risks associated with interconnected devices remain challenging (I8), supporting the findings of Mohan et al. (2022) on cybersecurity vulnerabilities in IoT and 5G networks.

Overall, while AI, Blockchain, IoT, and 5G impact business models by enhancing value creation, delivery, and capture their successful implementation requires considering several challenges to experience their full potential in global markets.

Digital Technologies and Internationalization

A recurring topic in the interviews is how digital technologies facilitate market entry strategies and operational scalability. Several experts emphasized that AI-driven automation allows organizations to expand across borders, making internationalization more accessible (I5, I3). The ability of Blockchain to ensure secure, transparent, and efficient international financial transactions further highlights its critical role in global markets (I9, I12).

Additionally, 5G's role in real-time financial data transfer and IoT's capability to optimize global supply chains make them integral to international business strategies (I11, I2).

The interviews contribute to the understanding of how advanced digital technologies drive internationalization by reducing operational barriers and enhancing market adaptability. AI's ability to analyze global consumer trends facilitates internationalization, supporting the view that predictive analytics enhance strategic decision-making (Bond & O'Byrne, 2014). Additionally, Blockchain's secure infrastructure enables cross-border financial transactions with greater transparency and lower costs, confirming its role in fostering trust and regulatory compliance (Schlecht et al., 2021).

IoT and 5G further support internationalization by streamlining supply chains and enabling seamless communication across markets (I11, I5). These findings align with Fjellström et al. (2023), who argue that 5G reduces geographical constraints, enabling businesses to operate efficiently in a global market. However, regulatory constraints and the need for substantial infrastructure investment pose challenges to the broader adoption of these technologies in emerging markets (Taheribakhsh et al., 2020).

While AI, Blockchain, IoT, and 5G technologies are key to facilitating internationalization by reducing operational barriers and enhancing market responsiveness, their successful implementation requires a practical and strategic approach. Businesses need not only to implement these technologies but also to achieve significant regulatory compliance, cybersecurity measures, and train their employees accordingly. The next section discusses critical practical considerations that businesses need to consider to fully leverage digital transformation in global markets.

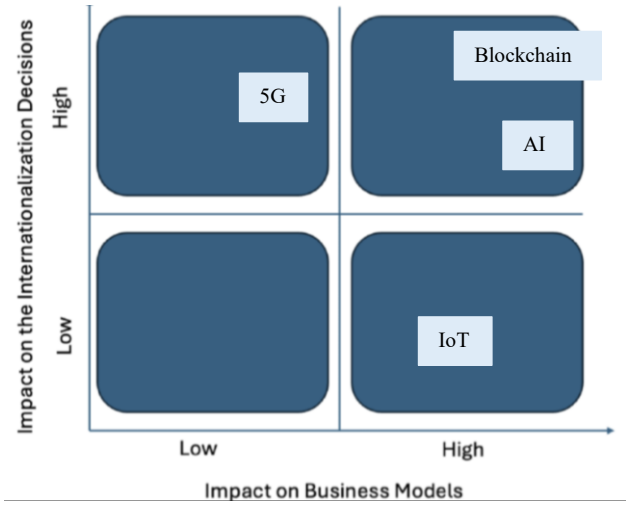

Figure 4 How Emergent Technologies Reshape Business Models in an International Context – Interviewee Perspective

Figure 4 illustrates the interviewees' perspectives regarding the impact of AI, Blockchain, IoT, and 5G on business models and internationalization. The interviewees mostly agreed that Blockchain improves security and financial transactions while AI drives automation and efficiency. Both technologies have been repeatedly placed as having a significant impact on business models and internationalization. However, IoT was thought to have a greater impact on business models but less on internationalization due to regulatory constraints. 5G was acknowledged as a facilitator for internationalization by improving global connection and real-time data transfer. However, it was not seen as directly impacting business models.

The placement of AI and Blockchain mostly aligns with that of the literature, significantly impacting business models and internationalization. In contrast to the literature, interviewees perceived IoT as more influential in optimizing operational efficiency rather than directly impacting internationalization. This difference is largely attributed to infrastructure limitations, as IoT implementation often depends on localized technological readiness. Similarly, 5G was recognized as a facilitator of internationalization rather than a direct business model driver, improving global connectivity and enabling real-time data exchange across global markets.

These perspectives highlight a gap between literature and real-world experiences in the field, showing that while such technologies enable innovation in business models, their practical implementation is shaped by external factors such as regulatory constraints, infrastructure availability, and cybersecurity concerns.

The findings suggest that while digital technologies provide many opportunities to redefine business models, their practical implementation is constrained by external factors to which the organization must adapt. The following section elaborates on the challenges observed to the extent of regulatory, infrastructural, and security factors that affect the application of AI, Blockchain, IoT, and 5G across global markets.

Challenges and Barriers to Digital Adoption

Despite the benefits of AI, Blockchain, IoT, and 5G, organizations face regulatory constraints, cybersecurity risks, and infrastructure challenges when implementing these technologies.

Compliance with financial regulations is a key concern, as it directly influences value capture and delivery (I5). This is consistent with Yeoh (2017), who emphasizes the role of legal frameworks in impacting the adoption of financial technology.

Beyond compliance issues, infrastructural limitations impact broad digital technology adoption, particularly in developing countries. I3 emphasized that there is an ambition to implement such technologies; however, lacking infrastructure is a major hurdle in developing countries. This view aligns with Raja (2021), who noted that infrastructural challenges hold back the rate of technology deployment.

Besides infrastructural challenges, workforce preparation is another critical challenge. I5 stressed that incorporating training as part of a digital transformation is essential for employees to feel confident working with such technologies. Hanelt et al. (2020) support this statement by mentioning that employee programs are vital for the effective governance of digital transformation.

Ultimately, while digital technologies significantly impact international business models, regulatory adaptation, cybersecurity measures, and workforce training must be considered to maximize their potential.

Conclusion

The findings of this study emphasize the potential of AI, Blockchain, IoT, and 5G in international business models, particularly in the financial sector. These technologies enhance efficiency, transparency, and global connectivity, reshaping how organizations create, deliver, and capture value. However, regulatory compliance, cybersecurity, and infrastructure challenges must be considered for a successful implementation. By adopting a strategic approach to digital transformation, businesses can leverage these technologies to drive innovation, competitiveness, and long-term sustainability in global markets.

From a theoretical point of view, this study extends existing literature by demonstrating that digital transformation is not only a driver of business model innovation but also an enabler of sustainable global expansion. Prior research has mostly focused on the individual impact of each technology (Plekhanov et al., 2022); however, this study emphasizes their synergetic effects on international business models. The integration of AI for predictive analytics, Blockchain for financial security, IoT for operational efficiencies, and 5G for seamless connectivity collectively enhances an organization's ability to navigate global market challenges. The findings further reinforce the BMI framework by illustrating business model changes, emphasizing value creation, delivery, and capture in global markets.

Moreover, as highlighted in the findings, the synergy of these technologies presents a new paradigm for international business models. Organizations that strategically integrate AI-driven insights, Blockchain security, IoT's real-time data analytics, and 5G's high-speed connectivity will not only improve operational efficiency, financial security, and automation but also gain a competitive advantage in global markets (Ancillai et al., 2023; Schlecht et al., 2021). Future research should continue to explore how combining these technologies can further optimize international business models and reshape financial landscapes.

Beyond technological implementation, the research findings highlight that successful digital transformation is based on overcoming challenges like regulatory constraints and infrastructural and organizational barriers. Organizations need to actively engage with policymakers to create supportive regulatory environments, invest in robust infrastructure, and create programs to prepare the workforce for adopting technology. Without these foundations, the overall impact of AI, Blockchain, IoT, and 5G will be limited. As industries

continue to evolve, the ability to adapt to advanced digital technologies will be key to long-term success in global markets.

Limitations and Future Research

While this study provides valuable insights, certain limitations must be acknowledged. Firstly, the research focuses on the financial sector, which may limit the generalizability of findings to other industries. The impact of AI, Blockchain, IoT, and 5G on international business models may differ significantly in sectors such as healthcare, manufacturing, and retail, where other internal and external factors shape technological adoption.

Secondly, the research examines advanced digital technologies within a specific economic and regulatory context. However, regulatory landscapes vary widely across countries, with different jurisdictions posing different compliance frameworks that influence both the adoption and scalability of digital technologies. Future research should conduct comparative analyses across multiple regulatory environments to assess how legal and economic frameworks impact international business models.

Thirdly, the research adopts a qualitative approach, which provides in-depth insights but lacks statistical generalizability. Future studies could build on these findings by deploying quantitative methodologies with larger sample sizes to capture measurable trends and assess the broader integration of AI, Blockchain, IoT, and 5G in the financial sector.

Lastly, future research should explore the long-term feasibility of these technologies in international business models, particularly in emerging markets where infrastructure development, digital literacy, and cybersecurity resilience remain critical challenges. Investigating how these factors evolve over time will be essential in determining the sustainability and scalability of technology-driven business model transformation.

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Appendices

Interview Guide

Research Questions

1. How are advanced digital technologies reshaping business models in the context of global markets in the financial sector?

a. How do individual technologies like AI, blockchain-based tokenization, IoT, and 5G impact different components of business models in global markets?

b. What are the advantages of combining AI, blockchain-based tokenization, IoT, and 5G for business model innovation in operations globally?

Interview Guide

1. Introduction to Project and Research Objectives

2. Generic Questions

- Can you briefly describe your current role and responsibilities?
- How many years of experience do you have?
- Does your organization primarily operate on a domestic or international scale?
- To what extent are you involved in decisions or implementations related to advanced technologies like AI, blockchain, IoT, or 5G?

3. General Impact of Technologies

- From your perspective, what has been the most significant impact of AI, blockchain, IoT, or 5G on the finance sector?
- Can you provide specific examples of how these technologies have affected your organization or the industry?

4. Value Creation, Delivery, and Capture

- Definition of terms:
- Value Creation

- How have these technologies changed the way your organization creates value for customers?
- Value Delivery
- In what ways have they altered how you deliver products or services?
- Value Capture
- In what ways have they altered how you deliver products or services?
- Value Capture

How have these technologies impacted your revenue models or profit margins?

- Can you share any initiatives or projects that illustrate these changes?

5. Strategic Goals and Internationalization

- Definition of Internationalization
- Does your organization currently operate internationally? If not, are there plans to expand?
- In what ways have these technologies enabled your organization's international expansion?
- What challenges have you faced in adopting these technologies across different markets?
- How do these technologies align with your long-term global strategies?

6. Regulatory and Compliance Challenges

- What regulatory challenges have you encountered with implementing AI, blockchain, IoT, or 5G?
- Have you faced different regulatory challenges in specific regions or countries? If so, what were they?

7. Operational Efficiency and Optimization

- How do these technologies impact operational efficiency, such as in areas like fraud detection, asset tracking, or data management?

- Which operational areas (e.g., fraud detection, asset tracking, data management) have benefited the most from these technologies? Can you provide examples of how these technologies have impacted these areas?

8. Cybersecurity and Data Privacy

- What cybersecurity and data privacy concerns have arisen with adopting these technologies?
- How is your organization addressing these challenges?
- How do data protection regulations impact your global operations using these technologies?

9. Potential for Combining Technologies

- Have you observed any synergistic effects when combining two or more of these technologies (e.g., AI and blockchain)?
- Can you describe specific instances where combining these technologies led to innovation or competitive advantage?
- What obstacles have you faced in integrating multiple technologies?

10. Future Outlook and Industry Trends

- What role do you think these technologies will play in shaping the future of the finance industry?
- How do you envision these technologies transforming industry practices in the next 5 to 10 years?
- How does your organization prepare for future trends

11. 2x2 Framework Feedback

- Present the 2x2 framework from your literature review.
- Do you agree with the positioning of technologies in this framework? Why or why not?
- How would you position these technologies based on their impact on business models and internationalization?