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Business models for the Blockchain: An empirical analysis

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ABSTRACT

Business models of industries and ventures enabled by new and emerging technologies are under-developed and fragmented. The blockchain technology promises to disrupt the business models. However, the scholarly literature in blockchain research is only beginning to emerge, and the majority are focused on the technical aspect leaving aside the business model complexities for blockchain applications. This paper fills this gap and proposes a blockchain business model framework. The research utilizes a sequential exploratory research design (SERD), encompassing two key phases: an initial phase involving a literature review and interviews to delineate blockchain business model building blocks and types, followed by a subsequent survey to identify the most pertinent building blocks and types. The findings helped to formulate the framework, necessary building blocks, and block types specifically for the blockchain applications. Organizations can tailor their business model through various configuration options and mechanisms, considering the arrangement of block types within each block according to their significant score levels. By giving priority to those with scores above the block's average, organizations can evaluate the performance of their models and pinpoint areas for enhancement. The proposed framework can be considered as a reference point for developing business models for blockchain applications.

1. Introduction

In an era where technological evolution is pivotal, the emergence of blockchain technology stands out as a transformative force in business, economic, and social space (Warkentin & Orgeron, 2020). Scholars draw parallels between blockchain and the Internet, recognizing the shifts they induce (Swan, 2015; Underwood, 2016). Just as the Internet revolutionized value creation and capture for businesses over the past decades (Iansiti & Lakhani, 2017), the concept of business models gained traction as a means to understand firms' strategies for generating and sustaining value (DaSilva & Trkman, 2014; Osterwalder, Pigneur and Tucci, 2005; Teece, 2010). Defined as the operational logic guiding a firm's activities to gain competitive advantage and deliver value to stakeholders (Amit & Zott, 2012; Johnson, Christensen, & Kagermann, 2008; Morris, Schindehutte, & Allen, 2005; Timmers, 1998), business models face disruption from innovations like blockchain (Frizzo-Barker et al., 2020; Nowinski & Kozma, 2017; Upadhyay, 2020).

Despite blockchain transformative potential, interpretations of its impact vary. While some view it as a radical innovation (Beck & Muller-Bloch, 2017), others see it as a foundational technology (Iansiti & Lakhani, 2017). The uncertainty and challenges it poses for existing firms emphasize the significance of studying its effects on business

models (Iansiti & Lakhani, 2017). Research on the intersection of business model innovation and blockchain technology remains scarce, with a predominant focus on the technical aspects of blockchain-based information systems, including conceptual models and architectural discussions that facilitate value creation (Kavanagh & Ennis, 2020; Pereira, Tavalaei, & Ozalp, 2019; Valtanen, Backman, & Yrjola, 2018; Yang, Chen, Chen, & Wu, 2019). Furthermore, specific investigations have been conducted into blockchain's broader implications for business models, including Nowinski and Kozma (2017) literature review, Dutra, Tumasjan, & Welp (2018) examination of its impact on the music and entertainment sectors, Weking et al. (2019) development of a blockchain-based business model taxonomy, and Schneider, Leyer, and Tate (2020) exploration of blockchain's role in value creation. Additionally, other avenues of research have explored the potential of blockchain through Delphi studies, highlighting its application in the machine economy (Schweizer, Schlatt, Urbach, & Fridgen, 2017), its future in the business environment (White, 2015), and its implications for the payments industry. A key tool in this endeavor is the business model canvas, initially proposed by Osterwalder and Pigneur (2010) and later adapted by Morkunas, Paschen, and Boon (2019) to reflect blockchain-specific propositions. Following this adaptation, Treiblmaier and Špan (2022) applied the canvas to evaluate small and medium

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enterprises' (SMEs) experiences with blockchain, while Marikyan, Papagiannidis, Rana, and Ranjan (2022) investigated blockchain's impact on companies' value configurations and the technological factors affecting business models, emphasizing the technology's benefits for corporate value.

A deeper comprehension of the application, implications of blockchains is crucial, considering the technology's evolving nature (Lacity, 2018; Risius & Spohrer, 2017) in supporting business growth and justifying investments somewhat ambiguous. There's a call for advancing theoretical and empirical foundations, including developing models that clarify the critical aspects of blockchain research (Rossi, Mueller-Bloch, Thatcher, & Beck, 2019). The unresolved question of how blockchain adds value to businesses (Glaser, 2017), along with the recognition that traditional business models may not fully align with blockchain's distinctive features, emphasizes the need for business models to be rethought and adjusted to incorporate blockchain technologies effectively (Janssen, Weerakkody, Ismagilova, Sivarajah, & Irani, 2020; Morkunas et al., 2019; Treiblmaier & Špan, 2022; Upadhyay, 2019a, 2019b). In response, this research addresses the following research question: *What are the essential components (building blocks) and types crucial for developing a blockchain business model, and which among these are key to configuring the blockchain business model effectively?*

The answer to this novel inquiry contributes to the growing body of research on the business value of blockchain within the management literature. Leveraging the key insights of Amit and Zott (2001) in the e-commerce context, along with the foundational studies by Morkunas et al. (2019), Marikyan et al. (2022), and Treiblmaier and Špan (2022) in the blockchain field, this paper pinpoint critical elements and configurations essential for crafting a blockchain business model poised to generate value. The empirical study has led to the development of a comprehensive framework for business models. Furthermore, an innovative evaluation tool has been introduced to refine the configuration of blockchain business models. This tool enables organizations to assess the effectiveness of their models and identify opportunities for improvement. Ultimately, this research responds to the calls by Morkunas et al. (2019), Marikyan et al. (2022), and Treiblmaier and Špan (2022), offering novel insights and contributing a valuable new stream to the discourse on blockchain's business potential.

The rest of the paper is structured as follows: Section 2 presents the literature review. Section 3 presents the research methodology adopted in the study. Section 4 describes the results. In Section 5, a detailed discussion is presented covering implications, limitations, and future research. Finally, Section 6 offers a conclusion.

2. Literature review

The advent of information and communication technologies, alongside the rise of Internet-based enterprises, has magnified the significance of the business model concept (DaSilva & Trkman, 2014). This focus stems from the understanding that technology's economic value is contingent upon its commercialization through a business model, a notion articulated by Chesbrough (2010). Consequently, the Internet has not only challenged traditional methods of value creation and capture in business models, as discussed by Teece (2010), but has also unveiled new avenues for value generation, according to Amit and Zott (2001). In a parallel vein, blockchain technology, recognized for its distinct attributes, offers innovation in business value creation and model development (Lacity, 2018; Iansiti & Lakhani, 2017).

Amit and Zott (2001) posited the business model as a critical lens for analyzing value creation in e-commerce entities, likening it to a membrane that integrates diverse yet pertinent theoretical insights, a viewpoint further elaborated by Ritter and Lettl (2018). They defined a business model as a blueprint for transactional content, structure, and governance aimed at exploiting business opportunities to generate value. This model delineates a firm's logic, detailing the mechanisms of value creation, delivery, and the mapping of costs against revenues, as

Teece (2010) outlined. Innovations in business models pertain to alterations in how companies create, deliver, and capture value, incorporating changes in activities, structures, and governance, as explored by various scholars including Ramdani, Binsarif, & Boukrami (2019) and Chesbrough (2007).

The scrutiny of business models has attracted considerable interest from both scholars and practitioners, spurred by extensive research (Costa, Darek, & Haftor, 2021; Morkunas et al., 2019; Upadhyay, 2020). Central components of a business model include cost and revenue logistics, value propositions, and strategic alliances, as identified by Osterwalder (2004) and further detailed by Keiningham et al. (2020). The business model canvas, introduced by Osterwalder and Pigneur (2010), encapsulates nine essential ontological elements, serving as a pivotal framework for business model innovation and adaptation. However, the application of traditional models to novel technologies like blockchain presents unique challenges.

Despite blockchain's potential, its integration into business models is still emerging (Treiblmaier & Špan, 2022). The need for deeper insights into how blockchain can revolutionize business practices is highlighted by Glaser (2017) and Sun, Jiang, Jia, and Wang (2022), pointing to a gap in understanding blockchain's unique capabilities as a value creator. The industry-specific adaptation of the business model canvas to leverage blockchain effectively is advocated by researchers such as Marikyan, Papagiannidis, Rana and Ranjan (2022) and Tiscini, Testarmata, Ciaburri, and Ferrari (2020). Furthermore, blockchain has spurred new phenomena like ICOs and NFTs, reshaping traditional revenue models and highlighting consumer interest in digital ownership, as noted by Spinedi, Rigotti, Canetta, Camoesa, and Redaelli (2019) and Deloitte (2022). This move towards tokenization presents fresh opportunities for industries to engage customers and generate revenue in innovative ways. The exploration of blockchain's role in business model innovation focuses on its technical aspects and architectural designs for value creation. Studies by Kavanagh and Ennis (2020) and Pereira et al. (2019) delve into these technical discussions, while other research explores blockchain's broader business implications (Nowinski & Kozma, 2017). The development of a blockchain-based business model taxonomy by Weking et al. (2019) and Schneider et al. (2020) examination of blockchain in value creation reflect the ongoing exploration of blockchain's transformative potential in business.

The adoption of a business model perspective is essential for understanding how blockchain technology can foster innovative ways of generating and capturing value, highlighting the need for an analytical framework to evaluate blockchain's impact on value creation, delivery, and capture (Iansiti & Lakhani, 2017). This approach underlines the importance of strategic adaptation and in-depth comprehension of blockchain business models for capitalizing on blockchain's potential as a catalyst for business innovation. The adaptation of the business model canvas to accommodate blockchain-specific elements by Morkunas et al. (2019) and its subsequent application by researchers such as Treiblmaier and Špan (2022), and Marikyan et al. (2022), emphasizes blockchain's potential in reshaping business value configurations and technological influences on business models. Blockchain's characteristics of decentralization and disintermediation necessitate a reevaluation of existing models and foster new possibilities for value creation and co-creation (Babkin, Malyzhenkov, & Pakhomova, 2019; Valtanen, Backman, & Yrjola, 2019).

3. Methodology

The study employs a Sequential Exploratory Research Design (SERD), as recommended by Teddlie and Tashakkori (2006) for its effectiveness in probing into areas with uncertain concepts. This method is particularly appropriate for examining the effects of blockchain technology on business models, an area still largely unexplored and requiring empirical research. The methodology unfolds in two main

phases: an initial qualitative exploration through literature review and targeted interviews, followed by a quantitative phase with a comprehensive survey. In the qualitative stage, interviews were carried out with 13 professionals specializing in blockchain business models. These individuals were carefully chosen using a multi-search strategy (Table 1), which included referrals from blockchain business networks and previous interviewees, as well as direct searches of online blockchain organizations. This varied selection method ensured a wide representation from different industries, improving the study’s generalizability.

The interviews were organized around the “business model canvas” framework, aiming refine the components and varieties of blockchain business models. The questionnaire used is derived and adapted from the research conducted by Osterwalder and Pigneur (2010, p. 19–42), with necessary modifications to align with the study’s objectives, Appendix A Fig. A1. Each interview was transcribed, coded, and validated with the participants, facilitating a dynamic refinement process through actions such as splitting, merging, and modifying elements. After the qualitative exploration, a quantitative survey was conducted to evaluate the relative importance of the identified components and model types. This survey was disseminated through various online channels to achieve broad participation, collecting responses from 250 individuals. A thorough screening process was applied to ensure data relevance and accuracy, which included removing duplicate submissions, discarding responses completed in <10 min, and analyzing standard deviations to filter out non-genuine responses. Following this screening, 69 responses were considered valid for analysis. The survey collected not only demographic information but also detailed the respondents’ professional experiences and their involvement in blockchain projects, offering a comprehensive profile of each participant.

Additionally, a non-response bias check (Armstrong & Overton, 1977), comparing early and late responders, showed no significant difference, indicating a low risk of bias. Despite the data being non-normally distributed and with non-homogeneous variances, the sample size was considered robust enough to withstand normality violations (Bartlett, 1935). A one-sample *t*-test and Kolmogorov-Smirnov test were used to validate the significance of the building blocks and importance ratings, respectively, revealing significant differences at a 95% confidence interval. The survey findings, including descriptive statistics and detailed analysis, were then systematically documented.

4. Results

4.1. Profile

In this section, a detailed description of the interviewee (Study 1) and survey respondents (Study 2) profiles are described. The search has resulted in 13 potential interviewees, and the descriptive information about the interviewees is shown in Table 2. It describes the sector in which an interviewee is working, the search reference used for the interview, size of the company, age, and type of blockchain solutions offering – product or service, or both. The interviewees represent a diverse range of sectors, each bringing unique perspectives on the blockchain (Table 2). Interviewee 1 (I1) from the Education sector, associated with reference RBN, utilizes a blockchain service that has been operational for 3–5 years in a medium-sized company with 50–250

Table 1
Search reference for the interviewees.

Search reference	Description
RBN	Search is based on the referrals from the blockchain business network
RBBS	Search is based on the referrals from the blockchain professional
RI	Search is based on the blockchain organization found on the internet.
RPI	Search is based on referrals from the prior interviewees.

employees. I2, hailing from Manufacturing and referred by RBBS, focuses on a product-based blockchain solution in a large company with over 250 employees, also with a 3–5 year offering age. The Healthcare sector is represented by I3 (reference RPI), offering both product and service solutions in blockchain within a medium-sized company, with an offering age of 1–3 years. I4 from Software Services (RBN) and I6 from Transportation (RBBS) echo this dual offering, both in large and medium-sized companies respectively, each with a 3–5 year presence in blockchain. I5 and I8 bring insights from the Energy and Retail sectors, with small companies (10–50 employees) focusing on blockchain products for 1–3 years. I7 and I12, from the Supply Chain sector, offer a combination of products and services in blockchain, with medium-sized and small companies respectively. I9 revisits the Education sector, similar to I1, but with a shorter blockchain service history of 1–3 years. The Finance sector, represented by I10, stands out with a micro-sized company (<10 employees) offering both blockchain products and services, also within a 1–3 year range. I11, from Software Services (RPI), and I13 from Retail (RBN), offer both products and services in medium-sized and small companies, contributing to a well-rounded view of blockchain’s impact across various sectors and company sizes.

The breadth of industries represented in this study, ranging from education to finance, emphasizes the extensive applicability and transformative potential of blockchain technology. The diversity of sectors, each with unique challenges and opportunities, demonstrates the technology’s versatility and its capacity to tailor solutions across various domains. This cross-sector representation enhances the generalizability of the findings, indicating the widespread impact and benefits of blockchain across diverse economic activities and organizational sizes. Analyzing the nature of blockchain implementations—whether as products, services, or hybrids—provides deep insights into sector-specific innovations and solutions. For example, blockchain’s role in credential verification within education streamlines processes and enhances security, addressing the issue of credential fraud. In manufacturing, blockchain’s application for supply chain tracking ensures product authenticity, protecting brand integrity and consumer trust.

The adoption of blockchain in healthcare for both products and services, particularly in patient data management, highlights its capability to secure sensitive information and facilitate interoperability. This showcases blockchain’s potential to improve patient care and data privacy. Similarly, in the energy sector, blockchain enables peer-to-peer energy trading, demonstrating its ability to disrupt traditional markets and empower consumers. The inclusion of company size and solution offering age provides insights into the adoption stage and market presence of blockchain initiatives, offering a gauge of their maturity and implementation scalability.

The survey, comprising 69 respondents, presented a diverse demographic profile, Table 3. Gender distribution was nearly balanced with 55.07% males (38 individuals) and 44.93% females (31 individuals). Age-wise, the respondents were spread across various groups: 14.49% were between 18 and 25 years, 33.33% in the 26–35 range, 26.09% aged 36–45, 18.84% were between 46 and 55, and 7.25% were 55 years or older. Regarding educational qualifications, a significant portion of the respondents were highly educated, with 34.78% holding Bachelor’s degrees, 50.72% having Postgraduate degrees, and 14.49% possessing Doctorates. This distribution highlights a balanced gender representation and a broad spectrum of ages and educational backgrounds among the participants.

4.2. Blockchain business model framework

The extant literature and the interviewees’ outcome has resulted in the business model framework for blockchain applications. The types of building blocks were adapted based on the types presented in Osterwalder and Pigneur (2010). These types were associated with each of the building blocks identified interviewee results. Fig. 1 depicts the building

Table 2
Descriptive information about the interviewees.

Interview number	Sector	Search reference	Blockchain solution- product or service	Blockchain solution offering age	Size of a company
I ₁	Education	RBN	Service Credential verification system to secure and streamline the process of verifying academic credentials.	3–5 years	Medium sized (50–250 employees)
I ₂	Manufacturing	RBBS	Product Supply chain tracking for manufacturing parts to ensure authenticity and reduce counterfeits	3–5 years	Large (>250 employees)
I ₃	Healthcare	RPI	Both Patient data management system for secure and interoperable exchange of medical records.	1–3 years	Medium sized (50–250 employees)
I ₄	Software Services	RBN	Both Decentralized cloud storage solutions to enhance security and data sovereignty.	3–5 years	Large (>250 employees)
I ₅	Energy	RI	Product Renewable energy trading platform to enable peer-to-peer energy trading.	1–3 years	Small (10–50 employees)
I ₆	Transportation	RBBS	Both Logistics and freight tracking system to improve transparency and efficiency.	1–3 years	Medium sized (50–250 employees)
I ₇	Supply chain	RBN	Both Supply chain visibility and anti-counterfeit solutions.	1–3 years	Medium sized (50–250 employees)
I ₈	Retail	RPI	Product Product authenticity verification system to combat counterfeiting.	1–3 years	Small (10–50 employees)
I ₉	Education	RBN	Service Credential verification system to secure and streamline the process of verifying academic credentials.	1–3 years	Medium sized (50–250 employees)
I ₁₀	Finance	RBN	Both Decentralized finance (DeFi) platform for peer-to-peer lending and borrowing.	1–3 years	Micro (<10 employees)
I ₁₁	Software Services	RPI	Both Decentralized cloud storage solutions to enhance security and data sovereignty.	1–3 years	Medium sized (50–250 employees)
I ₁₂	Supply Chain	RBN	Both Supply chain visibility and anti-counterfeit solutions.	1–3 years	Small (10–50 employees)
I ₁₃	Retail	RBN	Both Product authenticity verification system to combat counterfeiting.	3–5 years	Small (10–50 employees)

Table 3
Descriptive information about the survey respondents.

Particulars		n = 69	Percent (%)
Gender	Male	38	55.07
	Female	31	44.93
	18–25	10	14.49
	26–35	23	33.33
	36–45	18	26.09
Age Group	46–55	13	18.84
	55 and above	5	7.25
	Bachelor's degree	24	34.78
Education level	Postgraduate degree	35	50.72
	Doctorate	10	14.49

blocks for the blockchain business model and each building block's possible types. In the Fig. 1, certain block types are mentioned by gray color coding, which depicts that these types were added based on the interviews (Appendix B).

To check on the nature of the unobserved factors where block types were added or changed significantly (Revenue Streams, Key Resources, Key Activities, Key Partnership, Cost Structure, Value Proposition), exploratory factor analysis is also conducted. The factor that exceeds the eigenvalue of more than one was selected. The oblique (Promax) approach was considered for better interpretation instead of orthogonal rotation due to the factors' correlation.

In the key activities block, three factors have emerged. The first factor is aligned to implementation and management and contains the types of implementation, platform development, software development, partner & vendor management. The second factor is targeted to customer building and includes types as customer development and logistics. The third factor is aligned with developing products and

contain types as product development. In the key partners block, three factors have emerged. The first factor is aligned to establishing alliances and includes the types of strategic alliances. The second factor is targeted ventures and partnerships and contains types as joint ventures, service partners, and platform partners. The third factor is aligned with enabling technology and include types of technology enablers.

In the key resources block, three factors have emerged. The first factor is aligned to physical resources and capabilities and contains the types of physical resources and employee capabilities. The second factor is targeted to relevant software and timely availability of resources and includes types as software and just-in-time resources. The third factor is aligned to financial aspects and contains types of financial resources. In the value propositions block, four factors have emerged. The first factor is aligned to product advantage and includes the types of newness, cost reduction, and access to products. The second factor is targeted to relevant benefits and contains types as comfort and reduce transaction costs. The third factor is aligned to product designing and contains types of design and convenience/usability. The fourth factor aligned to visibility and performance and includes types of performance, brand/status. In the revenue streams block, three factors have emerged. The first factor is aligned to revenue through sale and contain types as an asset sale, and ICO (Initial Coin Offerings)]. The second factor is targeted to relevant revenue generation processes and includes types of token sale, lending/renting/leasing, and smart contracts transaction fee. The third factor is aligned to the fee for generating revenue and contain types of usage fee. Finally, in the cost structure block, three factors have emerged. The first factor is aligned to dealing with personnel and includes types of personnel. The second factor is targeted to revenant costs for IT and contains types of IT costs. The third factor is aligned to the automated process for marketing and sale and includes marketing & sales and Process automation types. Appendix C describes the factor



Fig. 1. Business model framework for blockchain applications.

loading of Key Resources, Key Activities, Key Partnership, Value Proposition, Revenue Streams, and Cost Structure, respectively.

To check whether there is any similarity in the respondents' importance rating, a Kolmogorov-Smirnov (KS) test is conducted. The result of the KS test showcased, as measured through the survey inputs, together with respondents 95% confidence intervals, that there is a significant difference in the importance rating. As such, relative importance (Fig. 2) and ranking (Fig. 3) statistics were developed. The block – value propositions has received the highest rating by the survey respondents for the blockchain business model. It is also to be noted the block value propositions have scored significantly – higher ($\bar{x} = 4.76$) than all other building blocks at the <0.01 level of significance. Besides, the block Key resources and Revenue streams also been scored high as compared to other blocks. However, blocks Channels and Cost Structure have been scored low and considered significantly less important at the

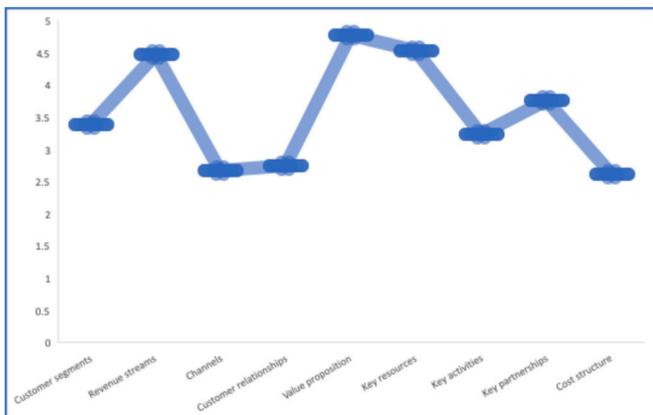


Fig. 2. The relative importance of blocks.

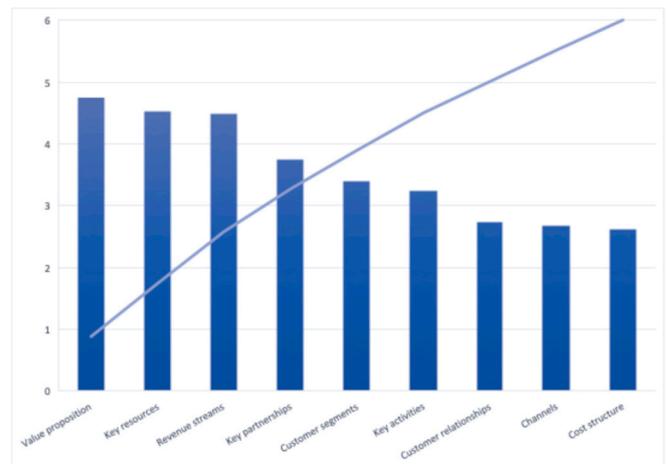


Fig. 3. Ranking of blocks by relative importance.

<0.02 level of significance.

Even interviewees have indicated the block value proposition highly as compared to other build blocks. The results of the interviewees supported the survey results as both in sync and showed no significant difference. The block types were arranged in each block according to the significant score level gained, which was more important than the respective block's average score. Such block types were coded as gray color and were placed on the left or above the gray area. Block types with significantly less score than the average score in the respective block were kept on the right or below the gray area. All the significance testing was done at the level of significance - 0.05, Fig. 4.

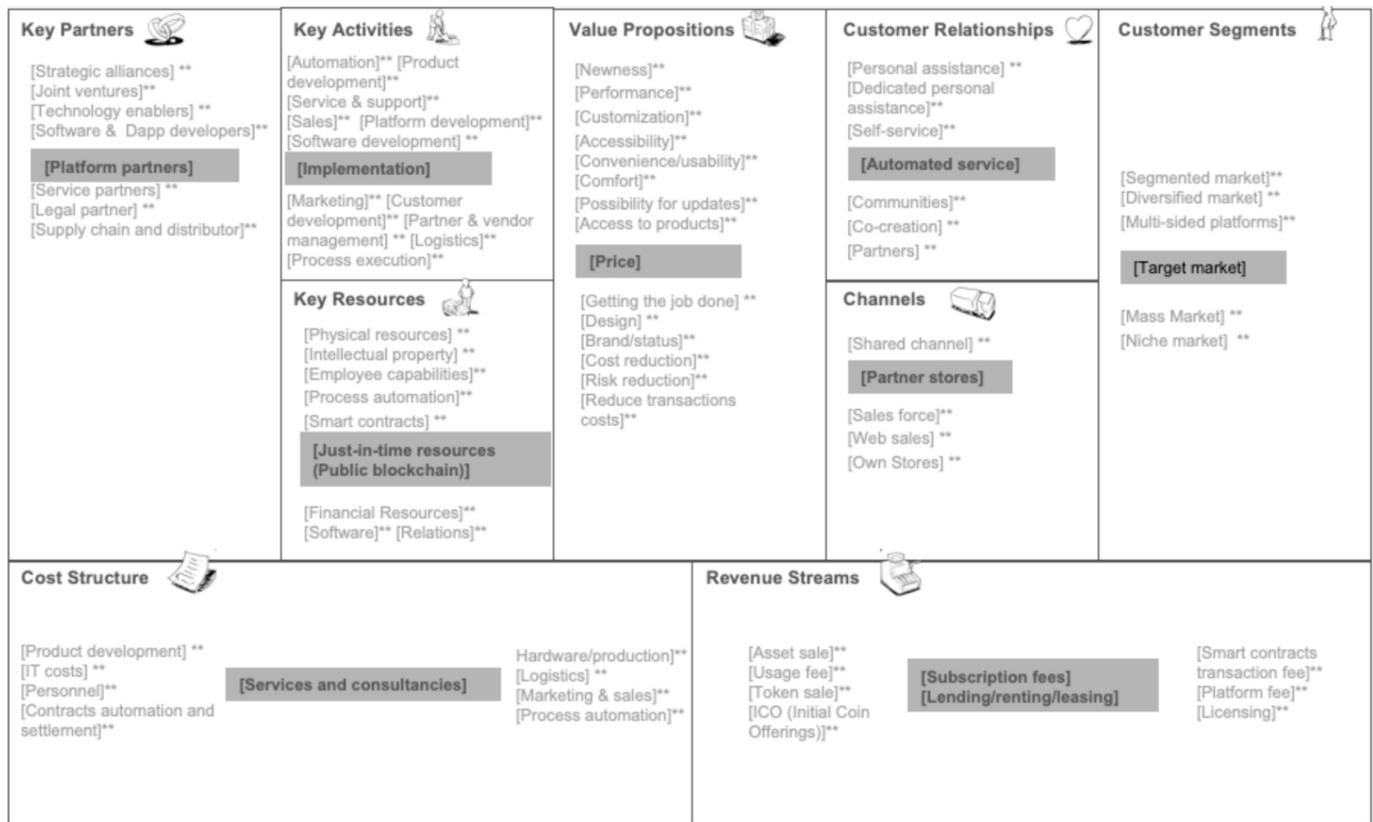


Fig. 4. Blockchain Business model framework with the relative importance of specific block types. ** < 0.05 significance.

4.3. Configuration and interdependencies

Osterwalder and Pigneur (2010) comprehensive framework - consisting of nine critical building blocks for business models, emphasized the significant advantages of employing a business model ontology for aiding practitioners throughout the design, evaluation, implementation, and innovation phases of their business models. This framework was adapted by Morkunas et al. (2019) to specifically address the unique aspects of blockchain technologies. Their research provides an in-depth analysis on how blockchain technologies could influence each of these nine foundational elements (building blocks - ontology) of the business model canvas, culminating in a series of pivotal questions aimed at guiding managers and executives in assessing the potential and implications of integrating blockchain into their business strategies. These inquiries cover a broad spectrum, including the added value of blockchain, its alignment with organizational objectives, resource implications, effects on existing business relationships, overall value proposition, and the synergy with current ecosystems.

In concurrence with these findings, this paper develops an ontology that operates at the configuration level—thereby aligning building blocks and types—can significantly enhance the process of abstracting and transitioning between the practical business model operations and the theoretical coverage of business model configurations and ontology, particularly within the blockchain domain. Santos, Spector, and Van der Heyden (2009) stress the importance of comprehending the relationships among business model components, not just the components in isolation. This perspective aligns with the observations made by Spieth & Schneider (2016), who note that modifications in one area of a business model often necessitate adjustments elsewhere to ensure overall coherence. It is critical to acknowledge, as highlighted by Zott and Amit (2013) and Fielit (2014), that the components of a business model are interdependent rather than isolated. This notion is supported by the ‘fit theory,’ which suggests that the efficacy of a business model

stems from the synergistic operation of its elements, thereby generating added value—a concept reinforced by Sorescu, Frambach, Singh, Rangaswamy, and Bridges (2011), who argue for the importance of alignment and interaction among business model parts for its effectiveness.

Building on these insights, this paper advocates for the ‘configurational approach’ to business model innovation, as initially proposed by Meyer, Tsui, Robert, and Hinings. (1993). This approach suggests that focusing on the configurational elements within each ontological building block can systematically foster and facilitate business model innovation activities. It does so by ensuring a seamless alignment between existing business model configurations and the newly identified potential configurations, thereby driving innovation within the business model framework.

Building on this foundation and aligned with the findings, a comprehensive framework for blockchain business model innovation is developed (Fig. 5). This framework includes not only the essential components (building blocks as ontology) and types required to construct a blockchain business model but also highlights the critical elements for its effective configuration, considering the interdependencies among the components. Moreover, the framework simplifies the traditional 9-component Business Model Canvas into three core aggregates: WHAT (value proposition), HOW (activities, partners and resources), and WHO (target customers, relationships and channels). Together with an organization’s revenue stream and cost structure, these aggregates play a crucial role in defining how an organization creates, delivers, and captures value, thereby shaping its business model. This approach provides a detailed insight into the dynamics of business model innovation, especially in the space of blockchain technology, emphasizing the necessity of a strategic alignment among the various components for achieving success. The relationship among value creation, value delivery, and value capture is cyclical and interconnected (Minerbo & Brito, 2022). Successful value creation leads to effective value delivery, which, when executed well, enables a business to capture

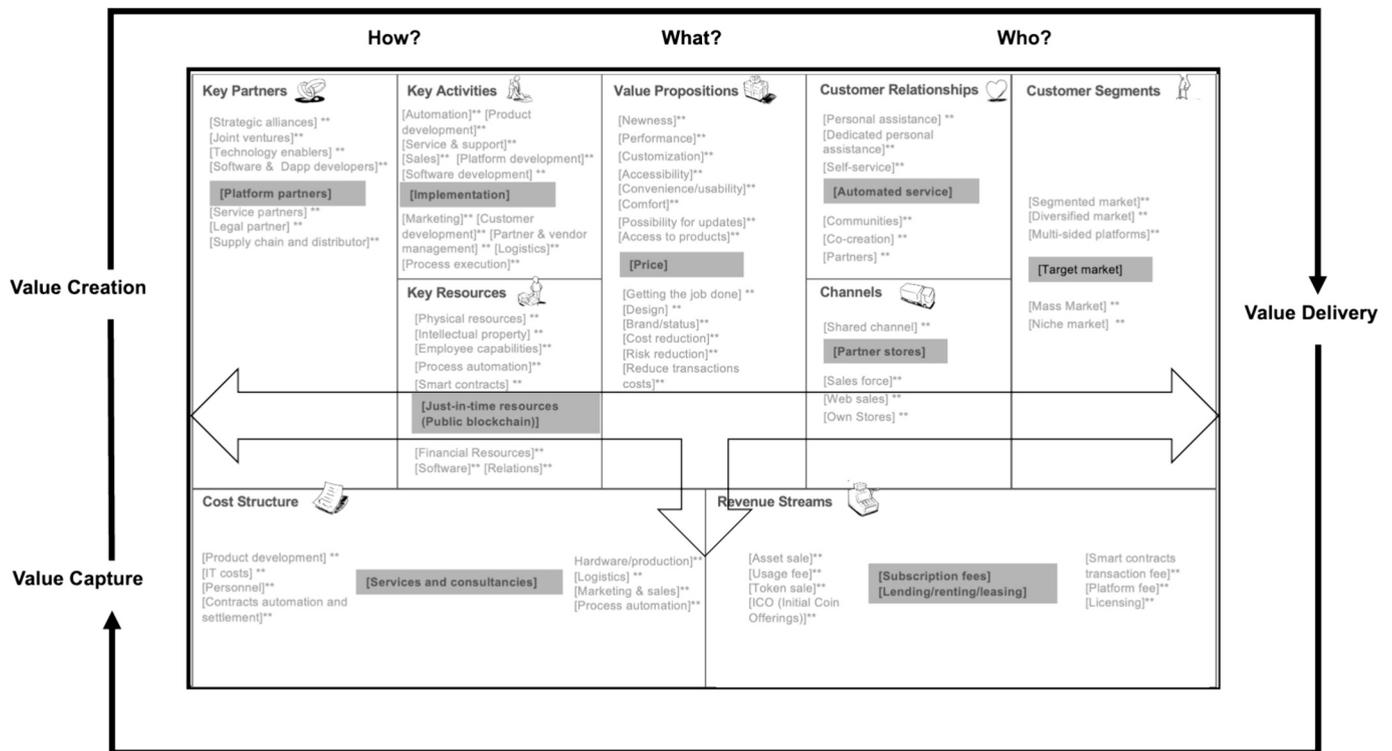


Fig. 5. Comprehensive framework for blockchain business model innovation.

value through profits and growth. This, in turn, provides resources to reinvest in further value creation. In the context of a blockchain business model, with its decentralized nature, immutability, transparency, and the ability to execute smart contracts, offers new pathways for creating, delivering, and capturing value. Organizations can tailor their business model through various configuration options and mechanisms, considering the arrangement of block types within each block according to their significant score levels (Fig. 5). By giving priority to those with scores above the block's average, organizations can evaluate the performance of their models and pinpoint areas for enhancement.

- *The organization's value proposition (indicated by What):* Blockchain technology significantly transforms customer value by unlocking access to products and services that were previously inaccessible or attainable only through significant expenditure of time or money. For instance, the Swedish company Safello leverages an open blockchain protocol to offer a transparent way of exchanging bitcoin for fiat currencies. This innovation makes resources, such as foreign currency, accessible without the extra costs traditionally associated with such transactions. Similarly, Centbee in South Africa allows users of its mobile app to send bitcoin directly to contacts, facilitating inexpensive international money transfers. This capability supports family and friends across borders without the hefty fees charged by traditional currency exchange services. Both Safello and Centbee bypass traditional financial intermediaries, such as banks and currency exchange services, streamlining transactions and potentially eliminating some services altogether. Furthermore, blockchain technology enhances the efficiency and cost-effectiveness of transactions beyond what's possible in conventional settings. For example, the process of buying or selling a home traditionally involves certified notaries who authenticate contract documentation, a process that is both time-consuming and costly. Blockchain introduces the possibility of using smart contracts to streamline these transactions, significantly reducing costs and time for all parties involved. ChromaWay's initiative with a private blockchain protocol exemplifies this, enabling Swedish citizens to use smart contracts for

real estate transactions, thereby simplifying the process and making it more affordable. Blockchain's value extends to company operations, particularly in creating verifiable and trustworthy systems for supply chain management. The technology's capacity for enhanced transparency can significantly benefit sectors such as food supply, where it can foster consumer trust by ensuring product authenticity and integrity. According to research by Rejeb, Keogh, and Treiblmaier (2020), and Montecchi, Plangger, and Etter (2019), blockchain application in supply chains can mitigate various risks, including financial, psychological, social, functional, and physical, through guarantees of origin, authenticity, custody, and integrity. Moreover, smart contracts can automate business processes, making transactions faster and more cost-effective. This efficiency enables businesses to reduce their service costs, maintaining competitiveness in their respective markets.

- *The target customer segments, relationships and channels (indicated by Who):* In this context, blockchain technology emerges as a transformative tool, offering enhanced trust, transparency, privacy protection, digital marketing security, and the potential for innovative loyalty programs (Rejeb et al., 2020). It enables a new level of transparency by granting customers access to shared data on a distributed ledger, selectively allowing them to view information pertinent to them, thereby not overwhelming them with unnecessary data (Morkunas et al., 2019). Blockchain technology stands out by facilitating the creation of data marketplaces, where individuals have control over their personal data and can even profit from its use (Travizano, Sarraute, Dolata, French, & Treiblmaier, 2020). This not only simplifies business operations by reducing the need for intermediaries in transactions, such as those in real estate facilitated by smart contracts, but also introduces novel channels within organizations to strengthen supply chains through shared common codes (Montecchi et al., 2019). An illustrative success story of blockchain's potential to streamline operations is seen in the Swedish government's land registry authority, Lantmäteriet. Using ChromaWay's blockchain technology, Lantmäteriet has significantly enhanced the efficiency and transparency of real estate transactions in Sweden.

The technology records each step of a transaction, accessible to relevant parties such as bank representatives and real estate agents, ensuring secure, up-to-date information. This continuity and reliability in the process have bolstered confidence and transparency in Lantmäteriet's interactions with the citizens of Sweden (Cheng, Daub, Domeyer, & Lundqvist, 2017). Moreover, blockchain opens up new market segments that were previously inaccessible, offering businesses the opportunity to serve niche, diversified, and mass markets alike (Morkunas et al., 2019). For instance, Everest, utilizing a private Ethereum-based protocol, has tapped into developing countries in Africa, Asia, and South America, targeting the 2 billion individuals without access to financial services. By offering a decentralized ledger that includes payment solutions, a multicurrency wallet, and a biometric identity system, Everest addresses the needs for microfinance transactions, land claims, and medical records in these regions. The integration of APIs and SDKs allows companies to seamlessly join sophisticated ecosystems, broadening their channels and reaching previously unreachable customer segments (Morkunas et al., 2019). Blockchain's unique value proposition lies in its ability to cater to specific customer needs, particularly those concerned with privacy, and to foster the development of innovative products and services that appeal to new customer demographics. Thus, by leveraging blockchain technology, businesses can not only enhance their operational efficiencies and customer relationships but also pioneer new market frontiers.

- *The activities, partners and resources needed to deliver that value (indicated by How):* The essence of a business model lies in its execution and the fulfillment of the company's value proposition, focusing on two key aspects influenced by blockchain technologies. Firstly, it addresses the flexibility of resource utilization, allowing companies to shift from traditional ownership models to accessing resources on an as-needed basis. This is particularly relevant to the use of public blockchain technologies, where transactions occur directly between parties within a peer-to-peer network. Such technology permits companies to avoid significant investments in IT infrastructure by leveraging the network for necessary resources and processes. (Morkunas et al., 2019) Additionally, blockchain facilitates the automation of previously manual tasks, freeing human resources to engage in more strategic activities. This includes processes like documentation, verification, and audit reporting. The second aspect highlights how blockchain technology reshapes resource and activity management, with users contributing crucial resources and processes (Morkunas et al., 2019). For instance, in real estate transactions facilitated by smart contracts, the transacting parties supply the necessary human and physical capital, while blockchain enables the efficient exchange of these resources. Blockchain's potential extends to eliminating traditional intermediaries (e.g., banks, notaries) or transforming them (e.g., credit card companies), as well as welcoming new partners like tech companies that provide essential development tools and maintain transaction algorithms. An example of blockchain's practical application is Centbee's creation of a merchant payment ecosystem in South Africa, which simplifies bitcoin acceptance for retailers without the need for additional terminal hardware. Furthermore, blockchain promotes direct partnerships between businesses, enhancing and expanding supply chains.

5. Discussion

This work contributes to the growing body of research on the business value of blockchain within the management literature. It draws upon the foundational work of Amit and Zott (2001) and extends it through the lens of blockchain, incorporating insights from seminal research by Morkunas et al. (2019), Marikyan et al. (2022), and Treiblmaier and Špan (2022). The investigation identifies key components and configurations vital for developing blockchain business models. A significant outcome of this research is the creation of a

detailed framework for business models, supplemented by an evaluation tool designed to optimize the configuration of blockchain business models. This tool aids organizations in assessing their model's performance and pinpointing areas for enhancement, thereby addressing the research gaps identified by Morkunas et al. (2019), Marikyan et al. (2022), and Treiblmaier and Špan (2022) and contributing novel insights into the business potential of blockchain technology.

The study emphasizes the importance of the synergistic relationship between various elements of a business model and the necessity for their strategic alignment, a concept supported by Santos et al. (2009) and further elaborated by Spieth and Schneider (2016). Employing a 'configurational approach' to business model innovation, as introduced by Meyer et al. (1993), this research develops a comprehensive framework that simplifies the traditional Business Model Canvas into three core segments: the WHAT (value proposition), HOW (activities, partners and resources), and WHO (target customers, relationships and channels), alongside an organization's revenue streams and cost structure. This framework facilitates a deeper understanding of business model dynamics, especially in the blockchain context, emphasizing strategic component alignment for success. Organizations have the flexibility to customize their business model by exploring different configuration possibilities and mechanisms, focusing on how different block types are organized based on their importance scores (see Fig. 5). By prioritizing elements that score above the average for each block, organizations can assess their model's effectiveness and identify opportunities for improvement.

The empirical findings emphasize the critical role of the value proposition in blockchain business models, echoing the theoretical perspectives of Chesbrough and Rosenbloom (2002) and Morris et al. (2005). This research reveals a universal recognition of the value proposition's centrality, with an emphasis on newness, performance, customization, and accessibility, reflecting a shift towards more agile and adaptable models in the blockchain sphere. However, a noted divergence in the perceived importance of cost and risk reduction among survey participants, compared to interviewees, suggests a need to reassess the evolution of blockchain models towards cost efficiency and new revenue streams, challenging Openshaw et al. (2014)'s assertions.

Furthermore, the prioritization of key resources and revenue streams following the value proposition is corroborated by earlier studies highlighting strategic resource deployment (Swan, 2015; Beck & Muller-Bloch, 2017) and novel revenue generation methods (Mougayar, 2016). This nuanced appreciation for resource utilization and the emphasis on key partnerships over other model components emphasize blockchain's potential to streamline stakeholder engagements and revolutionize organizational and market structures.

The inclusion of customer-to-customer transactions, enabled by smart contracts, and the advent of new financial models like micro-payment and tokenization, demonstrate blockchain's capacity to redefine traditional business practices. These advancements, alongside the potential for blockchain to revamp settlement, negotiation processes, and the redesign of channels to control and deliver true value transactions, highlight the transformative impact of blockchain technology on traditional business models.

5.1. Implications

5.1.1. Theoretical implications

This research extends existing management literature by exploring the business value of blockchain, by proposing a novel framework and evaluation tool for blockchain business models. The study emphasizes the significance of strategic alignment among business model elements, advocating for a configurational approach to innovate business models within the blockchain context. It modifies the traditional Business Model Canvas for value creation, value capture and value delivery, highlighting the importance of each for business success. The novel framework and evaluation tool for blockchain business models contribute to

innovation management by providing a roadmap for leveraging blockchain technology in business model innovation. This is particularly relevant to the literature on disruptive innovation (Christensen, 1997).

A major theoretical contribution of this work is the emphasis on the value proposition's central role in blockchain business models, noting its importance in driving agility and adaptability. The research points out a need to reconsider cost efficiency and revenue generation in evolving blockchain models. It also validates the significance of strategic resources, key partnerships, and innovative revenue streams as critical to leveraging blockchain technology for enhancing stakeholder engagements and transforming organizational and market structures. The emphasis on strategic alignment and configurational approaches aligns with IS research focused on the strategic use of information technology for competitive advantage (Melville, Kraemer, & Gurbaxani, 2004).

The study further illustrates blockchain's potential to disrupt traditional business practices through enabling customer-to-customer transactions, micropayment systems, and tokenization. The discussion on innovative revenue streams, micropayment systems, and tokenization has implications for finance and accounting, particularly in understanding the financial structures that blockchain enables. This includes contributions to the literature on financial innovation (Lerner & Tufano, 2011) and digital currencies (Narayanan, Bonneau, Felten, Miller, & Goldfeder, 2016). This research contributes to the literature by providing a detailed understanding of the essential components for developing successful blockchain business models, offering insights into the unique value propositions and strategic considerations necessary for leveraging blockchain effectively.

5.1.2. Practical implications

This study sheds light on how organizations can strategically develop and refine blockchain business models, serving as a guide for leveraging blockchain technology's capabilities. At its core, the research stresses the importance of creating compelling value propositions. It suggests that organizations should focus on attributes like newness, performance, customization, and accessibility to meet stakeholders' expectations effectively.

Moreover, the research identifies cost and risk reduction as essential facets of a robust value proposition. This reflects a shift towards more cost-effective blockchain models and the exploration of new avenues for revenue generation. The emphasis on key resources and revenue streams is highlighted as critical to the blockchain business model. Organizations are encouraged to harness a variety of resources to manage transactions and smart contracts with greater efficiency. The potential to generate revenue through innovative methods that challenge traditional business models and enhance customer engagement is particularly emphasized. Techniques such as asset sales, usage fees, token sales, and ICOs are recognized as effective means for revenue generation.

The role of partnerships in blockchain initiatives is also underlined, with the technology's capability to streamline the formation and management of partnerships by minimizing or removing intermediaries. This aspect facilitates faster transaction validation and opens up opportunities for transformative business collaborations. Additionally, the research introduces a tool for evaluating and configuring blockchain business models, offering a valuable resource for decision-makers. This tool aims to strategically utilize different components of the blockchain model to achieve impactful outcomes. The study further contributes to the academic discourse by outlining specific categories and types of blocks integral to blockchain business models, informed by empirical evidence. This detailed framework assists organizations in strategically aligning their business model components, enabling them to navigate the rapidly evolving blockchain environment with agility and insight. This comprehensive approach not only aids in strategic planning but also equips businesses to adapt and thrive in the dynamic world of blockchain technology.

5.2. Limitations

While this research study offers valuable insights, it is important to acknowledge the limitations of the study. One key limitation is that the research approach adopted is broad and exploratory, which means that it does not focus on a specific building block or industry sector. Furthermore, it is important to note that while the results are robust and reliable, they should be considered within the context and limitations of the study. This means that the findings should not be applied universally without considering the specific context and circumstances of the organization or industry in question. Organizations and decision-makers that are considering the findings of this study to guide their blockchain journey must be aware that these findings may not conform to their general expectations. As such, it is important to act accordingly, taking into account the specific limitations of the study and the unique circumstances of their organization or industry.

5.3. Future research

Given the limitations noted above, future research in this area could take several directions to build upon the findings of this study. First, expanding the research design to include a more diverse and larger sample of participants across different stages of blockchain adoption and across various industries could enhance the generalizability of the findings. Investigating the impact of emerging blockchain technologies and platforms on business models could offer insights into how companies can adapt to rapid technological changes. Future studies could also explore the role of regulatory environments in shaping blockchain adoption and how businesses can navigate these challenges. This includes examining cross-border differences and the impact of legislation on blockchain model innovation. Another area for future research is the development of dynamic models that can adapt to the changing blockchain ecosystem. This could involve creating tools that allow businesses to quickly pivot their business models in response to new opportunities or challenges. Additionally, exploring the long-term sustainability of blockchain business models, including environmental impacts, could provide critical insights for businesses aiming to balance innovation with social responsibility.

Lastly, future research could focus on the implementation challenges and success factors of blockchain initiatives in practice. This includes case studies of successful and unsuccessful blockchain projects, providing a deeper understanding of the practical implications of adopting blockchain technology in various business contexts. This research could also examine the skills and competencies needed to effectively manage and innovate blockchain business models, contributing to the development of a skilled workforce in this emerging field.

6. Conclusion

This research significantly enhances the literature on the business value of blockchain technology within management studies. By integrating foundational theories with contemporary insights, it advances understanding of blockchain's transformative potential in business model innovation. Utilizing a sequential exploratory design, including a thorough literature review, practitioner interviews, and a comprehensive survey, the study developed a detailed framework for blockchain business models. This framework, coupled with an evaluation tool, addresses gaps in the literature and aids organizations in assessing and optimizing their blockchain business models.

This research identifies key components and configurations vital for developing blockchain business models. The study highlights the importance of synergistic relationships between business model elements and their strategic alignment. By adopting a configurational approach, the refined framework allows organizations to customize their models, prioritizing elements based on strategic importance. Empirical findings emphasize the value proposition's central role in

driving newness, performance, customization, and accessibility, marking a shift towards more agile and adaptable business models. Additionally, the study emphasizes the significance of strategic resource deployment and key partnerships in leveraging blockchain technology for enhanced stakeholder engagement and market transformation. Finally, it provides strategic insights and a comprehensive roadmap for effectively leveraging blockchain technology in business model innovation.

CRedit authorship contribution statement

Nitin Upadhyay: Writing – review & editing, Writing – original draft, Visualization, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

The author declare of having no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The authors do not have permission to share data.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.digbus.2024.100082>.

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