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Unlocking the Power of Blockchain: Driving Digital Business Transformation

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Full research paper

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Abstract

In order to stay competitive and meet customer expectations, companies must understand the importance of digital transformation. Blockchain technology is a groundbreaking innovation with the potential to revolutionise traditional business models. Despite this potential, it is currently not being fully utilised in digital transformation efforts. Our study used the Gartner roadmap for IT digital transformation to explore how organisations can lead successful digital business transformations using blockchain. Our recommended model emphasises strategic alignment among stakeholders while addressing their concerns. This research provides valuable insights into the digital transformation process with blockchain technology, contributing to new knowledge. By leveraging blockchain's unique features, businesses can enhance operational efficiency, optimise decision-making processes, generate new revenue streams, and improve customer satisfaction. Our findings offer essential guidance for organisations looking to adopt digital business transformation through blockchain, unlocking innovation and competitiveness.

Keywords: Digital transformation, Blockchain, Digitisation, Business transformation

1   Introduction

In today's fast-evolving digital world, companies from various sectors are realising the significance of digital transformation. Businesses must adapt to the digital era to stay competitive and meet customers' constantly changing needs (Khanom, 2023). Blockchain technology has gained immense popularity as one of the most innovative technologies to drive this transformation by disrupting traditional business models (Taherdoost and Madanchian, 2023).

Digital transformation is a crucial aspect of any organisation's growth. It involves integrating digital technologies into all aspects of the organisation, leading to fundamental changes in how it operates and delivers value. Embracing digital disruption requires a complete overhaul of processes, systems, and culture, enabling organisations to seize new opportunities and overcome challenges. We look into the processes that enable digiotal transformation through blockchain. The benefits of digital transformation are undeniable. Adopting digital technologies can enhance operational efficiency, optimise decision-making processes, and develop new revenue streams, leading to improved customer experiences (Foltean and van Bruggen 2022). Digital transformation enhances agility, allowing organisations to adapt quickly to market dynamics and innovate more effectively (Khanom 2023). Therefore, organisations that ignore the importance of digital transformation risk falling behind in today's fast-paced business environment.

Digital transformation may be gaining attention, but the potential of blockchain technology remains vastly unexplored (Ertz et al. 2022; TN et al. 2023). With its unparalleled security, transparency, and decentralisation, blockchain is the ideal solution to address gaps in digital transformation. Immutable, tamper-proof records and trust among participants are only the beginning of what blockchain can offer (Chhina et al. 2021; Mendling 2018; Nakamoto 2008). It is necessary to conduct research into blockchain's potential applications in digital transformation to fully realise its benefits (Al Shanti and Elessa 2023; Massaro 2021). However, organisations face significant challenges in identifying use cases, addressing scalability, interoperability, regulatory compliance, and integrating blockchain effectively into their digital transformation strategies (Chhina et al. 2019). This research attempts to explore digital transformation journey as a process through blockchain. To unlock the full potential of blockchain for digital business transformation, we propose the following research question:

How do organisations embrace blockchain technology to drive their digital business transformation?

"The transformation journey is taking large enterprises especially at least twice as long and costing twice as much as they originally anticipated. (Pg 2)" (Gartner 2023a). This study draws upon Gartner's Information Technology (IT) roadmap for digital business transformation to address the question and achieve the research objectives (Gartner 2023a). This roadmap provides a systematic sequence of digital transformation objectives, including the challenge of adopting innovative technologies like blockchain (Komulainen and Nätti 2023). To date, key theoretical perspectives and empirical findings have informed the topic of digital transformation and its potential impact on organisations. However, the specific integration of blockchain technology into this transformation process remains relatively unexplored territory. While prior studies have highlighted the challenges and opportunities of adopting blockchain (Rejeb et al. 2022), a gap exists in understanding how blockchain aligns with established digital transformation frameworks (Majdalawieh and Khan 2022), like Gartner's roadmap. Through this study, scholars and practitioners will better understand how blockchain fundamentally changes and enhances our comprehension of digital transformation. With blockchain being a relatively nascent technology with immense potential, organisations face uncertainties and challenges in leveraging it to achieve their digital objectives. This study strives to address this unexplored aspect by utilising Gartner's roadmap as a guiding framework and shedding light on the implications of blockchain-driven digital transformation.

The problem statement addresses the imperative need for organisations across diverse sectors to adapt to the rapidly changing digital landscape, emphasising the importance of digital transformation to stay competitive and meet evolving customer demands. While digital transformation is acknowledged as pivotal for growth, the integration of blockchain technology into this process remains largely uncharted.

The remaining paper is organised as: the next section provides a comprehensive literature review of the related concepts to this study. The subsequent section then elaborates on the research method utilised for data collection and analysis. Then the next section presents a discussion of the findings, followed by the implications. The final section then provides the contribution and concluding remarks.

2   Literature review

2.1   What is digital transformation?

Digital transformation has received considerable attention in academic and business literature over the past decade. The use of digital technologies for strategic advantage represents a fundamental shift in the way organisations approach digital technologies (Kraus et al. 2022). While digital transformation has been extensively researched, there is still a gap in the literature, suggesting that more research is needed to provide clear directions for organisations embarking on such a journey (Adel 2022).

Digital transformation has been studied from various perspectives, with scholars emphasising its multifaceted nature (Büchner et al. 2022). This includes changes in the technologies (Mangalaraj et al. 2023), business processes (Kraus et al. 2022), organisational structures (Ghosh et al. 2022), and customer experiences (Busulwa et al. 2022). Researchers have used a variety of lenses to examine digital transformation, including innovation, strategic management, organisational change, and information systems (IS), among others (Danneels and Viaene 2022). We explore this using Gartner's roadmap for digital transformation.

Digital transformation is of utmost importance. Failure to adapt in today's hyperconnected world could make an organisation obsolete (Chakravorti 2022). As a result of digital transformation, businesses can achieve increased operational efficiency, improve customer engagement, enhance agility, and capitalise on new opportunities (Khanom 2023). By leveraging it, organisations can remain competitive, respond to market dynamics more effectively, and ensure they are prepared for the future (Kraus et al. 2022). It is important to note that despite the extensive discourse on digital transformation, there is a gap in the literature regarding a systematic exploration of pathways for organisations to navigate their digital transformation journeys (Raza et al. 2023; Trischler and Li-Ying 2023). IT innovations have played a pivotal role in driving digital transformation for organisations. As discussed in the next section, various models have been utilised to guide digital transformation initiatives. There are case studies, frameworks, and best practices available. Still, there is a lack of comprehensive research that can provide organisations with guidance on how to embark on and navigate this complex transformation. Organisations planning and implementing digital transformation initiatives face many challenges that require research in this area (Gretzel 2022). If there are no clear pathways, confusion can arise, strategies may be suboptimal, and even transformations may not succeed (Chhina et al. 2019). Evidence-based research, frameworks, and guidelines can guide organisations' digital transformation efforts. Research in this area should examine the interplay between technology adoption and business strategy. To develop tailored strategies and solutions, it is important to understand the unique contexts and needs of the organisations leading to transformation. As a results, this study proposes the steps involved in the process of digital transformation and the people involved in the process.

2.2   Digital transformation and IT

Over the years, various IT innovations have played a pivotal role in facilitating organisational digital transformation. This transformation involves a fundamental shift in how businesses operate and engage with technology to enhance efficiency, customer experiences, and overall competitiveness. Key aspects of this process include reimagining business strategies, adopting new technologies, and fostering a culture of innovation and agility (Khanom 2023). Throughout this journey, IT innovations have driven change and enabled organisations to leverage emerging trends such as cloud computing, artificial intelligence, the Internet of Things (IoT), and data analytics (Moghrabi et al. 2023).

To facilitate this transformation, organisations have adopted different models and frameworks to guide their initiatives. Gökalp and Martinez (2022) developed a digital transformation capability maturity model by utilising the analysis of various capability maturity models in the literature. Loonam et al. (2018) developed a conceptual framework by reviewing case studies from the literature to understand the actions required for digital transformation. Using data envelopment analysis, İnel (2019) developed a framework to measure the efficiency of digital transformation. Berghaus and Back (2016) suggested the stages of digital transformation, but the research did not gather views from transformation experts instead, the findings were based on individual self-assessments. The literature is dominant in terms of literature reviews suggesting frameworks for digital business transformation (Teichert 2019; Verhoef et al. 2021; Zaoui and Souissi 2020). Holmström (2022) proposed a digital transformation framework for Artificial Intelligence (AI) readiness by conducting a literature synthesis. Pflaum and Gölzer (2018) also created a conceptual model for the Internet of things (IoT) and digital transformation suggesting what organisations need to do. The literature review synthesis reveals that the literature is dominant in literature reviews and conceptual frameworks. Empirical work backed up by expert data is scarce in this domain. Extensive research has highlighted the critical success factors, and various models have been

utilised to guide organisations. However, fostering a digital-ready business and empirically investigated processes are areas that need further exploration to ensure holistic and responsible digital transformation.

2.3 Digital transformation and blockchain

Blockchain technology is a distributed digital ledger that securely and transparently shares transactions and information between multiple participants (Al-Jaroodi and Mohamed 2019). This technology was first introduced as the underlying technology for Bitcoin (Nakamoto 2008) but has since been used in a wide spectrum of other areas (Koens et al. 2021). The potential of blockchain for revolutionising traditional business processes, enhancing security, and fostering decentralised systems makes it a promising tool for driving digital transformation (Ertz et al. 2022). Significant gaps in the literature regarding navigating digital transformation through blockchains (TN et al. 2023) lead to a lack of successful blockchain projects and a need for research that can provide a clear path forward. Researchers and practitioners have explored blockchain technology's potential in a wide range of fields, including supply chain management (Dasaklis et al. 2022), finance (Javaid et al. 2022), healthcare (Adere 2022), and beyond. The unique characteristics of blockchain, such as immutability, transparency, and decentralisation, can potentially transform existing business models (Carson et al. 2018; Casino et al. 2018). As a catalyst for digital transformation, blockchain has attracted attention because it establishes trust among participants, reduces intermediaries, and enables secure data sharing (Gurzhii 2022).

Despite the enthusiasm surrounding blockchain technology, there are notable gaps in implementing blockchain projects for digital transformation. The complexity of regulatory frameworks and scalability and interoperability challenges often hinder organisations from implementing blockchain technology (Chhina et al. 2019). Consequently, blockchain adoption and implementation are hindered by a knowledge gap and a lack of guidance (Komulainen and Nätti 2023). Several studies have focused on blockchain technology and its potential applications (Adere 2022; Javaid et al. 2022). There is a lack of comprehensive research addressing blockchain integration within digital transformation frameworks (TN et al. 2023). As a result, organisations cannot derive value from blockchain and advance blockchain-driven digital transformation (Gurzhii 2022).

Tapscott and Tapscott (2016) introduced the potential of blockchain in their book. They highlighted the need for a new digital transformation framework to harness blockchain's capabilities, particularly in areas of supply chain, finance, and identity management. Iansiti and Lakhani (2017) explores the transformative potential of blockchain technology. It emphasizes the need for a digital transformation framework but falls short of providing a detailed framework itself. Beck et al. (2018) present a governance framework for the blockchain economy. While this framework is valuable, it primarily focuses on governance and not the broader digital transformation process. Few studies offer detailed implementation guidelines, leaving organizations without practical guidance on how to adopt blockchain solutions successfully (Chhina et al. 2021). To effectively integrate blockchain into digital transformation strategies, research efforts should focus on providing organisations with an actionable pathway (Raza et al. 2023). In this way, organisations across various industries could tailor blockchain-driven digital transformation strategies to meet their unique requirements. The full potential of blockchain-driven digital transformations will be unlocked by closing these gaps through comprehensive research and providing organisations with practical guidance.

2.4 Gartner's roadmap for digital transformation

This research takes inspiration from Gartner's IT roadmap for digital transformation (Gartner 2023a). The requirements of a digital business transformation plan can be understood by applying Gartner's IT roadmap. This roadmap has been compiled by expert research and interactions with companies around the globe to draw the best practices for digital transformation. The roadmap suggests proposing three questions to an organisation planning a digital transformation initiative- 1) whether the organisation is looking to optimise or transform? 2) what are the key stages and activities? and 3) who/which leaders are involved? While defining digital transformation in their other research, Gartner highlighted the importance of differentiating between digital optimisation and digital transformation (Gartner 2023b). Question one of the roadmap is essential for organisations to identify which outcome of digitisation they are looking for, optimisation or transformation. *Optimisation* means improving the current business processes, or *transformation* is reinventing the business model (Gartner 2023b). The suggested roadmap by Gartner only proceeds with the next two questions if the answer to the first question is transformation. The answer to this question defines the business ambition and strategy (Gartner 2023a).

The second question then explores the key stages involved in the transformation process. After this phase or the answer to this question helps to identify and create new business models by evaluating the industry's technology disruptions and innovation (Gartner 2023a). When disruptive technologies emerge, transformation is often prioritised over optimisation (Gartner 2023b). Blockchain, an emerging disruptive technology, has triggered the need for digital transformation across many industries.

The third and final question explores and identifies the people or the leaders involved in the transformation process. Businesses that are successful in digital business transformation establish cross-functional teams (Gartner 2023a).

This study explores blockchain's digital transformation process, utilising this roadmap. This research has explored the key stages in blockchain digital transformation and the leaders and their roles in the digital transformation initiative. The findings of this study also confirm the use of this roadmap to study digital transformation for various technologies, and it is interesting to see how the process varies with variations in technological features like blockchain has introduced some distinguished features like disintermediation, decentralisation, immutability and transparency.

3   Research Method

The study utilised a qualitative Delphi technique to achieve the objectives. The study aims to explore the process of digital transformation through blockchain in organisations. Among the widely used research methods for qualitative analysis is the Delphi technique, also known as the Delphi method (Avella 2016; Brady 2015; Rowe and Wright 1999). It is one of the most appropriate methods for filling the knowledge gaps regarding an unsolved problem or exploratory scrutiny of a process (Skulmoski et al. 2007). It is also considered an acceptable method for data gathering from subject matter experts (Hsu and Sandford 2007). The Delphi approach, also known as the Delphi technique, is a widely used qualitative research method that shares similarities with phenomenography, grounded theory, and case studies (Brady 2015; Rowe and Wright 1999). This method is the most suitable as this study explores the digital transformation process by gathering a consensus from experts from different organisations. Delphi was developed in 1963 under "Project DELPHI" at the RAND Corporation. Deliphi aimed to gather expert opinions (Dalkey and Helmer 1963). Delphi's fundamental objective is to obtain a reliable consensus from a group of experts (Dalkey and Helmer 1963).

The Delphi method exhibits flexibility, as evidenced by its application in the literature. Although it traditionally had a quantitative nature, modified versions of the approach demonstrate its compatibility with qualitative research and mixed-method approaches (Skulmoski et al. 2007). In the original method outlined by Dalkey and Helmer (1963), the technique could be implemented through either interviews or questionnaires. Unlike other data collection and analysis methods, the Delphi method necessitates multiple rounds of gathering and analysing data to reach a consensus on a given topic (Hsu and Sandford 2007). The number of rounds typically depends on the revised group responses and the level of consensus or near-consensus among the group members (Chhina et al. 2023). The primary objective of this study is to understand the digital transformation process through blockchain by conducting multiple rounds of interviews with experts from organisations who have successfully started using blockchain for their business. We attained saturation and consensus among the expert responses in 3 rounds of interviews. Table 1 in Appendix A provides the interviewee profiles. The I1-In identifiers are the interview numbers, and R1, R2 & R3 are identified as Round 1, Round 2 and Round 3 rounds of interviews.

Initially, 8 experts participated in a pilot study to identify key themes and ensure that the right questions were being asked. Among these experts, 5 were adopters of blockchain technology, and 3 were consultants. Building on the findings from round 1, round 2 aimed to explore additional themes. In this round, 10 panelists were involved, including 5 adopters, 3 consultants, and 2 experts who had initially considered adopting blockchain but later abandoned the idea. After analyzing the data from round 2, a preliminary decision framework was developed. Round 3 involved soliciting feedback from the experts regarding this framework. Each expert was asked to provide their insights on which elements should be included or excluded from the framework. The final framework was constructed based on elements where a consensus or near-consensus was achieved among the experts.

3.1   Data Collection

A selective purposive sampling approach was used. This approach is in line with the Delphi method, which seeks input from a purposefully selected sample of experts (Brady 2015). We targeted the leaders involved in the digital transformation process in their organisation. Semi-structured interviews lasting approximately 30 to 40 minutes were used. The utilisation of semi-structured interviews facilitated the

identification of specific areas to explore as they encompassed a set of key questions and allowed both the interviewee and interviewer to delve deeper into the phenomenon being studied (Britten 2006). There are no specific formal requirements to ascertain the qualifications of a Delphi expert (Hsu and Sandford 2007), certain criteria were essential for the participants in this study. These criteria included possessing an expert-level knowledge of the research subject, voluntary participation, engagement in multiple rounds of testing, and maintaining communication with the researcher.

3.2 Data Analysis

Thematic analysis was employed to analyse the data. Thematic analysis is a suitable technique for searching, identifying, and reporting emerging themes while examining the phenomenon under investigation (Braun and Clarke 2006). Interviews were recorded and subsequently transcribed for analysis using NVIVO software. Before proceeding to the next round, each interview round was analysed independently. During the analysis, themes were identified, which then guided the formulation of questions for the subsequent round. Prior to conducting the next interview, coding was applied to each transcript, allowing for a focused exploration of important themes in the subsequent interview. This approach emphasised central themes and identified new themes in parallel.

Three rounds of interviews were conducted to achieve consensus among the expert participants' responses and reach a point of data saturation. Data saturation occurs when the researcher no longer obtains new information from participants, thus indicating that further interviews are unnecessary (Schmidt 2004). After the third round of interviews, participants were encouraged to suggest additional insights for the subsequent round. However, as most participants confirmed that saturation had been achieved, data collection and analysis ceased.

4 Findings & Discussion

Analysis of the themes and data against Gartner's IT roadmap for digital transformation questions in a blockchain context revealed some interesting insights (Gartner 2023a). The following sections present our findings:

4.1 Is the ambition to optimise or transform?

Business processes need to be re-engineered and optimised to achieve successful digital transformation (Schwertner 2017). To explore the answer to this question, we asked our study participants about their business goals with the technology and if blockchain aligns with their vision. An organisation's digital business strategy should align with its IT vision to improve the business value of IT (Bharadwaj et al. 2013). Successful organisations leverage strategy and leadership, harnessing the full potential of digital transformation (Schwertner 2017). One of the participants elaborated that they do not see technology as a standalone strategy; instead, they view it as part of the whole digital transformation initiative that aligns with their organisation's vision.

> "In terms of our digital transformation journey for the capital market industry, [organisation name] has a strategic vision called the ABCD of next generation. What it means is, A stands for Artificial Intelligence, B for Blockchain, C for cloud and D is the Digital initiative. So, what do we mean by that is there is a significant opportunity for capital market, stock management firms, process management industry to evolve more in [the] digital world? And in that context, we don't really look at blockchain as an isolated or any independent strategy by itself. We look at it how does it co-exist with larger digital transformation initiative which putting to cloud and AI and the other digital transformation that's happening in the capital market. We don't necessarily look at ourselves like everything needs to move into blockchain or we just want to build solutions using blockchain or we want to be the de-facto dominance into blockchain provider, that's not really our strategy. We looked at using blockchain in niche areas where [organisation name] is the de-facto leader, and we are just positioning to bring the significant changes to the industry. Those are the areas where we stand with blockchain." (I1,R1)

The findings from this study revealed that the organisations moving towards digital transformation adopted blockchain to represent themselves as dominating or early adopters in their industry. Gartner also mentioned that gaining a strategic advantage by exploiting digital technologies for new digital business models is a complete digital transformation (Gartner 2023b). Therefore, to initiate digital business transformation, organisations need to run optimisation and reengineering parallel to digital transformation to attain sustainable and competitive advantage in their industry market.

4.2   What are the key stages and activities?

The roadmap from Gartner suggested evaluating the market, identifying and creating new business models, seeking out strategic partnerships and checking the design for emerging customer needs (Gartner 2023a). However, when we asked participants about the key stages and activities while transforming their business model with blockchain, they mentioned the key stages that led to the first prototype. Figure 1 below describes the stages encountered by the study participants whilst transforming their business model through blockchain.
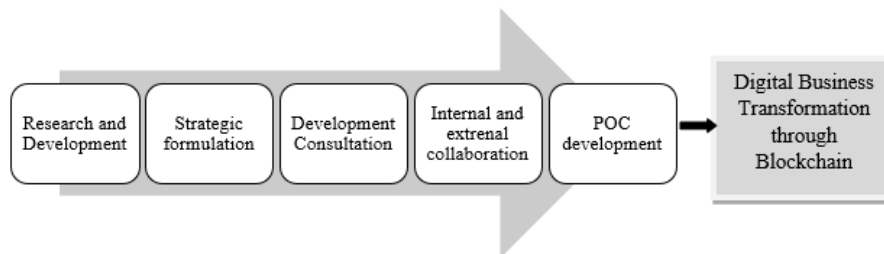

Figure 1: Proposed framework for stages and activities involved in digital transformation through Blockchain.

4.2.1   Research & Development (R&D)

The first stage encountered by the study participants was knowledge gathering through the organisation's research and development (R&D) efforts. The participant responses indicated that these operations are conducted by the R&D or emerging technologies group. One of the participants indicated that they had a formal and informal group of research establishing a process for how this technology could be executed for their business.

> "We wanted to have, we did have formal research and as well as informal research, do I need a centre of excellence and that was essentially set up in 2016 to look at this technology, understand this technology. Understand the implications of this technology to provide rich and working with our corporate development team or corporate strategy team" (I1, R2)

Another participant mentioned that they started researching the technology as it was emerging, they wanted to explore the use cases for their organisation which had a legacy of over 150 years.

> "I was a part of the Innovation team with the mandate of identifying How could a [business] like ours which had a 150 Year Legacy? How were they going to embrace the new technology? And since I was delving a lot in the Blockchain space, I was also pulled into this this spectrum to see what we could do here? and since I was the head of emerging tech, my job was to identify, how can I leverage the technology for our organisation? so a lot of research was involved initially." (I3, R1)

The consensus among the participants revealed formal and informal research is where blockchain transformation starts. Here, they would look for the answer to why they need blockchain. Meyer and Goes (1988) identified this stage as a phase for organisational members to learn about new technological innovations and determine their suitability for business transformation. However, Drljevic et al. (2022) discovered that knowledge about the technology is most important at this stage. Still, the level of that knowledge also gathered influences and determines how aware the organisations are about transformation with this technology. Therefore, research and development emerged as blockchain's first stage and activity in the digital transformation process.

4.2.2   Strategic Formulation

The strategic stage is futuristic and thus involves planning the innovation (Bhattacharya 2015). From the analysis, this stage involves laying down the strategies for the business after utilising or while utilising innovation. Almost all decision-making models for organisations include this step of generating alternatives, which determines what goals decision-makers want to achieve by choosing a particular technology option for their business (Lunenburg 2010). One of the participants mentioned that the next activity involves the company's founders, the business leaders, mapping their strategies with the business advantage of using the technology.

> "It is then for Founders of the company; the business level people for them to identify the business need of the idea...assessing the ROI. We mapped our strategies for what would

blockchain technology brings to their organisation. How would they make money out of the technology?" (I3, R3)

The initiator participant from one of the organisations mentioned that the technology-related people might identify the need, but it is the business people who make the final decisions after evaluating if there is strategic value in using the technology for their business.

> "We are the tech people; we cannot adopt blockchain until the business owners see a value. In our case we explored few use cases and took it to our CEO." (I7, R3)

Kumar Bhardwaj et al. (2021) explained that top management support is the degree to which this top management is involved in the process and comprehends its significance. If the transformation process through a new technology gets leadership support, other stakeholders are aligned towards the process (Dwivedi et al. 2021). Therefore, business leaders must develop and map their business strategy early to identify the strategic value in utilising the technology to transform their business processes. At this stage, if technology is a goal for digital transformation, it should be articulated in the organisation's digital business strategy (Gartner 2023a).

4.2.3 Development Consultation

The involvement of external technology consultants like Gartner, IBM, KPMG etc. is important before delving into any technological development. Having justified the strategic need for a blockchain solution in the previous stage, we now enter the implementation decision-making stage of digital transformation. It is possible to perform this stage by reading about the technology, attending workshops about it, and contacting people who know it (Sanson-Fisher 2004). One of the study participants mentioned that they hired an external consultant to work on their site, which helped them better understand their processes and requirements.

> "We hired consultants to work at our site. That gave them the confidence to learn the existing process well. But yes after the business-people we went out to get the quote from consultants and discuss our requirements." (I7, R1)

As a result of this analysis, organisations typically consult developers for their understanding of blockchain. Blockchain technology experts estimate the future value of blockchain projects. How an organisation digitalises, creates more value with the technology and takes the technological changes in its corporate culture determines how well they have taken the digital transformation process (Schwertner 2017). According to the participants in this study, consultants play a significant role in deciding whether to consider technology for digital transformation because they provide a unique perspective on the market and reveal aspects of technological innovation that are not considered by an organisation's limited knowledge base. A large organisation with sufficient innovation knowledge will likely take advantage of it, while smaller firms engage external IT experts like consultants to supplement their expertise (Thong 1999).

4.2.4 Internal & External Collaboration

It is important to seek out internal and external strategic partnerships that align with an organisation's transformation vision to increase the speed and quality of the initiatives (Gartner 2023a). The participants of this study also asserted the importance of internal and external collaboration as the next activity in the digital transformation process. These collaborative activities aim to increase the chances of development and contribute to the design and development of technical solutions. A participant, a consultant founder himself, mentioned that at this point the interested organisations approach them asking them questions about the cost, complexity and resources required for their idea.

> "Since I am a development consultant, right? I get a phone call right at this point, and they want to discuss blockchain's idea with me, and they say, we have got this much funding, do you really think this is something that you could work with? And then I'll go through the documents, the initial research and the current standing, how much they can raise and then if they ask me for an onsite position or maybe as a full-time consultant for them, then my day-to-day job for them is to really validate their idea. If there are chances of improvements, I do that. If they're looking forward to hire some, some people from the outside world, generally the blockchain engineers, I help them to find talent." (I4, R3)

Ediriweera and Wiewiora (2021) also emphasised the importance of communication with stakeholders internally and externally. Toufaily et al. (2021) have discovered that collaboration is one of the challenges in blockchain projects and the main ingredient for successful outcomes. The literature shows this alignment would drive internal and external stakeholders' confidence and enthusiasm about

blockchain. Therefore, engaging the stakeholders in the transformation process through technology helps gain confidence in the technology. Especially blockchain, an inter-organisational technology, needs strong stakeholder engagement in digital transformation.

4.2.5 Proof of Concept (POC) development

The literature has revealed a requirement for a framework that defines elements of value to improve the acceptance of POC-driven technologies (Korte et al. 2020). POC development appeared as the final activity involved in digital transformation through blockchain from the gathered responses. The participants emphasised the importance of POC development before a final decision on the technological transformation of a business. One of our participants mentioned that when they reached the final stage of POC development, the developers attempted to showcase how the technology could improve their processes.

> "As we reached the final stage which is the POC development and here the consultants or the developers they showcase how the POC would work. POC is something which is obviously the final product with just some limited licenses, and they're showcase it with how blockchain technology would improve their new process with improved processes, improved trust and transparency. For an example how the decentralised process would be more efficient." (I2, R2)

It is important to create a Proof of Concept (POC) to understand the full potential of digital technologies and clearly define digital transformation (Van Dyk and Van Belle 2019). The POC is often a fraction of the entire system, and testing a POC involves verifying the concepts and assumptions before actual development (Tan and Masood 2022). POC prototypes new features and advances with the benefits for which the technology was introduced to the organisation in the first place. Therefore, POC development is the final activity of the digital transformation process through blockchain which involves testing the prototype of the anticipated business process.

4.3 Which leaders and teams need to be involved?

Digital business transformation initiatives are most successful when they are implemented by cross-functional teams (Gartner 2023a). We explored the answer to this question by asking our participants involved in each activity that they elaborated on in the transformation process. The data described the hierarchy of people involved in the process as per the stages discussed in the previous section.

At Research & Development: The teams identified at this stage are R&D and the merging technologies group. One participant indicated that two teams work hand in hand at this stage, one researching new solutions and one working on ideating the use cases with a potential technology.

> "This is actually divided into two teams, usually. In fact, at least in our organisation also we have divided this into two different teams. One is the team that keeps on hunting for new technologies and new solutions out there and there is one more team who works on Ideating a new idea or a new a new product." (I1, R3)

The first stage is triggered by the research group and the emerging technologies people who are technical and understand the technology. At this stage, these people try to explore a potential blockchain use case for their organisation.

At Strategic formulation: At this stage, the people identified are primarily the business team and the top management responsible for decision-making. These include the Chief Information Officers (CIO), Chief Technology Officers (CTO), founders, and other leadership team members. One participant from this study mentioned that the people involved in stage 1 take the blockchain idea to the business leaders and try to justify the technology will make a strategic advantage.

> "So, a group of people sit together, and they formulate sort of a business plan with the technology, now they sat down to build up to make up a business case, went to the business level. People like the founders who don't know anything about technology. But they own the business. R& D team tries to justify how blockchain would help their business to grow." (I4,R3)

Top management's committed interest in the technology is crucial to ensure the company's profitability and long-term viability in the transformation through a technology (Sarker et al. 2006).

At Development Consultation: Consultants, business leaders, and R&D are the people involved at this stage. Before the use case is finalised, business owners and the R&D team members provide input in the discussion with consultants to ensure expectations are clearly understood.

"Like I mentioned as this the most crucial stage it is important to understand it from all stakeholders' perspective. They bring the emerging tech people; the business leaders of course and then explore the consultant perspective on their idea" (I6, R3)

The role of consultants is crucial in management's choice as they align the manager and the firm's interests by recommending an optimal course of action (Leiby 2018). Consultants fill the managerial gap by advising to improve the operation of the transformation process through the direct transfer of expert knowledge, sharing implicit and explicit experience and cross-pollinating between firms (Bessant and Rush 1995). However, the recent literature and studies on digital transformation and decision models have failed to uncover the importance of these consultants and their role in the adoption decision process.

At Internal and External collaboration: The study identifies the internal and external stakeholders participating in the blockchain-based process as the important people to be involved at this stage. The importance of involving internal and external stakeholders is not hidden from the literature view. Yin and Ran (2021) mentioned that influential and productive relationships can be maintained with internal and external actors using collaboration. One of the participants exemplified that it is important for all stakeholders to be on board before the development starts and should understand how this technology would affect them and their processes.

"All internal and external stakeholders should be on board even before the development has started. So, at this point they should understand the requested changes and how blockchain would affect them. Like transparency etc." (I5, R2)

Pólvora et al. (2020) also highlighted the importance of stakeholder engagement and prototyping with stakeholders. Internal relationships can drive collaboration, coordination, and digital transformation through blockchain (Kouhizadeh et al. 2021). Therefore, the study suggests taking all internal and stakeholder confidence in the technology for the success of digital transformation projects.

At PoC Development: The study identified that it involves all people involved in the process and will be using the technology. The consultants who build the prototype are involved at this stage. All stakeholders evaluate the POC based on their perceptions and requirements. As suggested by one of the study participants, it 9is important for all participants to consent to the new process features utilising blockchain technology.

"Here we present with the working prototype to all the participants, primarily the adopting organisation and get their consent on the new features. The additions might come at that point or later after use but that goes outside of the current agreement. The process should reflect that blockchain would benefit them and how it would transform their business efficiently" (I4, R3)

At this stage, a prototype is developed, a small final product showcasing how the new technological features can be utilised. At this stage, the solution proposed by the heterogeneous engineer locks in as it is accepted by more people (McMaster et al. 1997). After this stage, a decision is made to either adopt or reject the idea or goes for an iteration if the prototype is suggested to have further amendments by the stakeholders. Therefore, all process participants are identified as the people involved at this stage.

5   Implications

The study provides insights into the digital transformation process through blockchain. The proposed model indicates that the digital transformation process of blockchain-based IS emerges with an idea from someone who knows the central IS/IT subject knowledge- the R& D team. The next stage then leads to strategies used by the R&D team and the emerging technologies group to align the business team, developers, internal and external stakeholders, finance and legal, and the external consultants' team, to identify the business and financial needs of the technology, aligning their interest towards digitisation with blockchain. Then once the business leaders are convinced, the consultants give a practical picture of their expectations at the next stage. The following stage then involves all the internal and external stakeholders on board and gets their perfective on the transformation process. The final stage then involves building a prototype commonly known as POC and involves all process participants and consultants to provide feedback on the new blockchain bases process. The study emphasises the importance of fostering innovation champions within the organisation who possess expertise in IT and blockchain. Addressing stakeholder concerns through open communication, developing a compelling business case, iterative prototyping, and the utilisation of external expertise further enhance the process, ensuring the successful integration of blockchain-based information systems into the digital

transformation journey.The findings of this study have several implications for organisations looking to embark on this journey:

- **Identify and Foster Innovation Champions:** It is important to have an R&D team with strong IT and blockchain technology skills. Organisations need to identify and develop innovation champions within their R&D teams who can drive the ideation process for blockchain-based IS. These champions will be crucial for generating and refining ideas to achieve digital transformation.

- **Strategic Alignment with Stakeholders:** Various organisational stakeholders must be aligned to achieve successful digital transformation with blockchain. Several departments are involved, including the business team, developers, finance, legal departments, and internal and external consultants. All these stakeholders must be aligned towards the common goal of digitisation with blockchain strategy.

- **Addressing Stakeholder Concerns:** Addressing concerns and reservations raised by internal and external stakeholders during the digital transformation process is essential. To do this, organise workshops, town halls, or other communication channels so that all relevant parties can share their perspectives and feedback. As a result of proactively addressing concerns, a blockchain-based process can be implemented smoothly and more widely accepted.

- **Business Case Development:** Blockchain-based IS must be backed by a robust business case to convince business leaders. There should be a clear explanation of the potential return on investment, cost savings, efficiency gains, and other tangible and intangible benefits.

- **Iterative Prototyping and Feedback Loop:** Digital transformation requires the development of prototypes, also known as Proof of Concepts (POCs). All participants and consultants need to be involved in providing feedback on the prototype. The iterative process allows the blockchain-based system to be continuously improved and refined, ensuring that it meets the needs of all stakeholders.

- **Leverage External Expertise:** In the study, external consultants are identified as crucial to the transformation process. Through the entire transformation process, organisations should leverage the expertise of external consultants with experience implementing blockchains.

As a result of considering these implications, organisations can improve their chances of successful digital transformation through blockchain-based IS, leading to increased efficiency, transparency, and competitiveness.

6 Contribution & Conclusion

This study explored how organisations can lead digital business transformation using blockchain technology. We examined the stages from ideation to prototype development in the digital transformation process for blockchain-based IS. The study identified the key activities in the transformation journey using the Gartner roadmap for IT digital transformation. The proposed model outlined the critical steps in the digital transformation process. A strategic alignment was emphasised among various stakeholders, including the R&D team, the emerging technologies group, the business team, developers, internal and external stakeholders, finance and legal, and external consultants.

A key contribution is the emphasis on strategic alignment among different stakeholders involved in the digital transformation process. The study recognises that addressing stakeholder concerns and gathering feedback at multiple stages of the transformation process are crucial for ensuring the success and acceptance of blockchain-based IS. This aligns with best practices in change management and emphasizes the human element in digital transformation, which is often overlooked. The study highlights the practical implications of embracing blockchain-based IS for digital business transformation. It underscores the importance of having skilled individuals with expertise in both IT and blockchain to initiate the process and generate innovative ideas. This practical guidance can assist organisations in building the necessary capabilities to drive transformation effectively. We suggests that organisations that embrace these technologies are likely to increase their efficiency and transparency, making them more competitive in the digital era. The study acknowledges the limitation of a qualitative-only approach and suggests future research directions. The call for collecting quantitative data to validate the findings indicates a commitment to strengthening the empirical basis of the research. These lessons contribute to the evolving body of knowledge on blockchain-driven digital transformation and provide practical guidance for organisations on this transformative journey which were not clear earlier.

7   References

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Appendix A

Table 1 Participant profiles

Pseudonym	Designation	Experience in years	Round 1	Round 2	Round 3
Interviewee 1 (I1)	Executive vice president	21	✓	✓	✓
Interviewee 2 (I2)	Founder	20	✓	✓	✓
Interviewee 3 (I3)	Co-founder and CTO	18	✓	✓	✓
Interviewee 4 (I4)	Chief Innovation Officer	12	✓	✓	✓
Interviewee 5 (I5)	Co-Founder and CTO	9	✓	✓	✓
Interviewee 6 (I6)	Enterprise Architect and Blockchain Advisor	30	✓	✓	✓
Interviewee 7 (I7)	Senior Software Engineer and CTO	10	✓	✓	✓
Interviewee 8 (I8)	Lead Engineer	8	✓	✓	✓
Interviewee 9 (I9)	Senior Consultant	6		✓	✓
Interviewee 10 (I10)	Co-Founder	7		✓	✓