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Leadership competencies and blockchain implementation in public sector organizations: a sensemaking approach

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Abstract

Purpose – This study aims to explore the required leadership competencies for successful blockchain technology (BCT) implementation in public sector organizations from a sensemaking perspective.

Design/methodology/approach – The study uses a multiple case study design. Primary data are collected by conducting semi-structured interviews with several representatives of Finnish public sector organizations. Written material from the selected organizations complements the primary data. NVivo14 is used to generate codes and analyze data.

Findings – The analysis shows that through sensemaking, leaders identify cues for digitally transforming their organizations through blockchain by leveraging their curious and rational vision. After identifying the cues, leaders then interpret these cues through technological understanding and exploring different technological solutions. Once the cues are interpreted for blockchain implementation, the third step is enactment after interpreting the cues. Leaders can facilitate the enactment of blockchain by connecting the outcomes of blockchain with organizational processes and goals. Furthermore, a dark side of BCT is identified, consisting of overly optimistic expectations and creating technological dependencies in the public sector.

Research limitations/implications – The study was conducted in 11 public organizations in Finland, which limits the generalizability of the findings. Leadership competencies that are required for blockchain implementation within organizations can be studied further by considering more use cases. The potential dark side of blockchain implementation can be explored further.

Originality/value – The presented research model of leadership competencies for blockchain implementation is derived from sensemaking research and contributes to the literature on leadership competencies by applying sensemaking to the study of BCT.

Keywords Sensemaking, Leadership competencies, Blockchain technology, Public sector organizations

Paper type Research paper

1. Introduction

The contemporary age of digitalization is exerting significant pressure on organizations in the private and public sectors alike to commence and advance a digital transformation agenda

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(Imran *et al.*, 2021). Government 3.0 personifies the latest phase of digitalization within the public sector, characterized by the broad integration of emerging technologies including artificial intelligence, blockchain, cloud services and big data. Blockchain technology (BCT) holds promise for governmental organizations as it can offer potential cost reduction, process simplification, reinforced trust and transparency, and reliable recordkeeping (Ølnes *et al.*, 2017; Haug *et al.*, 2023; Shahzad and Imran, 2021). However, its transformative potential hinges on effective leadership and the capacity of leaders to make sense of the novelty and complexity of the technology (Pittaway and Montazemi, 2020). Leadership competencies refer to the specific skills, traits and behaviors that leaders possess and develop (Alshareef and Tunio, 2022; Imran *et al.*, 2021; Van Wart, 2011). Leaders with the right competencies may be in a better position to navigate the complexities of blockchain adoption and manage the underlying change management process for blockchain implementation (Alshareef and Tunio, 2022).

Given their varying backgrounds and knowledge and the characteristics of blockchain, leaders need to possess sensemaking competencies to navigate and make sense of the potential benefits and suitability of the technology within their organizational settings. Therefore, the underlying starting point of this article is that sensemaking is a critical component for effective decision-making, particularly when it comes to the implementation of novel and emerging technology such as blockchain. Sensemaking, as defined by Weick (1995), is the process through which individuals give meaning to their collective experiences. It has been widely used in organizational studies to understand the cognitive processes that underlie decision-making and leadership (Weick *et al.*, 2005).

Despite being a growing multidisciplinary approach, the application of sensemaking to blockchain implementation has been limited. The process of sensemaking that leaders go through as they consider adopting blockchain is practically and theoretically important due to the novelty and complexity of the technology. Leaders need to navigate the uncertainties associated with the technology, interpret its relevance within their organizational context and make strategic decisions on its implementation (Moqaddamerad and Tapinos, 2023). Therefore, this article aims to explore the leadership competencies that could facilitate blockchain implementation in public organizations. The article uses sensemaking as a theoretical lens to interpret how public sector leaders in selected organizations make sense of their competencies as they consider implementing blockchain. Based on qualitative data, we provide a framework for public sector leaders to use as they consider adopting the technology. We ask the following research question: *How do public sector leaders 'make sense' of their competencies as they consider implementing blockchain technology within their organizations?*

To address this research question, we analyzed multiple case studies of selected public sector organizations in Finland and conducted semi-structured interviews with their middle and higher-level leaders. Through our analysis by using sensemaking, we identified key leadership competencies required for successful blockchain adoption and consequently enriching the body of knowledge on leadership competencies (Bass, 1990; Imran *et al.*, 2021; Getha-Taylor and Morse, 2013; Van Wart, 2011). It does so by proposing a framework for leaders, accompanied by a set of competencies required at each stage of the process (Brown *et al.*, 2015; Weick, 1995). This process includes the identification and interpretation of cues, followed by appropriate enactment, all the while considering the dark side of the technology.

2. Theory

2.1 Leadership competencies and blockchain technology

Leadership is crucial in public administration for transforming organizations. It involves influencing, creating vision, driving change, building consensus, and using emotional intelligence and common sense. Leadership is defined by traits, behaviors and skills, leading to styles such as transformational, transactional, collaborative, empowering and laissez-faire

(Backhaus and Vogel, 2022; Muterera *et al.*, 2018; Van Wart, 2011, 2013). Leadership competencies include idealized influence and inspiration (charisma), intellectual stimulation (rationality and creativity) and individualized consideration (personalized coaching) aimed at exceeding performance expectations (Bass and Steidlmeier, 1999; Muterera *et al.*, 2018). Some leaders focus on exchanging relationships by rewarding employees, and managing them actively and passively (Bass and Steidlmeier, 1999; Nguyen *et al.*, 2022). Collaboration fosters cooperation and win-win situations through shared power and networks (Getha-Taylor and Morse, 2013; Van Wart, 2013). However, implementing collaborative leadership can be challenging due to organizational limitations and the inability of networks to replace hierarchies, potentially reducing productivity and effectiveness (Van Wart, 2013).

Effective leadership and disruptive technologies can reduce costs and improve public service delivery, making digital leadership crucial. Key leadership competencies include managing change, quick decision-making, motivating teams, using technology efficiently and building strong stakeholder relationships. These relationships foster organizational transformation (Cortellazzo *et al.*, 2019; Nuryadin *et al.*, 2023). Leaders also need vision, strategy, communication, collaboration and technological expertise to tackle complex issues (Van Wart *et al.*, 2019; Nuryadin *et al.*, 2023). Leadership competencies can digitally transform organizations using BCT, which introduces a distributed ledger for trustful trade, and its wide-spread acceptability made it a general-purpose technology for digital transformation, especially for better administrative services in public organizations (Ølnes *et al.*, 2017; Shahzad *et al.*, 2024; Sung and Park, 2021).

Public sector BCT applications include digital identity, land registration, healthcare, education and data management (Tan *et al.*, 2022). BCT can be a solution to leadership goals for public organizations (Sung and Park, 2021), which can enhance data integrity – consistency, security, reliability, timeliness, non-repudiation and non-manipulation, – though not fully guaranteed it (Ølnes *et al.*, 2017). It also facilitates information sharing through consensus, reducing intermediaries for faster and more transparent services (Ølnes *et al.*, 2017; Sung and Park, 2021). Blockchain eliminates intermediaries, ensuring trustworthy transactions (Mohamed *et al.*, 2022; Juszczyk and Shahzad, 2022). Data security is enhanced as accepted information cannot be altered by anyone other than the controlling party, allowing for transaction tracking (Atzei *et al.*, 2021). However, reduced independence increases the risk of permanent data loss (Mohamed *et al.*, 2022), and redundancy may impact BCT's capacity, cost or transfer speed (Perlman, 2017). Moreover, adaptability is also a concern, as speed and cost can decline with more transfers (Mohamed *et al.*, 2022). For blockchain characteristics and goals please see Table 1.

Table 1. Blockchain characteristics

Blockchain characteristics	Blockchain goals Organizational perspective	Citizen's perspective
	Data integrity	Seamless services for users
1. Decentralization	Cost reduction	Increased satisfaction of users
2. Trust	Operational efficiency	Increased trust
3. Transparency	Innovation in government organization	Fast and transparent services
4. Immutability	Simplification of bureaucracy	
5. Redundancy	Increased reliability	

Source(s): Authors' own work

Leadership competencies are evolving to manage organizational transformation through blockchain amid disruptive technologies (Cortellazzo *et al.*, 2019). Effective leadership requires diverse competencies for digital transformation, enhanced through training, education and practice. Leaders must initiate complex public-oriented digital

transformations with technologies such as blockchain (Ushaka Adie *et al.*, 2024). Public sector literature highlights leadership's role in digitalization and the challenges for leaders (Staniulienė and Lavickaitė, 2022). While blockchain is a driver for digital transformation, its application in the public sector is understudied (Sousa, 2023). Further research is needed to explore how blockchain impacts public sector leadership skills. This study investigates leadership competencies for successful blockchain adoption and implementation.

2.2 Sensemaking of leadership competencies for blockchain implementation

Sensemaking is the process of understanding, organizing, and making sense of uncertain, equivocal or emerging issues by seeking plausibility and structuring the unknown (Brown *et al.*, 2015; Moqaddamerad and Tapinos, 2023; Weick, 1995). This process simplifies complexity through individual mental models, utilizing previous experiences to anticipate and act accordingly. Retrospective in nature, sensemaking helps to identify potential future crises (Combe and Carrington, 2015; Moqaddamerad and Tapinos, 2023; Weick, 1995). Moqaddamerad and Tapinos (2023), emphasize its importance in uncertain situations, as it aids in better decision-making during disruptive events. However, integrating retrospective and ongoing experiences can be challenging since ongoing experiences can change the retrospective sense. The concept can be summarized in an integrated way, noting that even though life is lived forward, the understanding of life occurs concerning the past (Pye, 2005). Sensemaking is crucial in unexpected and dynamic environments (Moqaddamerad and Tapinos, 2023), as it influences digital transformation through the adoption of technologies, and its wide span across multiple disciplines such as leadership, digital thinking and information creation (Zulu and Saad, 2023). Furthermore, organizational capacity and a leader's competency in environment scanning play a role in seeking relevant information for its survival, technological advancements and trends (Daft and Weick, 1984). The sensemaking process includes *creation*, i.e. recognizing and extracting cues from a disruptive event, *interpretation*, i.e. forming an initial understanding and unfolding it into a cohesive interpretation, and *enactment*, i.e. acting based on the developed sense and reinstating the interrupted activity (Brown *et al.*, 2015; Daft and Weick, 1984; Moqaddamerad and Tapinos, 2023; Weick, 1995).

Leaders leverage insights and assumptions to guide others toward a specific goal, and effective communication enhances the likelihood of organizational change (Combe and Carrington, 2015). According to Thayer (1988) "p. (263)" "*The leader is a sense giver*" because leaders can provide sense, indicating that leaders provide meaning and direction that inform decision-making (Ruben and Gigliotti, 2016). Trustworthy leadership is crucial for adapting to organizational change (Tan *et al.*, 2022; Yasir *et al.*, 2016). Trust is a vital competency for leaders in achieving organizational goals, enhancing performance, fostering innovation and improving knowledge (De Lima Rua and Costa Araújo, 2015; Yasir *et al.*, 2016). By cultivating trust among stakeholders and drawing on past experiences, leaders can make sense of the future by identifying cues related to the technology (Daft and Weick, 1984; Moqaddamerad and Tapinos, 2023). BCT is known for its aspect of trust as it removes all third parties from transactions (Shahzad *et al.*, 2024; Juszczyk and Shahzad, 2022).

For digitally transforming organizations, competencies such as communication skills, experimentation, open-mindedness, empowerment and many others (Imran *et al.*, 2021) can help leaders in recognition of cues from the environment and use them to make sense and take decisions accordingly (Brown *et al.*, 2015). Empowerment enables employees to present and test new ideas, fostering creativity in problem-solving. Leadership should be less formal and more open to future-oriented goals with encouraging behavior for knowledge development, particularly in bureaucratic public organizations (Van Wart, 2013). Organizations with decentralized structures have a greater chance of achieving their goals (Imran *et al.*, 2021), particularly through blockchain. Competencies of knowledge sharing and collaboration enhance creativity, innovation and effectiveness (Imran *et al.*, 2021; Tangaraja *et al.*, 2015).

However, public organizations often struggle with creativity and innovation due to their focus on efficiency and quality control, which can hinder experimentation and risk-taking (Van Wart, 2011). Leaders can foster knowledge sharing by creating networks and communities through technology like blockchain, enhancing understanding of the technology (Tangaraja *et al.*, 2015). By interpreting cues meaningfully through knowledge sharing and collaboration, leaders can develop solutions to complex issues, facilitating technological enactment (Cecez-Kecmanovic *et al.*, 2003). Also, leadership vision allows for envisioning future possibilities by connecting current cues to future scenarios (Brown *et al.*, 2015; Daft and Weick, 1984; Moqaddamerad and Tapinos, 2023; Van Wart *et al.*, 2019; Weick, 1995). While sensemaking has been studied in various public sector contexts (Luna-Reyes *et al.*, 2021; Martin-Rios, 2016), its application to leadership competencies in the blockchain context remains understudied, highlighting the need for further research on this significant topic.

3. Research methodology

We adopted a qualitative exploratory approach to conduct an in-depth, yet salient, multiple case study to obtain an extensive understanding of the phenomenon (Yin, 2009). Qualitative research methodology is crucial for theory building due to its novelty, testability and empirical validity (Eisenhardt and Graebner, 2007). A multiple case study design is methodologically sound for exploring "what," "how," or "why" questions (Yin, 2009). This approach also allows for data analysis across various situations, grounded in diverse empirical corroboration (Eisenhardt and Graebner, 2007). The empirical findings stem from investigating public organizations in Finland that have either adopted BCT in some operations (two organizations) or expressed interest in its adoption (nine organizations). We selected these cases following Huberman *et al.* (2012) approach. The primary criterion was the active pursuit of BCT integration in strategic initiatives. Due to the limited adoption of blockchain in the public domain, we engaged with two organizations that have initiated pilot cases to gain insights into required leadership competencies. Another criterion was shared features in digital leadership, such as senior leadership with diverse digital competencies across various public sector organizations. Lastly, we focused on diverse public sector organizations that recognize the opportunities BCT presents for enhancing governance. Table 2 provides details about the cases and contextual information, including their interests and actions in developing digital infrastructure, including blockchain and leadership.

3.1 Data collection

This research utilized both primary and secondary sources, with data collected in 2022–2023. Primary data included semi-structured interviews with representatives from 11 public sector organizations, while secondary data comprised publicly available information, such as organizational webpages and project reports. Secondary data enhanced understanding of the past development of the cases and the current technological implementation. The study integrates literature and empirical data from the case organizations (Dubois and Gadde, 2002). We adopted a tripartite approach: reviewing relevant literature on leadership competencies, sensemaking and blockchain; developing a semi-structured interview protocol to conduct interviews with 13 key experts ranging from top-to middle-management positions (see Table 3); and piloting the interview guide. Moreover, using snowball sampling, we engaged additional key informants. Participant selection was based on relevant expertise and experience, ensuring maximum variation across public sector organizations. All 13 anonymized semi-structured interviews were conducted online (40–105 min) via Zoom and Microsoft Teams in English, recorded and transcribed verbatim. The full transcription resulted in 172 pages and 690 min of content. We used the interview protocol to guide conversations around the research questions, with most interviews conducted by two research team members to ensure reliability and consistency.

Table 2. Introduction of cases and contextual information

Contextual information	Case A	Case B	Case C	Case D	Case E	Case F
Background and services	Smart mobility and productized digital ecosystem services	City organization developing and offering several services to various stakeholders	Legal information solution provider	Public administrative authority	Social protection services	Legal solution services
Digital strategy and leadership development actions	- Developing digital capabilities for data processing and new service solutions - Optimization of infrastructure investments - Developed strong leadership, process digitalization and competence development	- Investments in developing and utilizing digital infrastructure - Upskilling and participatory leadership culture	- Developing new digital services for stakeholders as well as for digital asset management - Leadership skills development through identifying most important tasks, accountability and efficiency	- Focus on people-oriented digital transformation and better utilization of data in society - Setting direction for digital practices and services in the government sector - Public service leadership development and management	- Developing programme to build a digital benefit processing system for the future - Strategic leadership development enabling the organization to execute digital strategy - Digital leadership through proactive and anticipatory approach	- Digital transformation, software development, fintech, data and data regulation - Public procurement of technology and digital assets - Development of leadership capabilities in creating diverse culture, emphasizes team building, understanding and talent development
No. of Interviews	1	1	1	1	2	1

(*continued*)

Table 2. Continued

Contextual information	Case G	Case H	Case I	Case J	Case K
Background and services	Research organization	Regulatory authority for social and environmental protection	Revenue management services	Technological platform for blockchain	Developing a network of verifiable data
Digital strategy and leadership development actions	-Unleashing superius performance and sustainability in digital systems Digitalization and science-based innovation -Systemic and technological breakthroughs for industrial and societal transformation -Responsible leadership relying on relevant indicators and data and overseeing and implementing digital strategy -Combining vision building and foresight to develop impact leadership	-Customer and user-oriented digital services -Enabling the use of emerging technologies -Focused self-assessment of safety culture and leadership -Assessing effectiveness of processes in achieving the objectives through work performance and leadership	-Employed in digital financial administration -Virtual currencies, NFTs and blockchain technology -Promoting experiment culture to improve leadership, trust and interaction by utilizing agile methods	-Reforming blockchain in different sectors by connecting with global players in the blockchain space -Reforming traditional mindset through education and interactions	-Leading software and digital engineering transformation and ensuring the correctness of data in digital interactions -Developing understanding technological innovations and organizational culture -Adoption of new practices, continuous learning and data-driven management skills
No. of Interviews	1	2	1	1	1

Source(s): Authors' own work

Table 3. Interview participants' positions and their sector of service

Interview participants positions	Organization	Years of experience	Duration of interview
Chief Ecosystem and Technology Officer	Transport and Communications Agency	5	45 min
Director of Municipal Infrastructure	City Government Organization	4	45 min
Managing Director	Legal Information Solution	4	60 min
Lead Service Designer, Innovation Unit	Social Protection Organization	5	40 min
Blockchain Specialist	Social Protection Organization	5	40 min
Development Expert	Tax Administration and Revenue Management	27	105 min
Senior Advisor	Public Administrative Authority	10	50 min
Counsel, Head of Public Procurement	Legal Solution Organization	7	65 min
Team Lead	Government Research Organization	15	40 min
Principal Advisor	Regulatory Authority for Social and Environmental Protection	33	40 min
Senior Inspector	Regulatory Authority for Social and Environmental Protection	32	50 min
Board Member	National Technology Innovation Hub	2	60 min
Chief Technology Officer	Data Network Organization	1	45 min

Source(s): Authors' own work

3.2 Data analysis

For this study, three types of data were utilized: interviews, organizational reports and PowerPoint presentations. Otter.ai was used to transcribe interviews, and Google Translate was utilized for translating written material from Finnish to English. We initiated a thematic analysis of the data (Braun and Clarke, 2006). To familiarize ourselves with the data, we selected four random interviews for initial reading, focusing on transcripts from organizations that implemented blockchain pilot cases and those expressing interest in its implementation. This comparison helped us understand the potential differences between the two groups. We then reviewed all interviews to gain a comprehensive understanding of responses and compared our findings with secondary data sources. To reduce confirmatory biases, we adopted a semi-ignorant approach to existing literature, as recommended by Gioia *et al.* (2013). An iterative method was employed to identify key themes emerging from the interviews using NVivo 14, a useful tool for coding concepts and outlining their interconnections.

To code the data, we followed a systematic approach illustrated in Figures 1–3 (Gioia *et al.*, 2013). This method offers a structured way to develop codes based on data-driven evidence, enhancing the study's trustworthiness while exploring unexplored concepts. Initially, we applied open coding to categorize raw textual data, grouping it thematically, resulting in fewer categories. These codes were condensed into first-order themes, including respondents' quotes. As new ideas emerged, we added codes to the NVivo coding scheme. Next, we employed a theoretically driven structural coding approach, grouping first-order codes into second-order themes linked to literature on leadership competencies and sensemaking (Gioia *et al.*, 2013). Multiple rounds of theme identification were conducted, explaining the empirical data. Upon reaching theoretical saturation, we derived aggregated categories for each theme, organizing the data by combining theoretical dimensions after fully understanding the second-order themes (Gioia *et al.*, 2013).

1st order themes	2nd order themes	Aggregated themes
Curiosity: I think it's important that you are curious, and you try different things and figure it out and maybe look at examples which you find very useful and make you curious. When the project was started, since then, people are active and curious about this blockchain technology, and we got many members from all the ministries and agencies interested in this technology.	Curiosity and rationality	Competencies of identifying cues
Vision: Of course, the leader is just one person and then his team who believes in the vision The future action depends on what is the level of ambition. We are trying to renew both services. So, we want to be more innovative. But I think one vision is to be like, continuous development and innovation of new functionality and features that we stay on top.		
Rationality: The reality is that this is not like a kind of free will selection of technology here. I think that when you're using new technology, you need to have a clear explanation why you are doing it. So, I think that a very good and clear reasoning that, you need to be very crisp and simple. First, build the knowledge, build the reason.		
Technology awareness: Of course, it applies to any technology. If you want to go with new technology, you need to make sure that the people understand the technology and its implications. Well, of course you must be able to describe the new technology and its benefits in a positive way. We increased the knowledge about blockchain and provide a demonstration, how it can be used for our organization, and I think it was very successful in the project.	Technological understanding	Competencies of interpreting cues
Onboarding employees for technology: The approach is that first, we educate employees utilizing some kind of Information sessions and start more from the value perspective, explaining that this is what we want to achieve with this new technology. I will say that it's important that everybody in the team understands why we are doing this.		
Teamwork for technology: I think we should have more internal collaboration. We should investigate accomplishing the task. And I believe 90% of the times development teams work nicely. We should have multiple team meetings, one team explaining to the others what they have accomplished.		
Openness to new ideas and creative solutions: We have certain technology sector which is being applied and projects are not just randomly started with randomly selected technology and architecture, but we have a pretty well-defined preferred set of technology that we will apply, and of course, it is Preferred that the technologies being selected for a project will have to be justified. Bringing some expertise to the table, who really know the thing and have some workshops or something like that to motivate employees so that they can have their own input and ideas. It is important to pilot new technologies, for example testing new ways of doing things and finding out if that really helps us or not.	Exploring different technological solutions	
Examples from other use cases: Quite often it starts from a good example from some other city or some collaboration with other cities. We're not pioneering new technology that much, but like seeing what's working for other cities and then figuring out if we're going to implement that technology. And during this experiment we talked to different organizations in Helsinki and asked if they have similar use cases. For blockchain we need more real-life success stories, and no more endless PowerPoint stories.		
Previous experience: Well, explaining the differences between the past and what's coming, so that they know the past, and what they must do in the future, while also you are listening to the lecture, for instance, and that can help them understand better from their past. we should have some kind of Reference for that project from our previous experience.	Technological enactment	Competencies of enactment
Experimentation: We need some national sandbox to experiment with and face the legal or other challenges that will help in using this technology. I think that maybe the easiest way is to have some kind of small project or something like that to get results. So, it's like piloting something.		
Planning: I think we tried to map what we have and what we don't have. It has been a demonstration and next we will look at feasibility. So, I think this is something you start thinking when you go further and start thinking about implementing projects.		
Technical outcomes: I would say that blockchain can bring data security. But with the distributed solutions, we can provide more security and privacy. And there's some evaluation of the technology, how those fits, how integration might work.	Connecting outcomes with organizational goals	
Efficient public services (Organizational goals): The technology might bring us quicker and more secure methods in the interaction with the Inhabitants or public. We can also most likely use public's data in the future and maybe connect into other departments for example taxation, or at least bookkeeping, or help bookkeepers do their job more easily without paper hassle.		

Source(s): Authors' own work

Figure 1. Leadership competencies for blockchain implementation

1st order themes	2nd order themes	Aggregated themes
We don't have that much of the right Personnel or ability to implement new technology in our existing ways of work.	Resources required	Organizational requirements for blockchain
A lot depends on what the new government will provide us in terms of resources, I hope that they will provide us with resources and that we are truly able to use blockchain technology		
Our organizational readiness to implement blockchain is low. We don't have any technical expertise in blockchain within the organization	Cost and other limitations	
Experts are quite dispersed, because there are experts, but they work for different organizations.		
Of course, in many cases, you need to have the right kind of use case and do a benefit analysis for the blockchain	Use case for blockchain	Suitable blockchain use cases
If we have the correct use cases, then I think we could be ready. It's all about having the use cases.		
The introduction of blockchain within a public organization should start with explaining what it is and what are the goals for the use of the technology.		

Source(s): Authors' own work

Figure 2. Blockchain requirements

1st order themes	2nd order themes	Aggregated themes
In our field of expertise, blockchain can be a tool, but it probably doesn't change that much.	Unreasonable technological results	Overly optimistic expectations
We do a lot of things manually. And, of course, blockchain will optimize the work but people view of optimization is that we have some kind of robot that does exactly the same as that person will.		
The mindset is due to the early years of blockchain technology that it was seen as more of a Swift knife that would solve everything. And now, we might need more pinpoint use cases for this technology. It is good to consider blockchain technology, but do not consider it for all possible use cases.		
But when we want to develop something for production, then it is a lot costly. And then we have the question, does it fit our tasks according to the law?	Technological restrictions	Technological dependence
So sometimes what we get from (higher public organization), is not optional.		

Source(s): Authors' own work

Figure 3. Dark side of blockchain

Additionally, we triangulated primary data from interviews with secondary material from multiple sources (Pandit, 1996; Yin, 2009), including organizational webpages, project reports and PowerPoint presentations that refined the theoretical and empirical setting. According to Pandit (1996), web-based data are rich in information useful for qualitative analysis. Our analysis of secondary data followed an approach by Bowen (2009). Relevant reports and presentations were acquired from organizations, while webpages were examined for additional information (Shahzad and Hafeez, 2022). Predefined codes were identified using an abductive approach based on primary data and literature (Bowen, 2009). The secondary data enhanced our understanding of digital initiatives and leadership development actions in organizations (see Table 2). Two authors independently reviewed the primary and secondary data to verify the validity of the information, avoiding conflicts in the database. This was followed by cross-verification of their analyses to develop a shared interpretation of the collected information.

4. Results

Our interview results and secondary data indicate that leaders are in the early stages of understanding blockchain as an emerging and disruptive technology. The analysis identified three phases, comprising five dimensions of required leadership competencies through sensemaking: (1) *competencies of identifying cues* (curiosity and rationality), (2) *Competencies of interpreting cues* (technological understanding and exploring different technological options) and (3) *Competencies of enactment* (technological enactment and connecting outcomes with organizational goals). Furthermore, two other areas were also identified: blockchain requirements, which include two dimensions: (1) organizational requirement for blockchain (resources required and cost and other limitations) and (2) suitable blockchain use cases. Another area is the dark side of technology, which consists of overly optimistic expectations from technology and technology dependence.

4.1 Competencies of identifying cues

Leaders of Finnish public organizations are looking for new ways to digitally transform their organizations, for example, by implementing disruptive technologies such as blockchain. Blockchain is envisioned by them through their cognitive lens and rational mindset. According to the leaders they are motivated by new technologies. Figure 1 shows the coding scheme for competencies of identifying cues.

4.1.1 Curiosity and rationality. The leadership perceived the digital transformation of their organizations via blockchain as an opportunity to understand and effectively integrate this disruptive technology into their operations. They view this process through scanning the environment and curiously looking at different ways to be more efficient. A leader commented:

> A personal trait, curiosity. Just curiosity comes first to my mind, it's very important (board member).

To curiously look for new ways of doing things, they also shed light on the importance of visionary leaders, who can show the future by looking at BCT. As a senior advisor commented:

> I would expect that we would need someone, I would almost say like a charismatic leader who is bold enough to speak loud on a vision where decentralized business models have a role.

This discussion led to another interesting aspect of rationality along with curious and visionary leaders, because without rationality, leaders can waste resources and incur heavy costs. A senior advisor added:

> It should be more systematic. We should have clearer goals, what we are aiming at, and what would be our concrete communication plan?.. . . we should have one.

These competencies are ways of identifying cues for digitally transforming public organizations through disruptive technologies such as blockchain.

4.2 Competencies of interpreting cues

The competencies for interpreting cues are an aggregated dimension that is derived from two second-order themes. According to this theme, leaders of Finnish public organizations explore new technologies and digitally transform their organizations, resulting from the previous stage of identifying cues. Figure 1 shows the coding scheme for the competency of interpreting cues.

4.2.1 Technological understanding. To make sense of the future and BCT, the leaders had to develop technological awareness and understanding by exploring different technological solutions, so they can rationally implement them. A leader responded:

> So, I think there should be some awareness or basic understanding of what the technology is, and how it might change processes within the organization and the country within the public sector at least (lead service designer).

Technology awareness and understanding are significant for leaders so that they can explain it to their teams. For that, as per the participants, onboarding of employees for technology is also crucial because employees should be educated about BCT so they can also make sense of its different aspects:

> It's important to understand the technology and different levels of understanding like the policy level, the technical level, and the functional level, all those need to be covered. So, that's very much important.

Ultimately the interviews also clarified that for technology understanding and onboarding employees for new technology, teamwork is also very crucial, because through collaboration task accomplishment can be easy and employees can stay motivated:

> Internal collaboration is important, so within a team, just set up any technical tools you might need to have them. Explore and discuss a range of possibilities, before discussion and exploration and trying and testing (counsel and head of public procurement).

> The Smart money network consists of multiple actors, with specific roles in the network. Each role is assigned with capabilities relative to its business function (proof of concept report, Case E).

4.2.2 Exploring different technological solutions. While looking at the interpretation of cues, the discussion also navigated toward exploring different technological solutions while understanding new technologies. Here, the leaders tried to look at different technologies through their openness to new ideas and creative solutions because they must rationally select blockchain for their organizations. This view is articulated by a respondent:

> Leadership should be open and should understand and trust the person who is wanting money from you for testing and using the new technology (counsel and head of public procurement).

The discussion led to another interesting aspect, as they also expressed their views on the importance of examples from other use cases. These examples can help in clearing doubts, increasing motivation and making sense of BCT. According to a participant:

> Hopefully by setting an example from some good use cases, from other cities that are currently using some technology, for example, blockchain or whatever, and they are finding it valuable and how it helps the city workers and citizens (director of municipal infrastructure).

These processes will ensure technological understanding among different organizational levels, also a plan can be developed by looking at other use cases.

4.3 Competencies for enactment

During the interviews, participants gave significance to the implementation of blockchain, after identifying and interpreting cues. It is worth noticing that leaders identified several aspects before implementing blockchain, for example, previous experience, experimenting, planning and connecting outcomes of blockchain with organizational goals. Figure 1 shows the coding scheme for competencies of enactment.

4.3.1 Technological enactment. Implementation of blockchain in Finnish public organizations centered around many interesting aspects, for example, technical enactment and connecting outcomes of blockchain with organizational goals. During interviews, it was noted that leaders were emphasizing a reference point from their previous experience, which can help and guide them in implementing BCT. Moreover, according to the secondary data, the leaders of the selected organizations were very experienced, for example, one leader had more than 20 years of experience in his role related to digitalization, showing the significance of previous experience. According to a principal advisor:

> We should have some kind of Reference for the current project from our previous experience. A chief ecosystem and technology officer also added If you think about for example from the past, we Pretty heavily adapted cloud technologies . . . and I would presume the similar kind of approach would also be applied for implementation for blockchain.

Here, along with previous experience, planning for implementing blockchain can act as a guide map for their plan of action as per their resources. In this context, a leader commented and shown in the secondary data:

> We set goals . . . we go through them all step by step, like system development, its benefits and costs. (blockchain specialist)

> This report gathers together the key findings of a short proof-of-concept (PoC) project executed over the second half of 2020. (proof of concept report, Case I)

After planning for blockchain implementation in the light of their previous experience, leaders expressed their views about sandboxes and pilot projects for carrying out experiments, which according to the leaders can help in resolving the challenges before its use in their organizations. A development expert expressed his views:

> We are not using our production data because we have some kind of sandbox where testing is done . . . where you can have so-called artificial companies, and you can do the whole process using this . . . sandbox.

4.3.2 Connecting outcomes with organizational goals. While leaders were discussing blockchain enactment they were also considering the outcomes of implementing blockchain, such as data security and reliability and the fit with the organization:

> If we were to look at blockchain, I think the reason would be increased reliability and integrity . . . I would say quality improvement to ensure that this is valid data. I see blockchain there as ensuring the quality . . . blockchain always increases the trust, meaning that I can trust that somebody is not fooling me around (managing director).

Along with the technical outcomes, leaders are always interested in providing efficient public services, in terms of security and speed. A blockchain specialist commented:

> They (the public) can forget all the paperwork they've been struggling with so far . . ..it brings also for the customers a huge benefit since they don't need to use a lot of different applications so that you this different handle these different situations.

It is worth noticing that the participants were also looking at achieving organizational efficiencies and cost savings by implementing blockchain:

> One thing is that you can more efficiently manage your assets, and you try to make the system automatically do that thing, so then blockchains can provide one solution for that. (team lead)

4.4 Blockchain requirements

4.4.1 Organizational requirements for blockchain. Disruptive technologies such as blockchain require capabilities from the organizations to be successfully implemented. According to our study, participants emphasize requirements such as technical infrastructure and the role of experts who can understand the use of the technology:

> We should have an expert working for us. At least it doesn't have to be like the world's best expertise, but someone who knows what we're doing, and how to use the technology . . .. I have to say that we don't have that many resources . . . for this new technology. (director of municipal infrastructure)

Along with human power, participants also expressed their views about the importance of infrastructure, as it can be a challenge in blockchain implementation. According to a development expert:

> Production requires this infrastructure which we don't have now. So, that is something we have been waiting a couple of years.

Furthermore, other than manpower and infrastructure, according to participants technology implementation comes with a cost. A senior advisor commented:

> Of course, a cost comes when you change something.

4.4.2 Suitable blockchain use cases. There should be a use case for using blockchain in public organizations, and the interviewees have focused too much on this point because only then blockchain will make sense for the organization:

> If there's a use case where blockchain is suitable, I don't have any issues with that. I'm happy to introduce blockchain, it's more like we need to have that use case to be introducing the new technology (lead service designer).

Such views and examples show the leadership's interest in using blockchain in public organizations.

4.5 Exploring the dark side of blockchain

4.5.1 Overly optimistic expectations. While interviewing, we came across another interesting aspect of using blockchain, which is its dark side. According to the leaders of Finnish public organizations, sometimes there are a lot of expectations from the technology that it will revolutionize everything, and they might look at the results of blockchain implementation unreasonably:

> People have too many expectations, when you mentioned Smart solutions, they probably don't understand that it only applies to the value exchange level . . .. but some expect that it will take care of a lot of the things that happen on the service level or in the application phase. But it's only a solution for the value exchange. (blockchain specialist)

4.5.2 Technological dependence. As per participants of the interviews, expectations from BCT should be realistic. Here, while discussing the dark side of BCT, the participants also connected it with the restrictions to their organizations as they work under other higher authorities and depend on these higher or connected organizations. So, technological dependence is worth considering here:

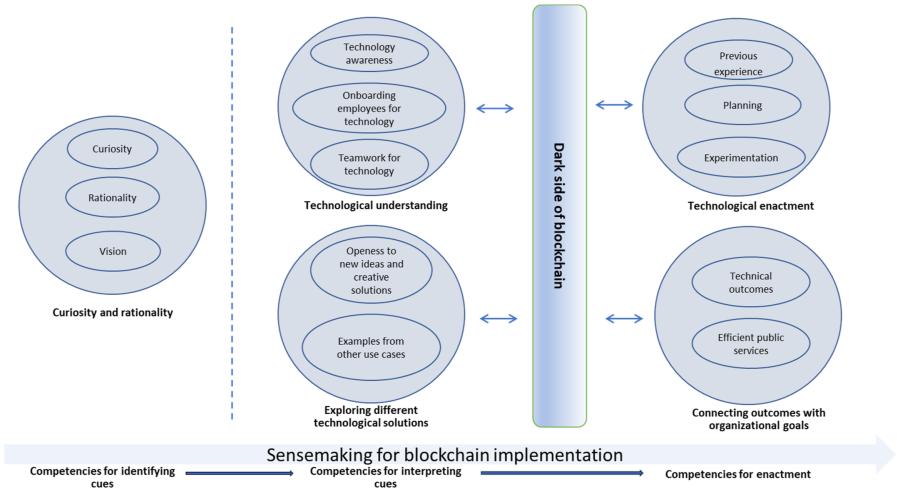
> I suppose, the question is that how long does it take for the approval by our data security department, even the management and some of the workers or experts would like to go there and use the technology. (development expert)

5. Discussion

This article explored a set of leadership competencies, using a sensemaking approach, required for successful blockchain implementation in organizations. We argue that specific leadership competencies are needed: curiosity and rationality for identifying cues for blockchain, technological understanding and exploring different technological solutions for interpreting those cues and then acting accordingly by aligning organizational goals with blockchain capabilities. Studies on digital government emphasize the need for new leadership styles and decision-making processes for digital transformation (Castelnovo and Sorrentino, 2018). Building on this, we posit that blockchain in public organizations is an embedded element of digital government. Thus, our research advances knowledge of public sector leadership through a sensemaking approach, by outlining the set of competencies to identify and interpret cues and take actions accordingly for blockchain implementation.

Figure 4 presents the research model of our study. Through sensemaking, our analysis found that leaders in Finnish public organizations are keen on adopting BCT. Three distinct phases of sensemaking identified the leadership competencies required for its implementation. Leaders initially identify cues for blockchain through curious and rational vision. Our study also explored how they interpret these cues, along with acknowledging blockchain's potential dark side. Leaders interpret the cues by understanding blockchain through technological awareness which is shared with their teams. They also explore solutions creatively and draw guidance from use cases. Finally, they act by leveraging their experience, planning and experimenting with blockchain, and aligning organizational goals with blockchain outcomes. Furthermore, blockchain must be feasible for the organization in terms of its use case and organizational requirements. Additionally, our findings reveal two aspects of the dark side of blockchain: overly optimistic expectations by considering it as a revolutionary technology, and the potential dependence on external organizations in the public sector setting.

The sensemaking process begins with identifying cues (Daft and Weick, 1984; Moqaddamerad and Tapinos, 2023; Weick, 1995), our findings show that leaders can identify these cues by being curious and visionary about emerging technologies. Curiosity and vision (Bass and Steidlmeier, 1999; Klein *et al.*, 2006) motivate leaders to explore innovative ways that can enhance organizational effectiveness and improve public services. Moreover, both are key aspects because they help leaders structure organizational change by engaging



Source(s): Authors' own work

Figure 4. Research model

employees in shared goals and envisioning a better future. We advance this argument by highlighting that rationality plays a key role alongside curiosity, helping leaders assess the fit of blockchain and foresee risks and challenges. Moreover, our secondary data also support this argument, showing that organizations envision the use of technology in providing efficient and effective services. This vision is paired with rationality, as leaders carefully evaluate blockchain's feasibility through proof of concepts, and rational decision-making process, considering costs, benefits and alignment with organizational needs. According to Weick (1995), rationality in sensemaking helps leaders look beyond the obvious, enabling solutions that enhance organizational certainty and predictability. Our findings emphasize the significance of intelligence, rationality and creativity (Bass and Steidlmeier, 1999; Muterera *et al.*, 2018) in identifying cues for effective blockchain implementation.

Through curious vision and rationality, identified cues are interpreted by leaders. Initial understanding (Daft and Weick, 1984; Moqaddamerad and Tapinos, 2023; Weick, 1995), according to our findings is formed through technological awareness, understanding blockchain at both individual and team levels, and exploring different technological solutions. Our study also divulges that leaders are required to interpret these cues rationally while being cautious of blockchain's potential risks, such as unrealistic expectations. Therefore, achieving technological comprehension through plausible curiosity (Klein *et al.*, 2006; Weick, 1995) is essential before adoption, and this understanding should be shared across teams to foster technological adoption. Sensemaking requires trustworthy leadership (De Lima Rua and Costa Araújo, 2015; Yasir *et al.*, 2016), and our findings advance the argument that trustworthy leadership aids in building intra-organizational trust and alignment, while good communication, collaboration and teamwork enhance technology understanding and risk management. Moreover, our findings are aligned with Imran *et al.* (2021) who argued that leaders must also be open to exploring technologies that align with organizational capacity. Organizational culture plays a critical role in fostering innovation, as leaders empower teams to bring creative solutions that align with dynamic organizational goals. A decentralized leadership approach mirrors the decentralized nature of blockchain. We argue that leaders make sense of blockchain by adopting an open, empowering mindset to understand the potential of blockchain and confront its uncertainties. Concrete examples and

use cases of blockchain provide further understanding, acting as guidelines for implementation. Our findings support this argument that concrete use cases further aid in making sense of blockchain and guide its implementation, as suggested by Weick (1995).

Weick (1995) highlights enactment as essential to sensemaking, and our findings show that leaders take practical steps to implement blockchain after interpreting these cues, with previous experience playing a crucial role. According to the sensemaking literature (Daft and Weick, 1984; Moqaddamerad and Tapinos, 2023; Weick, 1995), it is easy to make sense of future events after looking at them from past experience. Moreover, if implementing blockchain and making sense of the future are decoupled from the experience of the leaders, then the future can be misleading, and risks and problems will remain unresolved. Leaders use experience and planning to conduct pilot projects and experiments, assessing blockchain's feasibility within their organization. Similarly, our analysis of interviewees' profiles and secondary data revealed that experienced leaders positively impact technological understanding, enactment and digital transformation. Furthermore, our findings reveal that aligning organizational goals with blockchain is essential; misalignment can lead to inefficiencies and poor goal attainment. Public sector organizations, with their rigid bureaucratic structures (Van Wart, 2013), limit creativity and innovation, necessitating a rational approach from leaders. Our research further elucidates, that leaders must also be cautious of blockchain's dark sides, such as inflated expectations and dependence on political dynamics and instability, which can endanger its implementation in the face of uncertainty. Challenges, such as limited funding for experiments and the need for highly skilled experts, can further constrain blockchain implementation, despite interest in it. Resource-sharing and collaborative governance challenges further constrain blockchain adoption.

Our study further explores the dark side of blockchain. Leaders could recognize that while blockchain has transformative potential, realistic goals are essential that go beyond a pro-innovation bias. Transforming public sector organizations is particularly challenging due to established structures, routines and silos (Haug *et al.*, 2023), which can obstruct collaboration and blockchain adoption. Sensemaking research suggests that organizational action should be driven by rationality rather than mere accuracy (Weick, 1995). Leaders who consider blockchain as a guaranteed solution may be overly optimistic whereas a more effective approach involves adopting a curious, rational and realistic mindset, ensuring that both leadership and organizational actors have a good understanding of the technology and its potential use and misuse.

6. Conclusions

Through our exploratory study, we highlight a set of leadership competencies for navigating blockchain implementation in the public sector, utilizing sensemaking to structure the unknown and address uncertainties linked to the adoption of emerging technology. We find that curiosity and rationality are crucial competencies for identifying cues. Interpreting cues effectively requires leaders to rely on technological understanding and exploring different technological solutions by onboarding employees, fostering teamwork, encouraging the sharing of creative ideas and looking for relevant use cases. In the enactment phase, leaders' previous experience, alongside careful planning and experimentation, play a vital role in the successful implementation of blockchain. Furthermore, once blockchain is implemented, a significant competency of leaders is to align organizational goals with technological outcomes. While blockchain can offer the potential for enhancing public services and organizational effectiveness, it is not a panacea that will revolutionize public sector operations. Given the limited exploration of leadership competencies for blockchain adoption, this study contributes to the literature on leadership competencies, drawing upon sensemaking as a framework that enables public leaders to navigate the implications of blockchain adoption.

6.1 Managerial implications

This article provides practical implications for leaders in public sector organizations aiming to digitally transform their organizations through BCT. The study emphasizes the importance of competencies that enable leaders to identify, interpret and act on cues effectively, using sensemaking to navigate the challenges of leading the process of digital transformation. Leaders could foster an open environment that encourages new ideas, utilizing brainstorming workshops and drawing inspiration from other successful organizations and cases. Additionally, enhancing technological understanding through hiring experts or training is essential for assessing the suitability of and readiness for using blockchain. While blockchain can transform service delivery, leaders must maintain realistic expectations and approach its implementation rationally, highlighting and creating awareness of its benefits and communicating ways to address emerging challenges.

6.2 Limitations and future research

This study includes several Finnish public sector organizations, which may restrict the generalizability of the findings. The emerging nature of BCT limited the data collection. Moreover, Finland is known for technological advancements; however, public sector organizations in Finland are still in the experimental phase of blockchain use. Future research could explore successful blockchain adoption cases across countries to identify and develop a better understanding of the role of leadership competencies in the process of adoption and implementation. A longitudinal approach could provide a broader understanding and enhance generalizability. Further empirical research on the dark side of blockchain and comparative use cases across different policy areas and empirical settings would further improve understanding of the inherent paradoxes of digital transformation generally and BCT specifically.

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