

# Digital transformation in local government organisations: empirical evidence from blockchain initiatives

Stanislav Mahula  
PhD student, KU Leuven  
stanislav.mahula@kuleuven.be

Livia Norström  
Postdoctoral researcher, University of Gothenburg  
livia.norstrom@ait.gu.se

Mikael Lindquist  
Doctoral student, University of Gothenburg  
mikael.lindquist@ait.gu.se

Juho Lindman  
Senior lecturer, University of Gothenburg  
juho.lindman@ait.gu.se

## ABSTRACT

Local government organisations are the first contact between the citizen and state authorities. However, the rapid technological development in the private sector raises questions on how public actors can keep up. Seeking improvement, local governments undergo the process of digital transformation (DT). This encompasses a variety of processes and initiatives, including experimenting with new technological solutions. We focus here on experiments on one of these emerging technologies: blockchain. We report the results of a multi-case study investigating the DT processes that experiment with blockchain technology in three municipalities in Western Europe. We present our theoretical perspective (institutional logics and digital transformation), describe our qualitative comparative case methodology that relies on key-respondent interviews, and discuss our distilled categorisation of three activities (including excerpts from data).

## CCS CONCEPTS

• **Social and professional topics**; • **Computing / technology policy**; • **Government technology policy**;

## KEYWORDS

blockchain, local government, digital transformation, institutional logics

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## 1 INTRODUCTION

The private sector's technological advancements have increased citizens' expectations of the public sector to be innovative, deliver

more relevant, efficient, fast, and transparent public services [25], and improve their relationship with the citizens [35]. The global phenomenon of digital transformation (DT) has introduced new roles and processes within the government and brought previously unknown opportunities and challenges. We understand DT as a fundamental change process, enabled by the innovative use of digital technologies accompanied by the strategic leverage of key resources and capabilities, aiming to radically improve an entity and redefine its value proposition for its stakeholders [15]. However, these impacts have been heterogeneous, as various levels of administration have diverse needs and face diverging pitfalls when innovating. At the local level, the decentralisation has brought the authorities more freedom but also more responsibilities, calling for novel approaches. Local governments, often viewed as the most-trusted governmental bodies [44], are particularly challenged to cultivate a culture of innovation and allocate enough time and resources to develop priority innovations [26].

Such change in the institutional logic involves consequent changes in a variety of processes and roles within the organisations, which, in light on the variety of available technologies and adoption strategies, have to be looked at carefully. For example, in the constellation of available potential tools, often advertised as silver-bullet solutions, municipal leaders must resolve trade-offs between: (i) making informed decisions on implementing modern technologies to avoid overspending and unmet expectation (ii), moving beyond theoretical debate and gaining empirical evidence on where specific technologies bring the best value. Public sector organisations need to make the right decisions in their DT efforts and hence use public recourses in a reflected and well-motivated way that aligns with pursuing public value(s): boosting government efficiency, citizen services and boosting democracy and participation while staying inclusive and transparent.

Blockchain (BCT) is one example of a group of emerging technologies that can be implemented in numerous ways as a part of DT. It can be defined as a "distributed ledger technology in the form of a distributed transactional database, secured by cryptography, and governed by a consensus mechanism"[4]. BCT minimises the power of a single party and instead represents a peer-to-peer network of decentralised actors deciding on its state and maintaining copies of all network transactions. Although it originated in the financial domain, BCT has become a general-purpose technology with several possible benefits to be of interest to the public sector [36]. In a broad sense, there are three generic ways to use BCT for

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public service: notarise transactions, automatically execute transactions and verify identity [35]. Correspondingly, these ways echo the government's three main functions: managing governmental registries, social transfers and benefits, and verified information [35]. Earlier research suggests positive outcomes of using BCT through increasing process efficiency, transparency, and flexibility, reducing bureaucracy and expenses, breaking siloes between agencies, improving autonomous organisation, and eliminating corruption [30, 32, 35, 38]

Blockchain is, however, not yet a fully mature technology, causing uncertainty and scepticism around its usage. Most BCT pilots are in the announcement stage, which is partially explained by the lack of management of governments' capacity to convert pilots into more mature projects [22]. Although some governments have put BCT initiatives on hold, several running solutions can be found, mainly driven by the central governments [6, 18, 20]. On the other side, the literature suggests possible BCT applications at the local level: more reliable assets registration, transaction tracking, data accessibility improvement, and facilitating decentralised decision-making processes [3, 8]. However, not much research is focused on the precious insights from actual BCT usage [35]. Understanding the local government's experiences with this technology, the limitations and the most salient application areas will become driving forces for BCT implementation globally and realise the whole spectrum of its benefits [28]. Investigating these activities is important to understand more generally how emerging - and not yet fully mature - technologies are diffused in organisations and what activities are involved when these technologies become institutionalised.

This study aims to explain and conceptualise the variety of local governments' approaches for (i) bringing novel technologies such as blockchain technology into the organisation, (ii) conceptualising and (iii) experimenting with this technology. We do so by collecting empirical data for several local government initiatives in Western European municipalities. We, therefore, strive to answer the following research questions:

*RQ1: What activities do local public managers engage in when piloting blockchain technology?*

*RQ2: How do institutional logics and digital transformation explain these activities?*

In other words, this paper describes and explains the DT process that local public governments undergo while conceptualising and experimenting in practice with blockchain. We propose that this process consists of several activities, characterised as driving, impeding and shaping the digital transformation.

We proceed to analyse these activities as practices enacted concerning interplaying and contradicting institutional logics already existing in the organisation to increase the understanding of the variety of reasoning that local governments have for blockchain technology. Our results are interesting theoretically and to practitioners struggling to implement blockchain and other similar technologies in public sector settings.

## 2 INSTITUTIONAL LOGICS AND PUBLIC VALUES

The public sector's core mission is to serve the citizens and provide quality services. It can also be seen as a set of various institutions

which contribute to efficient public policy implementation and, as a result, to economic growth [44]. The term "*institution*" refers to both informal institutions (conventions) or behaviour patterns that are essential to a community (e.g., family) and formal institutions formed by entities (e.g., government). The latter correspond to formal norms that determine social, economic, and political activity, such as property rights, the rule of law, and good governance [44]. One can think of institutionalisation as the process of embedding a concept (for example, a social role, specific value, or way of conduct) inside an organisation, a social system, or society.

The institutions are associated with a social goal, transcending individuals and intentions by mediating the laws that govern behaviours, also referred to as institutional logic [34]. Its idea is concerned with how larger belief systems affect actors' cognition and conduct, implying pluralism in institutional logics, i.e., several institutional logics are available and often in conflict [14]. Institutional logics can be defined as organising principles that (i) regulate the choice of technologies, (ii) define the actors authorised to make claims, (iii) shape and restrain the actors' behavioural possibilities, and (iv) identify criteria for effectiveness and efficiency, as cited in [17, 21].

Institutional change is frequently described as shifting from one dominating logic to another [14]. Presently, the public sector is transitioning beyond the traditional public administration and new public management paradigm, which aim at efficiency and effectiveness. This new and still emerging approach focuses on recent technologies and stimulating the expansion of internal knowledge resources with externals (e.g., business or academia) as well as knowledge from the "crowd" [20]. Governance is mentioned as the key institutionalisation challenge in this approach. One can understand governance as structures, policies, actors, and institutions by which entities are managed through decisions and authority is exercised. Furthermore, while the "old" governance model implies a top-down approach to social and economic activities, a new and emerging governance model puts interaction (e.g., with citizens and industry) at the centre of all activities [19]. Government management and control systems should be employed not only for efficiency and effectiveness in using public money and authority but also for legitimisation in terms of satisfying societal benefit, accounting for public value [22].

The public sector should prioritise pursuing public values and having the government as the guarantor for these values [7]. There is a difference between "*public value*" and "*public values*". The former is an added value an organisation contributes to society by acting as its agent [13]. For example, "*public value*" can refer to the government's ability to increase its efficiency, citizen services, inclusion, better democracy, transparency, and participation [40]. On the other hand, Bozeman, as cited in [27], sees "*public values*" as social standards, principles, and ideals to be pursued and upheld by government agents and organisations; they are oriented toward the broader society and the promotion and sustenance of its collective norms and beliefs. For instance, public values include responsiveness, inclusivity, impartiality, accountability, respecting human rights, and collaboration, and they may impact the implementation of technology [40]. The governmental organisations necessitate the use of means (such as internal competition, contracting out, and performance monitoring), and they adopt values such as customer

orientation output orientation, found in citizen-centric organisations [17]. A shift is needed to view citizens as an active part and not just as clients, making it easier to achieve long term goals and improvements in public value creation [25].

### 3 DIGITAL TRANSFORMATION

Digital transformation has become an integral part of the organisational change debate. Even though change is continuously ongoing in organisations, the high interest in understanding and enacting DT relates explicitly to the recurring argument for its relevance in terms of scale, scope, and speed [42].

There are internal and external factors that influence an organisation's DT process [16]. The internal factors include organisational legacy, organisational cultures (innovation culture, willingness to take a risk), organisational strategy, managerial characteristics, and the awareness and attitudes among top management about DT. External influences include emerging technologies and their properties, environmental factors such as country and industry characteristics, and consumer characteristics [16]. In the governmental organisations' context, one must consider the pressure from the environment (citizens, businesses, politics) and technological change, mainly resulting in digitised services and processes.

In DT, it is essential to understand the connections between the usage of digital technology and the changes that occur with various organisational aspects [15]. Some properties of digital technologies are especially important for understanding DT. The open architecture of digital technologies enables new forms of collaboration and interactions in ecosystems yet calls for continuous adaptation [16, 42]. The consequence for organisations adapting to DT is a move toward more flexible organisational structures that allows for continuous change and unpredictability, particularly because technologies and competencies are often outsourced to external actors [16, 42]. Hence, the DT operations, services, and products need to be incrementally adjusted in response to external demands [25].

A range of factors can create inertia, e.g., existing relationships, already highly optimised production processes and resources that cannot easily be reconfigured [16]. One way to achieve cross-functional collaboration is through units with some independence from the rest of the organisation [42]. However, there is a traditional separation of IT and business that may have strong roots in the company's values, which may hinder DT [42]. Furthermore, employee resistance can be a barrier if the rate of recent technology introduction is high, and there is a lack of visibility on the potential benefits of the novel solutions. Moreover, the people in organisations will also need to assume roles outside of their traditional functions [42]. These new roles will require different skills and competence in governing the change [2, 37].

DT still undergoes conceptualisation [23] since there is a lack of coherence as to exactly what DT is [16] and what are its implications at multiple levels of analysis [42].

Lack of understanding of DT through oversimplifying the important and difficult changes associated with DT that ignores the public sector's complex institutional environment will understate the obstacles faced throughout the governmental transformation

[15]. Hence, the effectiveness of digital transformation would depend on how confronting institutional logics becomes imbricated, which could be transformative or could embed the existing logic in a new and more complex form [17].

### 4 BLOCKCHAIN TECHNOLOGY IN THE PUBLIC SECTOR

Some of the properties of blockchain include it being (i) decentralised, (ii) transparent, (iii) immutable, (iv) secure, (v) (pseudo)-anonymous, (vi) time-stamped and (vii) robust [9, 32, 46]. These properties are not necessarily afforded, however, just by choosing blockchain as a platform for a planned application. The specific fulfilment of these affordances and overall performance properties, depending on the specific technical details and capabilities of the blockchain configuration chosen during the design phase [31, 32].

The government could utilise BCT to reduce cost and bureaucracy, increase efficiency for authenticating many types of persistent documents [9], avoidance of fraud, reduce corruption, increase trust, auditability, resilience, better data quality, security, increased transparency, accountability [28, 29], data accessibility [8]. Furthermore, BCT could enhance identification and data integrity procedures, enable more reliable asset registration, strengthen transaction monitoring [3], and promote decentralised decision-making processes, making it an appealing instrument for democracy [48].

BCT could arguably become the fundamental backbone technology to orchestrate a new, peer-to-peer fashion for public administrations [24, 39, 47] or even shift power from economic and political institutions towards the ecosystem [10, 31, 35], and thus, creating a token or blockchain economy [5, 33]. It is, however, early to discuss such an alternative economy [35].

Moreover, there are also areas where blockchain is not the best solution since it is not a one-size-fits-all tool [9]. In other words, a traditional database solution could be used in many situations instead of BCT. Therefore, researchers call on public managers to be aware of the current trends in blockchain implementation to understand the main domain of application better and intervene with appropriate policy at various levels of administration to steer and guide the deployment of the blockchain [22]. Moreover, policymakers should also ensure that public values and societal needs are fulfilled and considered when developing and maintaining BCT architectures and applications [29]. Various choices and trade-offs of blockchain in the public sector are also affected by contextual factors, which means that each choice concerning blockchain governance must be made in accordance with policy objectives, public values, institutional structure, and social expectations [36].

### 5 METHODOLOGY

The case of the study is located at a local government level. The reform of public administration considers the organisational structure of local governments, whilst the political dimension takes into account the locally appointed executives, meaning that more power and resources are being allocated to lower levels of administration [11]. As studies assert, citizens tend to trust local governments even more than central governments [44]. The services provided by local municipalities vary per country and even per municipality. Commonly local government organisations can be responsible for

**Table 1: Municipalities analysed in the study**

Municipality	Country	Population	Number of interviews
Municipality A	Netherlands	200,000-250,000	9 (incl. one group interview)
Municipality B	Belgium	250,00+	4
Municipality C	Belgium	50,000-100,000	3

(i) primary and secondary education, (ii) culture, (iii) healthcare, (iv) welfare, (v) public utilities, (vi) sport and leisure or other things.

Local and regional institutions promote development and growth by creating suitable conditions for investment, economic interaction, and trade [44]. It can be argued that it also enhances democracy since the decision-making happens closer to citizens. When local governments and central governments regard themselves as partners in development rather than enemies, decentralised governance is more likely to last and contribute to peace and prosperity [41].

Our research questions are explorative because the phenomenon of interest in our study can still be considered under-explored. Furthermore, a case study approach allows us to investigate a contemporary phenomenon within a real-world context when there is less theoretical ground and when separating the case and case context is difficult [45]. We thus opt for a qualitative research approach with an interpretative stance [43]. Finally, in terms of research design, we follow a multiple case protocol aiming for robustness [12, 45].

This study investigates how local governments approach BCT in their digital transformation. For this reason, we have chosen three empirical case organisations. All three are Western European municipalities that are participants of an innovation academic-industry network related to a collaboration project financed by the EU. This project explores, enables, and delivers blockchain-enabled services for (local) governments. A commonality between these municipalities is that they all share an interest in the phenomena of transforming with BCT. The overview of the case of public sector actors is presented in Table 1

These three case organisations had, in total, nine blockchain initiatives in previous years. These pilots are described below in more detail.

As a data collection method, we have used key respondent interviews. Respondents were chosen from our case organisations. Our respondents were selected by snowballing among the project partners for professionals that had earlier expertise in blockchain implementations. Thus, all our respondents shared first-hand experience of public organisation blockchain initiatives. These experts are listed in Table 3 below.

The Corpus of data consists of semi-structured interviews. Tape-recording was the default option for the interviews, but one email interview was added to the data. Secondary material was used to support understanding the case context. Finally, all interviews were transcribed for analysis. The research team performed the analysis.

In this study, we used an abductive analytical approach as an approach to analyses to iterate between empirical data and theory [1]. This means that data was collected with open-ended interviews, and findings are inductively derived. The theory was used as an influence in a deductive manner.

In practice, we conducted our analyses in three iterations. The research design was revised for each iteration to align even better with the research question. In the first iteration, we reviewed relevant theories of DT guided by our initial research interest in understanding blockchain public sector implementations. Specific research questions were reformulated several times even though the overall aim of the study stayed the same. We identified relevant activities informed by the literature from our empirical material. This first iteration included going back between literature and empirical material to produce a structure to understand the characteristics of this process. In the second iteration, based on our analyses in the first iteration, we came up with three characteristics of digital innovation activities. These three are: driving, impeding, and shaping. In the third iteration of our analyses, we go back to the empirical material to find examples of transcripts of these three characteristics. The findings from this part are listed in Chapter 6. Throughout the abductive process of our research, an analytical lens emerged that we used to frame our findings. It reflects aspects of the digital transformation activities that are salient in our data, and it has elements from the digital transformation literature. We focused on the part of this process, the activities that involve blockchain piloting and how these can be characterised.

## 6 RESULTS

This section outlines and explains the digital transformation process that local governments go through while experimenting with blockchain. This process involves main activities that can be characterised as Driving, Impeding and Shaping digital transformation. Within each main activity, we identify different sub-activities (see Table 4). Main activities with their respective sub-categories are described in detail in what follows. Even though we divide these activities into three, we are not claiming that they would need to be always mutually exclusive.

### 6.1 Driving

DT activities have a path dependency, prior events and conditions that occurred and led to the formation of the activity. We label these as characteristics *driving* the digital **transformation**. Our data give a detailed account of these DT-triggering activities, the role of specific individuals and stakeholders, and the motivators for conducting these activities.

*6.1.1 Experimenting with novel technology.* Trying out novel technology in practice is perceived as an essential activity to be able to adapt to future changes and be proactive in modern service delivery: “We’re a government organisation which usually doesn’t lead innovation, [however] we still do think, if you try more different things and are more innovative, then it’s also easier to adapt and

**Table 2: Blockchain project descriptions**

BCT pilot	Description	Public sector role	Municipality	Interviewees involved
#1	This case involves a voucher system for socially disadvantaged groups with limited incomes to participate in cultural, sporting, and social activities. The municipality's social administration has offered the service for many years, but the procedure was previously manual and paper-based, requiring much administrative effort. Furthermore, the system lacked a control capability to prevent spending vouchers twice. As a result, the municipality decided to place the transaction vouchers (QR codes) on a private blockchain to avoid double-spending.	Maintaining the infrastructure and providing the vouchers	A	4
#2	This is a system for distributing coupons that can be used to purchase products or activities for children from low-income families. The original procedure entails a substantial amount of manual administrative work. The main purpose of implementing blockchain technology is to program value transactions under specific conditions. Smart contracts on the blockchain can automatically condition transactions, resulting in improved transparency. A secondary focus is on decentralising the organisation in terms of distributed decision-making to bring decisions closer to citizens.	Maintaining the infrastructure and providing coupons	A	3
#3	Pilot to test blockchain technology to do more efficient elections. The system counted votes during a proper national referendum as a parallel procedure, i.e., voters were asked to also vote on an iPad for a second time. The system was set up on about five Ethereum nodes.	Providing election system and organising election practicalities	A	1
#4	This was a conceptual idea that a blockchain could be used for sharing parking permits. The system would increase flexibility in parking rights, as citizens can trade rights amongst each other. Blockchain could then play a role here by its decentralised nature, where there need not be a central intermediary, i.e., the municipality.	Providing parking permits and the marketplace	A	1
#5	In this project, residents of a newly built residential area participate in an online and offline circular economy. The BCT's role in the system is to reward inhabitants for their circular behaviours and facilitate transactions. Actors in the system can issue challenges for residents (e.g., minimise water use) that they can complete and get a reward for. Smart contracts are utilised to complete the deals. The incentives are in the form of tokens (digital vouchers) that may be redeemed for items, services, or group prizes (e.g., a barbecue).	Issuing rewards and designing the smart contracts	B	3
#6	This case is about the city's IT organisation's procurement system, which stores information on public procurement with external actors on a blockchain. The blockchain is being utilised to verify that all bids in the procurement are accurate and time-stamped. The purpose of placing the data on the blockchain was to reduce mistrust among the contending parties.	Designing and maintaining a procurement system for public procurement	B	3
#7	This initiative involves the health and well-being of municipality employees. It is a way to improve the physical and mental well-being of the employees by offering various activities for free. In addition to sports events, different types of courses are also provided. A fitness tracker device is used that is connected to a decentralised blockchain system. With a decentralised system, the data will not be controlled by a company or the employer, and the employee can decide whom to share the data with.	Offered to municipality employees	C	3
#8	In order to attract student workers to employers in industrial zones, a carpool app is built on blockchain. The aim is to ensure that every ride is transparent and that no data is tampered with. This is a contrast to, for example, Uber. Blockchain is used to provide transparency, history transactions, and a tamperproof system.	Provision of carpooling system	C	3
#9	This is a blockchain-based system for gift vouchers to replace an old paper version. The system creates more flexibility and less administrative burden, given that there are many stakeholders involved. For example, the retailers will get their money by scanning a QR code instead of heavy paperwork. The reason for using blockchain is to see if it can make the transactions of value more efficient, as the technology can address the double-spending problem.	Designing and maintaining the system and issuance of vouchers	C	3

**Table 3: Summary of interviews and respondents**

Respondent #	Role	Municipality	Length of interview	Pilot
R1,R2,R3, R6,R8,R9	Various (group interview)	A	161 min	#1, #2, #3, #4
R1	Project manager	A	41 min	#1
R2	Digital democracy/ethics data manager	A	41 min (same as above)	#1
R3	Strategic information manager	A	58 min	#1
R4	Project manager	A	60 min	#1
R5	Head of innovation & manager	A	57 min	#2
R6	Alderman of innovation	A	54 min	#2
R7	Product owner and developer	A	63 min	#2
R8	Project manager	A	43 min	#3
R9	Team leader	A	23 min	#4
R10	Head of innovation funding	B	56 min	#5 & #6
R11	Secretary, general	B	(email interview)	#5 & #6
R12	Business and enterprise architect	B	68 min	#5
R13	Enterprise architect	B	95 min	#6
R14	Solution Coordinator	C	48 min	#7 & #8 & #9
R15	Implementation	C	35 min	#7 & #8 & #9
R16	Vision and Strategy	C	47 min	#7 & #8 & #9
			Total: 15h 9min	

**Table 4: Summary of empirical findings**

Characteristics of digital transformation activities		
Driving	Impeding	Shaping
Experimenting with novel technology	Technology limitation	Organisational learning
Addressing business and societal needs	Human resources	Legal aspects
Improving service processes	External attention and the hype	Supporting and collaborating with industry
Creating publicity	Regulations	Changing the role of public organisations

change to the current new environments, to new ideas, instead of just being reactionary.” (R8)

Technology should not be experimented with just because of novelty; its choice needs to be motivated by a clear business idea: *“We have the policy that people and processes come first, and technology comes second, so I really had to question the technology and see if we could do it with easier technology because this radical technology costs a lot of money because it’s experimental, [ . . . ] is it worth it?”* (R5)

On the other hand, experimenting also involves testing technologies without a specific business idea: *“We wanted to test new technology, and the manager wanted”* (R3).

**6.1.2 Addressing business and societal needs.** It is important to use technology to improve services, not only digitise them: *“If you have a challenge as a local authority, you don’t say anymore: Well, we have now this procedure, and we will digitise this procedure. No, you have to think digital and say: We have this service or delivery. Is there a technology or an IT possibility to make it easier for us and for you?”* (R16).

Solving business and societal problems are discussed as a crucial driving activity prior to initiating the pilots: *“It was crucial for them [the project leaders of the pilots] to have pilots that we can go along*

*with and can proceed, and that we do not have some legal burdens and that it will be societal added value, and that we have a link with the sustainable goals of United Nations.”* (R14)

**6.1.3 Improving service delivery.** Related to solving business and societal needs is improving service delivery processes. Blockchain is thought of as a technology that could make services more flexible and scalable and thereby beneficial to more people while still protecting the privacy of users: *“The paper voucher with 50€ they had to spend it all at once because [ . . . ] you couldn’t get money back. [ . . . ] It was not flexible or scalable. And also, if you go to a shop and are poor and you come in with vouchers, it’s really shameful, people hesitate to do that, so, it wasn’t successful. That was our use case that we wanted to change.”* (R5)

Blockchain can also help to decrease the administrative burden of services, making internal processes more efficient and freeing the personnel from back-office tasks. This results in more resources for providing face-to-face service to citizens: *“There was a lot of work, and blockchain would solve some pieces in the process and work. When people had to do something on a computer, now blockchain could do that. [ . . . ] We automated those processes with blockchain. [ . . . ] The shop owner [for example] got the money automatically when the code [on the voucher] was scanned.”* (R3)

*“We want to invest in personnel in the front office and keep the back office as small as possible. Not only to save money, but if [...] we could put the people that are now at the back office and put them in the streets, it’s much more interesting for our clients, [...] try to be as much in the streets, where we can make a difference and not in offices.”* (R10)

**6.1.4 Creating publicity.** Experimenting with novel technologies such as blockchain in the local government creates publicity, media and research presence, showing it at the forefront of innovations, despite the majority thinking otherwise: *“Doing [pilot 3] in a government organisation such as ours really was a head-turner. We suddenly had a lot of opponents who thought it was a bad idea. And there were also a lot of people who were very interested, especially from other municipalities and cities what we were doing [...] because we were using blockchain in a very political environment. [...] We had a lot of exposure on the Blockchain pilot of counting votes.”* (R8)

## 6.2 Impeding

As we found evidence of impeding factors and other forms of challenges in conducting digital transformation activities in the studied organisations, this is highlighted as a group of factors in our model.

**6.2.1 Technology limitations.** The expectations did not scale up from the theoretical promises; it was expected that *“blockchain was more reliable, that you can’t alter the data, [...] it would be faster, handling the transaction. But that wasn’t the case in the end. That’s why we don’t use blockchain anymore.”* (R3)

The technological limitations of blockchain, such as its immutability, have also been discussed: *“And as a municipality, [...] you want to have the possibility to revoke or undo the transaction on your data. And with Blockchain, that is not possible.”* (R8)

**6.2.2 Human resources.** Projects are often initiated and driven by one person, which makes the piloting vulnerable: *“It was our former CEO who went to the politicians and convinced them about this technology [...] It was not that big budgets, so they [politicians] said “Go on”. And for the rest, they were not so interested in it actually.”* (R10). Furthermore, the absence of such a person among leadership was named as another impeding factor for not using BCT: *“because we’re missing somebody in the higher management who wants to do that.”* (R3)

**6.2.3 External attention and the hype.** Publicity is also perceived as extra scrutiny, disturbing the work, and that should be avoided: *“And he [a colleague] said no, I don’t want any publicity, because we work in really small steps, and I don’t want the media to look at this and starts to interrupt us.”* (R5)

The media tries to polarise the discussion about blockchain and how difficult it is to work with a technology that is hyped and look at BCT objectively: *“In the beginning [the journalists] were super enthusiastic [...] And then after a while I met a journalist, and he was supercritical. And I said: [...] we are not logging any transactions anymore, but there is a bigger story, it’s the whole process, it’s the position of the government. It’s about shifting power, decentralisation, new financial system, and that’s interesting. But he couldn’t see that because he was already obsessed with this idea of writing this article, which would portray this technology as something negative, because*

*he knew that because of the hype that this was the thing to write [to get] most views.”* (R7)

**6.2.4 Regulations.** Some pilots were politically loaded and sensitive to experiment with, such as pilot 3, which developed a new way of voting in national elections. The pilot team was therefore only allowed to pilot it in a parallel voting system: *“We basically let people vote twice. So, we made the parallel efforts so as not to interfere regular voting process”* (R8)

## 6.3 Shaping, organisational context

The characteristics of DT activities are highly contextual. With shaping factors, we refer to high-level factors that frame the DT process. All these factors work as contextual conditions and characterise the digital transformation activities.

**6.3.1 Organisational learning.** The managers are unsure of the outcome and benefits of blockchain piloting, which impacts possible investments: *“We don’t have enough people who can assess [blockchain] very well”* (R10)

There is a need in the organisation to learn how blockchain’s functionality and potential, which requires more effort: *“We are on a level [where] we understand that there is a lot going on in the field, but we need the grabbing of how can it help us solve problems and is it the most effective technique to use. [...] We haven’t had the discussion in a group [...] about this question.”* (R1)

**6.3.2 Legal aspects.** Next to the technical limitations, legal implications of using blockchain were discussed, including the right to be forgotten: *“In personal details, when it’s put in a blockchain, you can take it out, in a good blockchain, so if you have municipal services and the citizens say: “We want you to remove the data”, it’s really hard to comply with because it’s in the blockchain and it’s there forever, at least that is my understanding.”* (R8, workshop)

*“Yes, like sometimes we are obliged by law to actually keep stuff in our archives, and maybe we are also legally obliged to destroy those archives after fifteen years, for example.”* (R2, workshop)

**6.3.3 Supporting and collaborating with industry.** Collaboration with city stakeholders and especially start-ups are mentioned as necessary when recruiting experts for the blockchain pilots: *“We wanted to help this company, for [start-ups] was important to get the experience. [...] For our city, it’s good to show that we support this kind of developments; we could show our helpfulness with this.”* (R4)

*“There is this philosophy to buy from start-ups, so we need to find start-ups. [However], we can’t really say: only start-ups can apply. It’s a public tender under European legislation.”* (R10)

**6.3.4 Changing the role of public organisations.** As part of the organisations automating and delegating decisions to external parties, the role of the changed role of public sector organisation is discussed: *“The main part of using blockchain is that you can eliminate a third person. So, it’s also for the city. So, if you use blockchain, flows are going more easily, you have less administrative burden. Everything goes automatically.”* (R14)

Smart contracts are especially discussed to automate and distribute processes, hence decentralising decision-making: *“The possibility is that you can programme all these processes [create smart*

*contracts for processes such as, e.g., validation] and take out the human factor, and make the process more efficient. And you do this by not monopolising [...] but sharing these roles” (R5). The argument is further illustrated that other parties, such as welfare organisations, can validate transactions. It was highlighted that giving away some control as a municipality implies decentralising: “You are decentralising budgets, and that’s the concept. blockchain is a decentralised technology, and if you can do this, blockchain comes to effect.” (R5)*

Another way to describe what smart contracts can do is that it transfers value under pre-set conditions. Considering municipal use of public money (e.g., building and maintaining houses, public spaces, bridges, roads, and providing social welfare systems), for the welfare, the government transfers value under pre-set conditions, i.e., executing a smart contract. “We use these funds to buy services or distribute the funds amongst people.” (R5)

Co-governance of services was noted as another issue: “The idea behind [the pilot 5] was to have like a system that could be rolled out on a broader level [...], that everybody could fund challenges and those challenges would be defined with smart contracts. [...] The idea was to have like a crowdfunding platform.” (R12)

## 7 DISCUSSION

The previous section reported the results from the empirical part of this paper. In the following paragraphs, we elaborate on answering our research questions. Our contributions can be structurally divided into theoretical and practical ones. On the one hand, we systematise and explain local governments’ experiences to introducing, conceptualising and experimenting with BCT as a part of its DT, using the theories from sections 2-4. We also derive practical conclusions for consultation on possible future BCT use-cases.

By seeking the answer to our first question, we have acknowledged that DT is a continuous process [16, 42]. We chose to distil the DT process into a set of *digital transformation activities* characterised as either *driving*, *impeding*, or *shaping the* digital transformation. The “driving” and “impeding” activities are reflected in the first theme, which illustrates how experimenting with blockchain is motivated and the obstacles and concerns of this process.

Drivers can be perceived as pressures [25] or as a confluence of technological, organisational, and environmental forces [16]. The dynamics of public sector institutions show the trends of striving to a better user focus and involvement, and also outsourcing the knowledge and resources from outside. On the contrary, a more conservative institutional logics predicts a threat for government’s role as a service provider and public values guarantor could be questioned due to the decentralised nature of blockchain. However, such drastic change was not a necessary nor feasible part of digital transformation.

Instead, the governments’ innovation ambitions were driven by addressing specific business and societal needs and public value creation, publicity, or general curiosity to test available tools. Among those needs, one can indicate protecting users’ privacy, providing better services, automating bureaucracy. The change can be driven by the ambition to stay adaptive and proactive in public service delivery, while it can also be argued that there must be specific business needs to motivate experimenting with new technologies beyond mere digitisation.

These impeding factors, closely related to the blockchain piloting activities, can be of a social/organisational nature, such as inertia and resistance [42]. However, data shows that a common source is technical limitations, which surfaced when the blockchain technology was instantiated and tested in a piloting environment. The results proved that a motivated and aware leadership is needed for such changes to be sustainable, as pilots can be abandoned due to a lack of thereof.

Therefore, some crucial conditions need to be met to achieve sustainable long-term change. First, in terms of institutional logics transition: changes in bureaucratic culture and external relationships are needed to adapt to new demands and technologies and not be held back by conservative and cautionary approaches. Second, a change in the individual mindset and competencies of the public servants is needed. Third, citizens were mentioned as both supporting and opposing local governments’ innovative approaches, so it is essential to ensure that they understand what using blockchain means, especially in a political environment.

The second theme illustrates the “shaping” activities, explaining how digital transformation is affected by internal and external factors. Such factors include internal factors such as organisational strategy and legacy [16], structure, culture, leadership, and employee skills [42], as well as environmental factors, such as legal and infrastructural conditions and material factors, such as digital properties and data availability [16].

For blockchain pilots, we revealed that given its novelty, building organisational capacity and informed leadership is essential for projects to be sustainable. Additionally, the DT literature argues that organisations must be flexible and adaptive to recent technologies due to their unstable nature [16, 42]. Moreover, any decision about blockchain must be taken considering policy goals, public values, institutional structure, and social expectations [36].

The know-how about the technology’s opportunities is also essential to make an informed decision when it is a good fit and when an alternative solution can be used instead, hence avoiding unmet expectations and fitting the existing legislation.

The results indicate that blockchain sometimes was used because it was available due to a missing intellectual and staff capacity to conduct an ex-ante evaluation. However, DT success also partially depends on organisation collaboration capacity, and the experts agree on that. Therefore, citizens and other stakeholders (such as start-ups) could be considered not only consumers of services but also co-producers, resulting in better knowledge capacity and improved cross-industry and citizen relationships.

In the third theme, we discuss the change process in local governments from institutional logic and digital transformation perspectives. The former implies introducing more user-centricity and sourcing the “*knowledge from the crowd*”, and the latter also advocates for an increased relationship in the local governments’ ecosystem.

While pursuing public values remains the main goal for local government organisations, they might adopt novel methods, including experimenting with new technologies. Remarkably, this concerns making public services more flexible and scalable, and the technology has such an offer. Furthermore, blockchain promise to decrease administrative burden is beneficial both for citizens and public service, creating more public value. Moreover, BCT can

facilitate direct interactions between institutions, people, and economic agents, enhancing inclusivity and democracy. It is, however, essential to ensure that BCT-based projects do not come with unnecessary complexity.

In general, the technology may be viewed as a direct attempt to fight the dominant institutional logic and turn it into a citizen-centric logic because it allows for the imbrication of a citizen-centric institutional logic within public sector organisations. In turn, this calls more attention to ensuring that the public servants possess sufficient skills and knowledge when engaging with new technologies. Furthermore, additional adaptivity and flexibility will be needed with blockchain, given its ongoing development as a technology. When decentralising public administration and automating public services, it is vital that these services are thoroughly developed so that there is no monopolisation because even decentralised decision-making must be programmed by some party.

## 8 CONCLUSION

During the BTC's 14-year life span, it has been altered and used in many applications and sectors with varying success while receiving noticeable support on the political agenda by being included in large-scale initiatives on the international level. However, it is yet neither a "one-fits-all" nor a mature technology, as there are still many uncertainties associated with it. In this article, we aimed to address the knowledge gap on how blockchain technology is perceived and used by local governments in light of the ongoing digital transformation.

This study focuses on public sector actors, though private organisations have a role to play in these initiatives. Change in private and public sectors is partly based on different aspects. On the one hand, while the private sector is primarily driven by economic advantages and competition, which may restrict sharing of good ideas with partners, the public sector is motivated by the diffusion of improvements (e.g., the efficiency of public service), to increase the public value. As such, the public sector may have fruitful premises for its institutional change to become more open to collaborations and innovation. On the other hand, the public sector is more sensitive to political influence; it is less autonomous and subsequently less flexible than private sector institutions. Despite all the surrounding promises, pre-mature technologies like blockchain need to go a long way and demonstrate sufficient success before becoming mainstream tools for local governments to innovate.

It would be valuable to also focus research efforts on private organisations' role in these initiatives and, in that way, understand the unique characteristics of both private and public organisations, digital transformation and changing dominant institutional logics. The limitation of the study is that we report early findings from limited blockchain pilots, and the only limit is to Benelux countries. Future research is needed to investigate these findings in other contexts (countries, regions, local governments) and other technologies. Our case methodology poses some limitations to the findings and could be complemented with other research methodologies. More research is also needed for the designs of different potential blockchain solutions and usage of these systems, and organisational change brought forward when these systems are taken into use. More research would also be needed from the citizen's perspective.

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