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Stijn Wouters, Veiko Lember, Joep Crompvoets

Coordinating the digital transformation of inter-organizational public services – The case of e-invoicing in Belgium

Abstract

Digital transformation has the potential to profoundly change the way public administrations deliver public services to its users. One of the challenges involved in the inter-organizational networks that often govern integrated digital services is to identify what coordination instruments are effective. In this paper we examine this issue through a case study that deals with the transformation of invoicing services in Belgian public administrations at the federal and Flemish (regional) level. We review the coordination instruments and study how they evolved over time. Our findings suggest that transformation (1) might in part depend on the choice of instruments and multiple mechanisms. The mix of appropriate coordination instruments is likely to change as digital transformation objectives and governance challenges evolve over time. (2) Digital transformation might be a step-by-step process involving multiple rounds of digitalization and its specific implementation contingent on the service itself.

Keywords: Public services, digital transformation, e-government, inter-organizational coordination, coordination instruments

Zusammenfassung

Koordination der digitalen Transformation organisationsübergreifender öffentlicher Dienstleistungen – Der Fall der elektronischen Rechnung in Belgien

Die digitale Transformation hat das Potenzial, die Erbringung von Verwaltungsleistungen tiefgreifend zu verändern. Eine der Herausforderungen in organisationsübergreifenden Netzwerken, die integrierte digitale Dienstleistungen steuern, ist die Identifizierung effektiver Koordinationsinstrumente. In diesem Beitrag untersuchen wir diese Frage anhand einer Fallstudie zur Transformation der Rechnungsstellung in der belgischen öffentlichen Verwaltung. Wir untersuchen die Koordinationsinstrumente und ihre Entwicklung. Die Untersuchungsergebnisse deuten zum einen darauf hin, dass Transformation zum Teil von der Wahl der Koordinationsinstrumente und verschiedener Koordinationsmechanismen abhängt. Je nachdem, welche Ziele und Governance-Herausforderungen mit der digitalen Transformation in einem konkreten Fall verbunden sind und wie sie sich über Zeit entwickeln, ist ein unterschiedlicher Mix an Koordinationsinstrumenten geeignet. Zum anderen zeigen die Ergebnisse, dass die digitale Transformation der Verwaltung ein schrittweiser Prozess ist, dessen konkrete Umsetzung von der jeweiligen Dienstleistung abhängt.

Schlagworte: Öffentliche Dienstleistungen, Digitale Transformation, E-Government, interorganisatorische Koordination, Koordinationsinstrumente

1 Introduction

Public administrations are increasingly developing new inter-organizational public services with goals characterized in terms of digital transformation. Examples of inter-organizational public services include life events or business situations (Wimmer & Tambouris, 2002). Each life event or business situation encompasses multiple public services delivered by multiple public sector organizations that are focused on a single event or situation, such as the birth of a child, retiring, or starting a business. According to Ines Mergel, Noella Edelmann and Nathalie Haug (2019, p. 12), digital transformation is “a holistic effort to revise core processes and services of government beyond the traditional digitization efforts. [...] The outcome of digital transformation efforts focuses among others on the satisfaction of user needs, new forms of service delivery, and the expansion of the user base.” Efforts to enact digital transformation in public service delivery have led to a multitude of inter-organizational collaborations (Chen, Hu, Tseng, Juang & Chang, 2019; Fountain, 2001; Kattel, Lember & Tönurist, 2019).

Effective collaboration to bring about digital transformation requires governance (Klievink, Bharosa & Tan, 2016; Pardo, Gil-Garcia & Luna-Reyes, 2010). This governance is and remains a central issue for public administrations (Chen, 2010; Hilvert & Swindel, 2013). First, little research exists that examines the coordination of integrated (public) services (e. g. Klievink & Janssen, 2010; van Os, 2011, also see Söderström, Melin, Lindgren & Galzie, 2018) or how they take form through inter-organizational networks (Chen, 2010). At the same time, collaboration is considered a crucial dimension in inter-organizational integration (Fan, Liu, Huang & Zhu, 2019). E-government research mostly focuses on collaboration that is primarily based on network-type instruments and resources, such as the building of trust or the voluntary sharing of resources (e. g. Chen & Lee, 2018; Chen, Hu, Tseng, Juang & Chang, 2019). Pure networks, however, hardly exist within the public sector (Meuleman, 2008), meaning that effective coordination of cross-agency digitalization projects assumes a capacity to combine various types of coordination mechanisms and instruments. Second, Olivier Berthod and Federica Segato (2019, p. 225) note that there is a need to better comprehend how governance change takes place over time.

In this paper, we intend to look at both aspects. This way, we aim to add to the e-government literature by applying the public sector coordination literature (e. g. Bouckaert, Peters & Verhoest, 2010; Sarapuu & Lember, 2015; Randma-Liiv, Uudelepp & Sarapuu, 2015) and provide a better understanding of the process of digital transformation through a focus on the coordination instruments and the underlying mechanisms that shape and bring about inter-organizational digital public services. Accordingly, we aim to contribute to the scholarly research on how public administrations are digitally transforming their public service delivery (Mergel, Edelmann & Haug, 2019).

Therefore, we pose the following main research questions: How can digital transformation, with respect to inter-organizational public services, be enacted through a mix of coordination instruments? And, how does the mix of coordination instruments change over time?

We examine this issue through a case study that involves the transformation of invoicing services within Belgian public administrations. E-invoicing is part of e-procurement, the latter which Daniel Veit and Jan Huntgeburth (2014, pp. 102-103) describe as a central component in e-government policies. Initially, e-invoicing was ex-

plored separately by different administrations. Later, a network formed around two public sector organizations. Within the administrative and legal context, this network had to create capacity to coordinate the service delivery chain, its adoption, the interaction with other services, and the involvement of stakeholders.

We inductively study the coordination mechanisms and instruments in this case as they provide an option to empirically understand how inter-organizational coordination regarding digital transformation in public services is organized and achieved. Our results suggest how achieving digital transformation might be conceived as a step-by-step process: one that is not just about applying best practices or merely solving technical challenges, but how it fundamentally also relies on the capacity to choose and apply instruments from multiple appropriate coordination mechanisms and change this mix as governance challenges and objectives evolve.

The remainder of this article is structured as follows. Section 2 provides the research background and details the conceptual framework of Geert Bouckaert, B. Guy Peters and Koen Verhoest (2010) to categorize the different coordination instruments and mechanisms. Section 3 outlines the method. Section 4 details the case study. Section 5 presents the findings, exploring how coordination shifted over time. In section 6, we discuss the findings and the implications for the digital transformation of inter-organizational public services. Our conclusion is presented in section 7.

2 Research background

We draw on the e-government literature on public service delivery for insights into the coordination of inter-organizational public services and digital transformation. To examine the coordination instruments in the case of e-invoicing, we apply the public sector coordination literature to define and establish the relationship between governance, coordination instruments, and inter-organizational public services.

Digital public services are electronically mediated services that are provided by public organizations (Lindgren & Jansson, 2013). Digital public services are increasingly organized on a cross-boundary basis (Chen, Hu, Tseng, Juang & Chang, 2019). Objectives of digital transformation with respect to public services are diverse, but typically (1) include the integration of information and services across organizational boundaries, and (2) aim to enhance efficiency, effectiveness, user-centricity, and accessibility (Curtis, 2019; Chen, Hu, Tseng, Juang & Chang, 2019; Gong, Yang & Shi, 2020).

Digital transformation in the public sector is a complex process involving governance challenges of a technological, organizational, and inter-organizational nature (Wouters, Janssen & Cromptvoets, 2020). In a public sector that is characterized by fragmentation, dependencies can be found between the public organizations and stakeholders in the service network (Klievink & Janssen, 2008), but also between the building blocks (or IT-artifacts) within and across service chains, as well as within and across public organizations. As Yiwei Gong, Jun Yang and Xiaojie, Shi (2020, p. 1) posit, little research to date examines how digital transformation is approached outside of single public organizations. Furthermore, Marie-Therese Christiansson, Karin Axelsson and Ulf Melin (2015) note that public services also change over time, and have to be examined in this respect as well. The authors identify three phases (in a service's life cycle): (1) a pre-conditions phase where the demand for a service and the (political,

legal, financial) prerequisites are examined, (2) a design and development phase that brings together relevant stakeholders to conceptualize, establish, and test the service, and (3) a delivery phase where a public service becomes operational and accessible to its end-users. These elements necessitate adequate coordination (Klievink & Janssen, 2010; Söderström, Melin, Lindgren & Galzie, 2018).

Coordination can be conceptualized as a process that negotiates decisions in order to achieve an objective (Bouckaert, Peters & Verhoest, 2010). Coordination instruments are distinctive actions that are undertaken to align activities between stakeholders (Bouckaert, Peters & Verhoest, 2010, p. 16). Coordination is closely linked to governance. Specifically, coordination instruments refer to the processes that are used to govern (Bevir, 2012).

Coordination instruments typically rely on one or more mechanisms of coordination: hierarchies, markets, and/or networks (Bouckaert, Peters & Verhoest, 2010; Meuleman, 2008). These mechanisms provide a common structure towards the processes of decision-making and their implementation. They often rely on the same resources to make coordination effective. Based on B. Guy Peters (2003), Bouckaert, Peters and Verhoest (2010, p. 35), and Külli Sarapuu and Veiko Lember (2015, p. 4) discern authority, power, bargaining, information, norms, and mutual cooptation. In the following paragraphs, we describe the coordination instruments and typical resources within each of the three mechanisms.

Instruments based on the hierarchy-type mechanism often make use of resources such as authority and power that mandate a change in the way organizations function and work together (Bouckaert, Peters & Verhoest, 2010). Coordination can be reached this way through the legitimacy of actors (governments or public sector organizations with a hierarchical position over other organizations) to convey their expectations towards one another, i. e. authority (Sarapuu & Lember, 2015), through power, which is manifested through the issuing of rules, budgets, laws, and regulations, or even coercion (Bouckaert, Peters & Verhoest, 2010). Examples of hierarchy-type coordination instruments include top-down strategic management or the formation of entities with clear lines of control (Verhoest, Bouckaert & Peters, 2007).

Instruments within the market-type mechanism often use (the diffusion of) information and bargaining among actors. Bargaining consists of “the exchange between relatively equal actors who each have something to bring to the trading process” (Sarapuu & Lember, 2015, p. 4). The market-type can be characterized as an exchange between actors that is coordinated through prices, contracts, economic incentives, or self-interest (Bouckaert, Peters & Verhoest, 2010; Sarapuu & Lember, 2015). Instruments based on the market-type mechanism comprise the establishment of internal markets (which governments create and regulate) or the establishment of contracts (Verhoest, Bouckaert & Peters, 2007). Such contracts can provide incentives to promote performance and make roles and relationships between actors clearer (Randma-Liiv, Uudelepp & Sarapuu, 2015).

Networks often consist of voluntary cooperation, driven by interdependencies (Bouckaert, Peters & Verhoest, 2010). The network-type mechanism typically depends on mutual cooptation, norms (such as trust) and the sharing of information (Bouckaert, Peters & Verhoest, 2010; Sarapuu & Lember, 2015). These resources can lead to a common understanding of problems, solutions, and actions. Instruments include systems to share information, bring about result-oriented management systems, or institute

a structure for collective decision-making (Bouckaert, Peters & Verhoest, 2010). Many forms of network governance exist. Keith G. Provan and Patrick Kenis (2008, pp. 233–234), for example, distinguish between participant-governed networks, a lead organization-governed networks, and network administrative organizations. They can be organized based on (1) the power relationships between the participants involved in the governance, and (2) the extent to which networks are governed internally by participants or by an external organization.

Instruments and mechanisms are prone to change over time due to the interaction between stakeholders, their interests and a shifting environment (or context) (e. g. Berthod & Segato, 2019; Emerson, Nabatchi & Balogh, 2012; Provan & Milward, 2001; Provan & Kenis, 2008). Previous literature has proposed or identified a shift from network-based and market-based to hierarchy-based instruments as the level of institutionalization increases (e. g. Randma-Liiv, Uudelepp & Sarapuu, 2015).

In practice, coordination instruments typically do not rely on a sole mechanism. While one mechanism is likely to be dominant (Sarapuu & Lember, 2015), overall governance can be characterized as hybrid (Meuleman, 2008). As such, it consists of multiple instruments based on combinations of different mechanisms that rely on different resources. As Jacob Torfing, B. Guy Peters, Jon Pierre and Eva Sørensen (2012) point out, adequate governance needs to be contingent on the issue, the type of interdependences, the characteristics of the transactions between the actors, and the environment.

Tiina Randma-Liiv, Annika Uudelepp and Külli Sarapuu, (2015, p. 378) assert that the number of studies in public administration looking into hybrid mixes of coordination instruments is limited. In the e-government literature, most attention is directed at network-type instruments. Recently, a significant body of e-government research has put emphasis on collaborative governance and network management (e. g. Chen & Lee, 2018; Gil-Garcia, Guler, Pardo & Burke, 2019; Juell-Skielse, Lønna, & Päivärinta, 2017; Klievink, Bharosa & Tan, 2016; Pardo, Gil-Garcia & Luna-Reyes, 2010). At the same time, resources and instruments from multiple mechanisms are occasionally favored, such as legal authority (e. g. Dawes, Creswell & Pardo, 2009) and incentives (e. g. Yang & Maxwell, 2011) to transform public service delivery.

3 Research approach

To examine the research questions, we adopted a qualitative research approach (Yin, 2014) within an interpretivist and pragmatic epistemology (Goldkuhl, 2012). We chose an in-depth case study design following the nature of the research questions (“how” questions), and because of the advantage to examine a complex phenomenon with a limited number of actors in its real-life context (Yin, 2014). This way, we consider the research method to be appropriate to explore instruments involved in the coordination of the digital transformation of inter-organizational digital public services.

Based on the research question, the case selection aimed at finding a service undergoing a process of transformation, involving collaboration in an inter-organizational setting and a service that could be conceptualized as a service delivery chain involving multiple public administrations. We present the selected case in the subsequent section.

Data collection followed from a combination of desk research of the relevant literature and government documents as well as interviews. Through the literature, we

gained knowledge of both coordination instruments and mechanisms, as well as the coordination of digital services. The literature served as a framework to guide empirical observations and analysis (Hay, 2002). The combination of the qualitative methodological choice and the triangulation of documents and interviews followed an iterative process (Walsham, 1995). This enabled us to observe the characteristics of the coordination instruments and mechanisms (Yin, 2014).

The document analysis was non-systematic and consisted of policy documents, laws, regulations, government white papers and technical specifications at the regional, federal, and European levels. In total, this included 103 documents that were publicly available or supplied by the respondents in the case of internal documents. The documents mainly provided the policy objectives, but also the architecture of the digital public service and the general context in order to distinguish the coordination practices (Söderström, Melin, Lindgren & Galzie, 2018). Following Randma-Liiv, Uudelepp and Sarapuu (2015, p. 378), we used the framework of Bouckaert, Peters and Verhoest (2010) to map the coordination instruments, mechanisms, and resources found in the documents.

Regarding the interviews, we followed a purposive sampling strategy aimed at project and product managers of the public sector organizations responsible for the building blocks and the governance of the invoicing service. The interviewees were identified through either the documents or referrals by the lead organizations. We conducted 16 semi-structured interviews between 2016 and 2019 (including two follow-up interviews with the lead organizations in the case study). They usually lasted between 1 and 2 hours. The interview protocol had the following structure: the context and history of e-invoicing within the respondent's organization; key actors and building blocks; and governance aspects (strategic, legal, organizational, semantic, technical, and financial). The interviews mainly revealed governance issues and the rationale for choosing coordination instruments. Through the follow-up interviews, we validated our results with respect to the (use of the) identified coordination instruments.

4 Case study: e-invoicing in Belgium

We selected the case of e-invoicing in Belgium as an example of an inter-organizational public service. Invoicing takes place at the end of a procurement process and involves the transfer of billing and payment information between business partners (i. e. the contracting authority, the supplier, and their intermediaries) (Veit & Huntgeburth, 2014). E-invoicing goals include developing and implementing a machine-readable format for invoicing documents and creating uniform communication channels for suppliers to communicate with the administration as a whole (Poel, Marneffe & Vanlaer, 2016). Besides these elements of digitalization, the case also involves a profound change in the relation between suppliers and public sector organizations, as well as the necessary capabilities within public administrations with regard to public procurement procedures. It can furthermore be used as a lever to transform invoicing between businesses.

The complex environment due to the nature of Belgian federalism makes it an appealing case to study inter-organizational coordination. Moreover, while inter-organizational projects often fail (Van Cauter, Snoeck & Crompvoets, 2015), this case was partially successful. This success can be derived by outputs such as the number of

organizations in the public sector able to receive invoices through the integrated service, the adoption of a common invoice format, the proportion of received digital invoices with respect to paper and e-mail invoices, the gains in processing times to handle and pay invoices, the reliability of the service, and the reduction of late payment fees (Poel, Marneffe & Vanlaer, 2016). This success makes it relevant to examine the employed instruments and mechanisms. However, success is partial because not every invoice is sent digitally (70% for the regional level we examined, Flemish Government, 2020) and not all public administrations (especially at the local level) have integrated to the central service.

The development and delivery of an e-invoicing service encompassed a collaboration between public sector organizations at all administrative levels in Belgium, either as a user or as a manager of the involved building blocks. Following the beginning of digitalization efforts in 2009, previous research found that e-invoicing can be characterized by four phases (based on and extending the categorization of Christiansson, Axelsson & Melin, 2015; also see Wouters, Janssen & Cromptvoets, 2020): (1) an initiation phase that saw the exploration of possibilities, (2) a pilot phase for a common invoicing building block, followed by (3) the operationalization of the service design, and (4) an expansion to include other e-procurement building blocks and new types of users.

In earlier research, seven governance challenges could be distinguished throughout those four phases that shaped the selection and change of coordination instruments and mechanisms (see Wouters, Janssen & Cromptvoets, 2020). The identification of these governance challenges relied on an iterative process in which governance challenges in the case were identified building on the e-government literature on digital public service delivery. These are (1) how to approach the groups of internal and external user(s) involved in the service, (2) how to develop the infrastructure, including the required functionalities and capabilities of the building blocks, (3) how to handle path-dependencies and adjust to (changes in) the internal and external service environment, (4) how to divide the roles and responsibilities of the main actors and the stakeholders, (5) how to manage the involvement of the stakeholders and (6) deal with their expectations, and (7) the extent to which (part of) the service has to rely on formal agreements and contracts. Those challenges were interconnected and shifted over time.

5 Findings

In this section, we present the findings of the categorization on instruments across the phases to deal with the challenges. They are structured and summarized in *Table 1*. This table presents an overview of the instruments for each phase in the evolution of the e-invoicing services, as well as the accompanying coordination mechanisms (Hierarchy (H), Market (M) and Network (N)). Most challenges had to deal with multiple governance aspects of the inter-organizational service (characterized as focus areas). Different coordination instruments were utilized to deal with the governance challenge as a whole or the governance challenge regarding a specific focus area. Some coordination instruments also persisted across phases. Four of the challenges were handled in the same way. In the text, we add the underlying resource(s) (Power, Authority, Information, Bargaining, Norms, and/or Mutual cooptation) discerned by Peters (2003) to each coordination instrument and mechanism.

Table 1: Coordination instruments used in e-invoicing

Governance challenge Focus area	Phase 1 Initiation	Phase 2 Piloting	Phase 3 Operationalization	Phase 4 Expansion
Governance challenge: (1) User approach				
Internal service ecosystem (Federal)	Bottom-up strategic management (N) (Federal)	Federal decision I (H, N) European Directive (H) (Prospective)		Federal decision II (H) Federal legislation (H) European Directive (H)
Internal service ecosystem (Regional)	Bottom-up strategic management (N) (Regional)	Regional decision I (H) European Directive (H) (Prospective)		Regional decision II (H) European Directive (H)
External service ecosystem (Federal)	/	Federal decision I (H, N)		Federal decision II (H, N)
External service ecosystem (Regional)	/	Regional decision I (H, N)		Regional decision II (H)
Governance challenge: (2) Functionalities, shared infrastructure and capabilities				
Shared building blocks	Bottom-up strategic management (N)	Federal decision I (H) Regional decision I (H)		European Directive (H) Lead organization network (M, N)
Service chain	/	Federal decision I (H) Regional decision I (H)		European Directive (H) Lead organization network (N)
Governance challenges: (3) Dependencies and the relation to the environment, (4) The division of roles and responsibilities, (5) Stakeholder management, (6) Expectations management				
General	Concertation committee (N)	Lead organization network (H, N) Governance structure (N)	Lead organization network (H, M, N) Governance structure (N) Concertation committee (N)	Lead organization network (H, M, N) Governance structure (N)
Internal service ecosystem	/	Pilot structures (H, N)		Informal structures (N)
External service ecosystem		National invoicing forum (N)		
	/			European fora (N) Informal structures (N)
Governance challenge: (7) Agreements and contracts				
General		Collaboration agreement (N)		
	/		Framework contract I (M)	Framework contract II (M)

Legend: Hierarchy mechanism (H), Market mechanism (M) and Network mechanism (N)

Source: Personal research.

5.1 Phase 1: Initiation (2009–2013)

Digitalization of Business-to-Government (B2G) invoicing services in Belgian public administrations began around 2009. At the time, businesses (or their intermediaries) would typically have to send invoices to individual procuring public sector organizations via mail or in a PDF via e-mail. They also had to consider public sector organizations' preferences, receiving capabilities, and data formats.

Initiated separately by the federal government and one regional government (Flanders), the first phase constituted a preliminary exploration of the objectives of digital transformation in the case. One particular issue was whether scanning paper invoices and PDF-invoices could be considered e-invoicing. The exploration related to both the approach to the user and the establishment of a digital infrastructure. Both governments opted for a bottom-up and interactive strategic management (N; Information), evaluating pilot proposals initiated by individual or groups of public sector organizations between 2009 and 2013 as an instrument to examine possible policy options, discuss infrastructures, and identify potential challenges.

In December 2012, the federal government decided to launch an administration-wide pilot at the federal level and establish an e-invoicing steering group (H, N; Authority, Power, Information) (Federal government, 2012). The main goals were (1) to develop a common building block, Mercurius, capable of receiving User-to-Machine (U2M) and Machine-to-Machine (M2M) invoices. Integration to the federal financial systems (2) was to be based on already existing data exchange platforms. The federal government (3) also decided to create an e-invoicing governance structure (N; Information).

Due to the horizontal nature of Belgian federalism, potential collaboration is largely restricted to network-type coordination based on the intergovernmental e-government collaboration agreements (N; Information, Mutual cooptation). Thus, the federal government communicated with the regional governments through the formal intergovernmental concertation committee (N; Information) to consider joining the project, to participate within the e-invoicing governance structure in order to negotiate further agreements, and to get involved in the existing national invoicing forum (N; Information, Mutual cooptation) that is external to the public administrations and cross-sectoral.

At the regional level, a decision (H; Authority, Power) was taken in July 2013 to coordinate with the federal level, as well as to establish a separate pilot project and steering group (Flemish government, 2013). The main motivation to collaborate encompassed internal efficiency concerns. Regional public administrations had to take measures to be able to accept machine-readable invoices by 2015.

5.2 Phase 2: Piloting (2013–2015)

As *Table 1* shows, following the federal and regional decisions, separate pilot projects were set up (H, N; Authority, Power, Information) (Federal government, 2012; Flemish government, 2013). The e-invoicing governance structure (N; Information, Mutual cooptation), provided a formal coordination structure that bridged the separate pilot projects and the national invoicing forum (N; Information, Mutual cooptation) (Federal government, 2012).

Collaboration between the pilots was, however, mostly informal between those actors that were granted the mandate to collaborate by their respective governments. These were the federal Service for Administrative Simplification (to coordinate with external stakeholders in the national invoicing forum (N; Information, Mutual cooption), the federal public service for information and communication technologies (ICT) (that developed the Mercurius building block and manages the federal data exchange platform), the regional Department of administrative affairs (to test their end of the service chain), and to a lesser extent the two main financial systems of each respective administration. Individual leaders and project managers within these organizations relied on an informal exchange of information and norms (trust based on earlier collaborations) to coordinate dependencies involved in the creation of an inter-organizational service, such as the ability to share a common interface, have common business processes, and realize technical interoperability throughout the service chain (Interviews with central federal actors).

Both pilots were concluded in the beginning of 2015. While Mercurius allowed both U2M and M2M communication, uptake was slow, largely because of the implementation costs regarding the chosen technology (Interviews with central federal actors). An additional governance challenge also presented itself. A recently approved European e-invoicing Directive put a common semantic standard (invoice format and syntaxes) into prospect and imposed public administrations to accept invoices based on the standard (H; Power), essentially mandating semantic interoperability.

5.3 Phase 3: Operationalization (2014–2018)

These challenges were eventually dealt with in the third phase. According to the interviewees, collaboration became centered around two main actors: the federal ICT unit and the newly formed e-Procurement team (as part of the successor of the regional Department of administrative affairs). They built on the previous collaboration dynamics and mostly relied on the exchange of information and norms to coordinate interdependencies to come to a shared step-by-step vision of realizing integrated e-invoicing services. One of the impacts was a change of objectives concerning the approach to the users, from internal efficiency to a user-oriented and externally efficient e-invoicing service.

While the scope of the projects initially intended to digitalize B2G invoicing, it became clear that it also had to transform Business-to-Business (B2B) invoicing to increase the adoption of the B2G solution. This was because the volume of invoices in the B2B context was an order of magnitude larger than the volume of invoices in the B2G context. They resolved the adoption challenge through a change in the infrastructure. More specifically, they chose to align the external ecosystem and the Mercurius building blocks to the PEPPOL interoperability framework.

Once the infrastructure of the e-invoicing service became more mature, the two main actors had to deal with several other governance challenges, such as the division of the financial impact of developing and using the shared building block, differing political priorities on the political level, and come to a division of roles and responsibilities. To coordinate these governance challenges, they relied on bargaining. Regarding the division of roles and responsibilities, the federal actor became responsible for the

management and ownership of the shared building blocks, integration of federal internal service ecosystem, as well as technical support with suppliers and intermediaries. The regional actor became responsible for (1) the integration from the part of the regional internal ecosystem (regional and local public administrations), as well as (2) communication, promotion, and technical assistance with the external and regional stakeholders.

To cope with the division of financial resources, the federal actor paid for the development of Mercurius, as well as an additional building block necessary to use the PEPPOL framework. The regional actor would pay for additional functionalities for the building block (outside the scope of B2G invoicing) and take care of communication with (internal and external) stakeholders. This financial arrangement was made possible through a formal framework contract of the federal ICT unit with a supplier (a common purchasing contract) (M; Authority, Bargaining, Information) (Interview with the central federal actor). The leading public administrations also chose to adapt the existing network to a more direct approach to deal with the management of the stakeholders. On the one hand, several informal groups were set up based on the capabilities of the building blocks within the service chain (N; Information; Mutual Cooptation) (Interview with the central regional actor). For example, one such group includes the financial systems and the central data exchange platforms of different administrative levels. On the other hand, they reused existing network structures, such as the national invoicing forum and European invoicing fora.

The success of the new functionalities also reverberated to new decisions at the political level. In December 2016, a new regional decision II (H; Power) anticipated the e-invoicing Directive (Flemish government, 2016). In May 2017, the federal government decided to allow invoicing through Mercurius (essentially for those suppliers that had to send invoices to the regional level) (Federal decision II) (H; Authority, Power) (Federal government, 2017). While both administrations made e-invoicing mandatory, the different deadlines increased the complexity for suppliers.

5.4 Phase 4: Expansion (2017 onwards)

As *Table 1* shows, the e-invoicing law of April 2019 finally transposed the European e-invoicing Directive into Belgian law, which provided the lead organizations another tool (H; Power) to realize interoperability throughout the infrastructure and coordinate the internal and external service ecosystems with respect to the approach to the user. Building on both this law and the earlier decisions at the federal and regional levels (H; Authority), the lead organizations continued efforts to expand the use of the invoicing infrastructure to federal and regional administrations (N; Authority, Information). The strategy to encourage them mostly relied on the spreading of information concerning efficiency, and to deal with stakeholder and expectations management through the informal and bilateral meetings with group representatives (N; Information) (Interviews with central federal and regional actors).

With regards to the governance challenge to develop a service infrastructure, in particular, the shared invoicing building blocks, a new tender (M, Bargaining, Information) was published to increase capacity, phase out legacies, and fully implement the European regulatory framework following the European Directive. It also included a

request to add other e-procurement functionalities to the infrastructure, based on successful pilots that were initiated at the regional level in the third phase. The federal ICT unit also procured a common building block for the B2B environment, as an instrument to increase the number of businesses and intermediaries connecting to PEPPOL, and consequently the proportion of B2G invoices.

6 Discussion

E-invoicing is one of the first cases in Belgium that led to an inter-organizational service with end-to-end integration across all administrative levels. It illustrates how a hybrid mix of coordination instruments and mechanisms took shape to deal with certain governance challenges and how it evolved over time as the governance challenges shifted. Since the research questions are strongly linked, we address them simultaneously. We discuss the use of coordination instruments and mechanisms with respect to the research questions, first, and second, digital transformation.

6.1 Coordination instruments and mechanisms to accomplish inter-organizational digital public services

Concerning the coordination instruments and mechanisms, the collaboration between both administrative levels had to initially rely on network instruments. This followed from the legal context, the high barriers to and disadvantages of intergovernmental agreements. This was reinforced by uncertainty regarding partly-overlapping objectives, the functionalities, shared infrastructure and capabilities. A network approach offered an opportunity for administrative levels to pool resources together on a voluntary basis. However, hierarchical elements were also already present relating to the designation of lead organizations for the projects and (at the regional level) the prospect of a mandatory adoption.

Throughout the four phases, a network approach remained dominant, but – as reflected in *Table 1* – changed as the inter-organizational service became mature. This made dependencies more apparent and required a more durable capacity for collaborative action. Once the pilots established the basic service chain, coordination evolved from mostly informal coordination to a lead organization–governed network between two main central public sector organizations (Provan & Kenis, 2008). These organizations (especially the project managers) employed the authority from their respective governments to come up with solutions to deal with the uncertainty in the absence of hierarchical responsibilities. They used the exchange of information and norms based on earlier collaborations as the basis for collaboration. As the dynamics between the lead organizations became more prevalent, other network structures became more instrumental to them, forming a loose network consisting of multiple informal and formal functional groups.

In the operationalization phase, the combination of the hierarchical and network mechanisms did not provide sufficient capacity anymore to deal with dependencies between the administrative levels and building blocks. One example concerned the dependency of the regional government on the federal government to process and rout in-

voices correctly. The lead organizations subsequently used the contract with the external service provider as a formal instrument to implement the bargaining arrangement and maintain flexibility where goals diverged.

The capacity created between those lead organizations not only had an impact on the governance of the network, but also on the infrastructure of the service. While the basic structure of the service chain followed the institutional landscape and the existing specialization between public sector organizations, the lead organizations managed to build in flexibility to cope with changing adoption rates in the internal and external service ecosystems. The impact on the infrastructure was especially reflected by the effect the change of objectives from internal efficiency to external efficiency and a more user-oriented approach had on the service design of the external service ecosystem.

In this paper, we applied the public sector coordination literature to derive new insights into the digital transformation of inter-organizational public services. We mapped the instruments that were used to bring about an inter-organizational digital public service. Our results are congruent with previous research that suggests that coordination practices are highly specific to the context and features of the service (Klievink & Janssen, 2010; Söderström, Melin, Lindgren & Galzie, 2018; Torfing, Peters, Pierre & Sørensen, 2012). They also confirmed the importance of network-based instruments as a basis for collaboration (Randma-Liiv, Uudelepp & Sarapuu, 2015).

There seems to be a need to have adequate coordination capacity to periodically evaluate the effectiveness of the mix of coordination instruments against the changing challenges and thus keep the focus on attaining transformation and long-term objectives. Especially in e-government, dependencies are more profound because of the involved information systems. At the same time, departing from the studies on collaboration in e-government that we identified in the research background, collaboration in this case was characterized by coordination instruments relying on multiple mechanisms instead of predominantly network-based instruments.

The results additionally confirm the role of formally appointed project managers as a means to advance a collaborative approach among stakeholders to realize digital transformation (Gil-Garcia & Sayogo, 2016). However, the case also demonstrates the limits of this approach, as some of the issues required coordination at the political level instead of the administrative level. Ultimately, political coordination failed to bring about a uniform approach to the external users with respect to the mandate to use e-invoicing.

The mix of coordination instruments built around the lead organizations is likely to change. It could lead to more formal agreements once the invoicing service becomes embedded within the general digital government infrastructure (following Randma-Liiv, Uudelepp & Sarapuu, 2015). Thus, the increase in marginal costs to receive, process, and rout invoices will not be in balance anymore with the costs for promotion and technical assistance. This will probably undermine the effectiveness of bargaining as a resource.

Furthermore, once most users have adopted e-invoicing, the rationale for a single building block that serves as the bridge between service contexts becomes less critical as a focal point of coordination efforts. Thus, the infrastructure might evolve to separate service chains that integrate directly through the PEPPOL framework. Consequently, the necessity to coordinate could become more determined and shaped by the maintenance of interoperability regarding the digital infrastructure (Kattel, Lember & Tõnurist, 2019).

6.2 Digital transformation of inter-organizational public service delivery

Concerning the digital transformation of public services and revisiting the definition of digital transformation by Mergel, Edelmann and Haug (2019, p. 12), the main objectives of e-invoicing exhibit more characteristics of digitalization rather than digital transformation. While the case focused on new forms of service delivery as well as the expansion of the user base, it did not exhibit changes on the institutional level or in terms of the governance. Although related and concurrent reforms in the financial systems have led to more automated processes, public sector organizations mostly only adjusted some of their routines, while core business processes in invoicing and procurement remained intact.

Digitalization of invoicing has, however, become a steppingstone for the digitalization of other procurement services that reuse the infrastructure. This raises questions, such as whether it is always necessary to aspire full digital transformation in all its facets, and when digital transformation has been fully achieved for a given service or administration. Digital transformation objectives might have to be balanced against or enhanced with other government objectives, such as inclusiveness, which, for example, leads the way to a mixed multi-channel approach that includes offline channels (Klievink & Janssen, 2010). A single project will probably not realize digital transformation with respect to all identified dimensions. However, understanding the coordination dynamics of individual projects could provide insights on the overall coordination challenge regarding digital transformation.

As Mergel, Edelmann and Haug (2019, p. 3) posit, e-government policies are still mostly focused on changing the internal service context. The case of invoicing rather shows a change of objectives, mostly from internal efficiency in the first two phases, to external efficiency (of private businesses) and a user-oriented service that encompassed a more holistic approach so businesses could send invoices regardless of whether the recipient belonged to the private or public sector or had adequate receiving capabilities. This research also provides an illustration of Mergel, Edelmann and Haug's (2019, p. 11) argument that the change in a public service can serve as a policy instrument to enact digital transformation in society. However, insights from the follow-up interviews also revealed that this is not sufficient, as the number of suppliers to the public sector is only a fraction of the total number of suppliers in the private sector.

Departing from existing studies regarding the notions that the transformation of services must follow user needs and that users expect fully digital services (Curtis, 2019; Gong, Yang & Shi, 2020; Mergel, Edelmann & Haug, 2019), we observed a transformation driven by lead organizations, while businesses and intermediaries were rather reluctant to adopt e-invoicing (also see Poel, Marneffe & Vanlaer, 2016). One possible explanation for this might be the larger impact the transformation of invoicing has on intermediary organizations, which must change their business models. Thus, public organizations must conceive of an infrastructure that is flexible to changing views, give adequate attention to expectations management, and consider the larger impact the transformation of the public service has on society.

The case also demonstrates how the internal and external service context has an impact on (1) the choice of information systems to be used in the integration of services, (2) the organizations involved in coordination, and (3) the coordination instru-

ments that can be used. This reflects the sociotechnical nature of integrating digital public services (Gil-Garcia, 2012; Pardo, Gil-Garcia & Luna-Reyes, 2010). Because of the complex environment, digital transformation might happen only gradually. For example, public and private end-users alike must weigh benefits and costs. They also must consider the time and effort necessary to use the service and deal with existing legacies and dependencies. This requires a capacity to recognize the governance challenges involved and to deal with them through an adequate mix of coordination instruments.

While the case study design provided insights into the coordination of inter-organizational digital services and our understanding of the process of digital transformation, it is not without limitations. These are related to the generalization to other inter-organizational services, contexts, and countries. Because of the limitations of the research, we did not present all the interactions between changes in the challenges and the coordination instruments. In future research, we aim to study these interactions through an analysis of the governance dynamics between lead network organizations in multiple inter-organizational public services.

Further research is necessary to understand how digital transformation in inter-organizational public service delivery gradually takes shape. A possible avenue is to examine how digital transformation is realized within the institutional environment of public administrations. Another option for research is to study what the impact of digital transformation is on the fuzzy boundaries between the public, private, and non-profit sectors.

7 Conclusion

Bringing about digital transformation in public services can be a daunting task. In this paper, we studied e-invoicing in Belgium and found how digital transformation in inter-organizational public service delivery can be related to the coordination instruments and mechanisms, in addition to overcoming only technical challenges. Furthermore, inter-organizational coordination with respect to digital transformation in public services may not only have to rely on network-type instruments, but also on different and changing coordination instruments and mechanisms that deal with several governance challenges. From our research, we provide three main insights. These findings also provide implications for public managers.

A first finding suggests that transformation of inter-organizational public services might follow a step-by-step process that can consist of multiple digitalization efforts. Consequently, as objectives shift, the environment changes and the functionalities provided by integrated services are modified, governance strategies will probably have to be layered and periodically evaluated against the effectiveness of the (mix of) coordination instruments. Once an infrastructure service proves mature, collaboration through network-type-instruments might be complemented, rather than supplemented, with hierarchical-type and market-type instruments.

As a second finding, the case highlights how different coordination instruments were directed at different governance challenges. This mixed approach facilitated the realization of integrated public services by allowing capabilities to be developed, buy-in from the stakeholders to be generated, and adoption by the end-user to be stimulated.

While the need to develop adequate capacity to evaluate the effectiveness of instruments seems clear, the case also supports research that posits that because of the diversity of end-users, organizations, services, and environments, a single approach towards successful coordination of digital public service delivery seems unlikely.

Third, at the same time, the objectives of digital transformation appear to be dependent on the specific service and the service context. While changing the direct interaction with users is a central objective in digital transformation, it might also be beneficial to adopt a society-wide perspective and examine integration with private services.

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