

TALLINN UNIVERSITY OF TECHNOLOGY
DOCTORAL THESIS
14/2025

Governance of Cross-Organisational Digital Innovation in the Public Sector

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This dissertation was accepted for the defence of the degree 10/02/2025

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Declaration:

Hereby I declare that this doctoral thesis, my original investigation and achievement, submitted for the doctoral degree at Tallinn University of Technology has not been submitted for doctoral or equivalent academic degree.

Steven Nõmmik

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ISSN 2585-6898 (publication)

ISBN (publication)

ISSN 2585-6901 (PDF)

ISBN (PDF)

DOI

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Author's contribution to the publications

Contribution to the papers in this thesis are:

- I In **Article I**, the author of the thesis contributed by data collection and conducting the analysis of the Estonian cases. This included assigning values for the different conditions as well as writing a qualitative background overview on the cases for conducting the fsQCA. The author also contributed to the revision of the manuscript during the submission process.
- II In **Article II**, the author contributed to the development of the theoretical framework and to the analysis of the empirical data. The author participated in the design and writing of the framework (contributing primarily to sections on complexities as well as the contextual role of digitalisation). The author also conducted interviews for the Estonian cases and contributed to the writing of the final draft regarding the empirical results.
- III **Article III** is a solo-authored work, with the author being responsible for designing the study, writing the analytical framework, collecting the empirical data (documents and conducting the interviews), performing the data analysis, and writing up the paper.
- IV In **Article IV**, the author of the thesis contributed to the initial design of the Q-sort, conducted the data collection for the Estonian cases, and contributed with the analysis of the Estonian cases. The author also contributed to finalising the Q-set during the initial design of the data collection process. In addition, the author participated in the final writing process and helped revise the manuscript during the submission process.
- V In **Article V**, the author of the thesis was in equal co-authorship with the lead author of the publication. The author co-wrote the theoretical framework (writing the sections regarding collaboration history and collaborative process challenges) and participated in the data collection, analysis, and writing an overview of the results. The author furthermore contributed with edits to the manuscript during the revision process.

The thesis analyses the institutional context through the factors of prior digital developments, actor embeddedness, and established interaction dynamics at the system level. By combining insights from studies on administrative traditions, public management reforms, network governance and e-government, the thesis delineates the context to understand its impact for cross-organisational digital innovation (Cordella & Tempini, 2015; Di Giulio & Vecchi, 2023; Fountain, 2001; Kattel et al., 2020; Klijn & Koppenjan, 2016; Peters, 2021; Vial, 2019).

Actor characteristics, network management, and the institutional context shape the design and implementation of digital innovation. This includes both the interpretation of the functionalities of the digital solution as well as their integration into existing work processes (Mergel et al., 2019; Fountain, 2001; Kempeneer & Heylen, 2023). The overall theoretical approach is summarised in Figure 1.

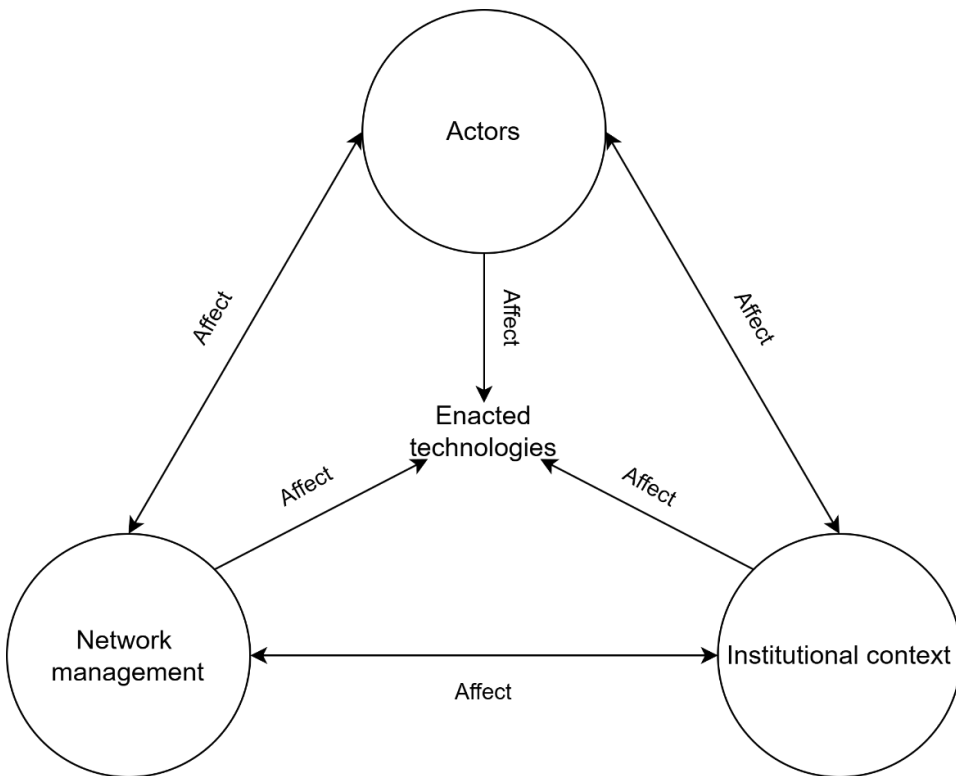


Figure 1: Cross-organisational governance of digital innovation

Source: Author, based on theoretical framework

2.1 Actor characteristics

Digital innovation has potential to change structures and processes, resulting in a change of relationships amongst public actors, government-to-citizen and government-to-business dimensions (Gasco-Hernandez et al., 2022). The process of change is strongly dependent on the actors present and engaged with digital innovation – from their ability to mobilise relevant resources and the capacity to engage in actions to the priorities they foresee in relation to their own goals (Fountain, 2001; Picazo-Vela et al., 2018). Actors in this

context refers to the different types of organisations (e.g., public, private, and societal) engaged within the multi-actor initiative. Public actors include both the national (e.g., ministries and agencies) and the local (e.g., municipal authorities and local agencies) levels in a variety of roles. Public actors can have a role in establishing a broader strategic approach through their role in designing and adopting legislation, regulations, and strategies (Ashaye & Irani, 2019). However, they also adopt more active roles within digital innovation initiatives, where they can be in leading and supporting actor roles (Breznitz & Ornston, 2013; Gasco-Hernandez et al., 2022). Furthermore, public actors can also be in the position of end-users and recipients, as they procure the desired digital solutions (Juell-Skielse et al., 2017). While private organisations have often been conceptualised through their role as IT-developers, they can also initiate digital innovation initiatives and be engaged as intended end-users (Janssen et al., 2020; Juell-Skielse et al., 2017; Wouters et al., 2023). Digital innovation initiatives in the public sector also involve other non-governmental organisations – from citizen representative organisations to different interest groups and professional associations (Juell-Skielse, 2017; Loeffler & Bovaird, 2016). By being involved in a multi-actor initiative, the actor imparts their own meaning to the digital solution, thus shaping the design and enactment of digital technologies (Bailey & Barley 2020). The meaning-making is derived from the actors' capacities and priorities (e.g., values and goals) (Bailey & Barley, 2020; Wouters et al., 2023). The thesis focused on the following actor characteristics: a) *committed resources*; b) *collaborative capacity*; c) *technological capacity*; d) *priorities of actors*.

As organisations become engaged in multi-actor initiatives, they also *commit resources* to the collaboration. By *committing resources*, actors foster further interconnections with one another within the collaborative project and establish the basis for new interactions (Chen et al., 2019; Gasco-Hernandez et al., 2022). This includes *resources* like knowledge, tangible resources, social capital, and reputation. Knowledge refers to an understanding of the problem that the actors possess (Bailey & Barley, 2020). Knowledge and knowledge creation is based on a combination of individual, organisational, societal, and professional sources (Raadschelders & Whetsell, 2018). Knowledge can contribute towards more informed decision-making, but it can also foster biases within organisations, limiting the applicability of digital solutions (Bailey & Barley, 2020; Raadschelders & Whetsell, 2018; Torfing, 2019). Tangible resources can be identified by their verifiable properties and ownership, and them being quantifiable (Grant, 2002). This mainly includes time and money (in both direct and indirect contributions through personnel and processes), but can also include existing digital infrastructure (e.g., platforms) that the actors are willing to contribute (Sullivan & Skelcher, 2002; Gasco-Hernandez et al., 2022). Through their prior history in interactions and the development of relationships, actors possess a reputation (Nahapiet, 2008). Reputation serves as a proxy indicator of an organisation regarding the actions they may carry out and the perceived chances of success (Bardach, 1998). The existence of a positive or strong reputation provides other actors with confidence regarding the integrity of the process, chances of success, and legitimacy of the outcomes, thus affecting their own commitment (Ansell & Gash, 2012). Lack of a reputation results in a more incremental development of interactions due to a critical stance on success (Bryson et al., 2006). Previous successes in digital initiatives shape the perceptions of stakeholders regarding future initiatives (Kattel et al., 2020).

Although actors commit resources to the multi-actor initiative, their extent and utilisation within the collaboration is also shaped by the *collaborative capacity* of the

engaged actors (Jakobsen & Thrane, 2016). Multi-actor digital innovation initiatives require actors to understand the potential of the functionalities of the digital technology for intra-organisational processes (Bullock et al., 2020). *Collaborative capacity* refers to the ability to process relevant information for the purposes of transfer, to translate it into a universally understood language, to transfer it in a manner understandable to the other actors, as well as the ability to reciprocate (Quick & Feldman, 2014; Perry-Smith & Mannucci, 2017). The choices towards transboundary exchanges originate in the analysis and evaluation of the potential actors (Bryson et al., 2015). Through *collaborative capacity*, actors are able to improve the collaborative process and better assess the potential value from the multi-actor arrangement (Gasco-Hernandez et al., 2022). This can lead to further contributions from the organisations involved as they see more value in cross-organisational exchanges. Furthermore, *collaborative capacity* improves the impact of the committed resources as well (Jakobsen & Thrane, 2016). By improving the ability for cross-organisational exchanges, actors can better steer the committed resources towards the different processes in the design and implementation of the technology.

As different actors are engaged in the digital innovation process, their contributions to the initiation, design, and enactment phases are also impacted by the *technological capacity* they possess (Wouters et al., 2023; Picazo-Vela et al., 2018). Although *collaborative capacity* is important in shaping the ability of actors to engage in cross-organisational exchanges, the selection and feedback mechanisms for the enacted technologies also influence the strategies. *Technological capacity* is linked with the actors' ability to recognise the different functionalities of the digital solution, explore potential opportunities for the technologies, develop a solution in a form that makes it possible to achieve the intended goals, and then enact and integrate the digital solution successfully within the organisation (Lember et al., 2018). This includes the mobilisation of different *resources* (e.g., knowledge, tangible resources) in the processes and practices linked with designing and enacting the functionalities of digital solutions (Picazo-Vela et al., 2018). It encompasses routines relevant for the development (e.g., financing, procurement, development) as well as the enactment (e.g., piloting, scaling up) of the digital solution. Feedback from existing routines affects the integration and institutionalisation of the functionalities of the digital solution into intra-organisational processes and the ability of actors to reshape semantic, operational, and technical logic. Actors have developed *technological capacity* over *prior digital developments*, which is encapsulated in existing processes and routines (Lember et al., 2018). The existing processes and routines may enforce established frames of thinking regarding technologies, or they may encourage openness and experimentation with the digital solution.

Alongside contributions, routines, and processes, the *priorities of actors* impact the strategies of participating in digital innovation initiatives. Actors have formulated specific *priorities* based on their defined role and links with other existing networks within the field they operate in (Dawes et al., 2009). *The priorities of actors* affect their interpretation of the benefits and disadvantages of the specific functionalities of digital technologies (Bannister & Connolly, 2014; Hellberg & Grönlund, 2013). The *priorities* are shaped by input from a variety of sources – e.g., prior experience with digital initiatives, professional knowledge, existing organisational structure and processes, values and norms within the organisation and in other networks in the policy domain (Dawes et al., 2009; Klijn & Koppenjan, 2016; Raadschelders & Whetsell, 2018). *Actor priorities* are also impacted by the *technological* and *collaborative capacities* present. This involves the

formation of *priorities*, but also how the functionalities of the digital solution are perceived. Actors with higher levels of *technological capacity* may be better able to interpret the different potential functionalities of the digital solution, and thus, find ways of potentially amplifying the expected benefits of the digital technologies (Chen et al., 2019; Kattel et al., 2019). Depending on the interests of the actors, they adopt specific strategies in collaborations with regard to their willingness to commit (Klijn & Koppenjan, 2016). Based on the combination of *priorities* and *capacities*, the actors can prioritise organisational goals, or they may look to commit to cross-organisational aims.

2.2 Network management

As digital initiatives cross established boundaries, actors work together within a collaborative process through networks. The strategies for managing the networks have to limit potential collaborative challenges, whilst capitalising on the potential for synergies and benefits from collaborative exchanges. As networks increase in composition, more diverse *resources* and *capacities* are involved, which increases the need to manage the differences and find common ground in semantic, operational, and technical details. Through network management, these *resources* and *capacities* can be utilised in the service of a shared goal, which can facilitate collaborative advantages in positive-sum games. The collaborative advantage can be achieved through a variety of strategies, encompassing both the composition of the network as well as the rules of interaction. To cover the different aspects, the thesis focuses on the following: A) *structural factors*; and B) *process-based factors*.

A) *Structural factors*

The functioning of networks is largely impacted by the design of its governance (Juell-Skielse et al., 2017). This impacts the intended dynamics for integrating the relevant cross-organisational processes and designing interoperability (Chen et al., 2019; Hellberg & Grönlund, 2013). The design of governance results from a combination of *structural factors*, the composition of actors, and the role of the lead actor(s).

As digital initiatives look to provide solutions to complex societal challenges, the network management approaches have to be adapted accordingly to provide the required competencies and capacities (Kattel et al., 2020). The complexity is also reflected in the composition of the network, which includes transboundary exchanges across policy domains and sectors (Quick & Feldman, 2014). This has led to cross-organisational networks occurring within governments (e.g., interagency collaboration) but also through public-private and public-non-governmental relations (Gasco-Hernandez et al., 2022; Picazo-Vela et al., 2018; Torfing et al., 2020). Engagement of private and other non-governmental actors can occur through formal (e.g., contractual partnerships, formal agreements) and informal (e.g., personal networks) interactions (Juell-Skielse et al., 2017; Kattel et al., 2020). The structural design of network governance affects the power allocation that shapes the availability of resources and capacities present within the network (Bailey & Barley, 2020). The allocation of power can originate from a variety of sources, such as the resources committed to the initiative, the reputation from previous initiatives, and the interdependencies with other engaged stakeholders (Bryson et al., 2015). Through the power allocation within the network, *structural factors* establish specific interaction dynamics between the actors, which can shape the potential to interact and influence the digital innovation process (Bailey & Barley, 2020).

This can provide innovation initiatives access to new cognitive frames, streams of knowledge and understanding (Stadtler & Karakulak, 2020). However, the asymmetries can also reinforce the perspectives of more dominant actors, with problems analysed through selective lenses (Wegrich, 2019).

A core element within the design of network governance is the role of lead actor(s). From the structural perspective, the position of the lead actor(s) within the network governance structure may take a variety of single or shared formats, with certain asymmetries with regard to responsibilities (e.g., discretion to design rules regarding interactions and decision-making) and resources available (Provan & Kenis, 2007). In more centralised structures, lead actor(s) adopt a top-down position in relation to other engaged actors. Alternatively, actors can agree upon sharing certain leadership roles by adopting shared formats or agreeing upon the creation of separate organisations (Juell-Skielse et al., 2017). Within the different structures, lead organisations shape the network management and the innovation process within the collaboration by balancing the interdependencies and autonomy of actors, reducing tensions within the initiative and facilitating an environment conducive to new ideas and perspectives (Ansell & Gash, 2012; Stadtler & Karakulak, 2020). Alongside an active role in shaping the network, the lead actor also affects the interactions with external actors and adjacent networks. The role of the lead organisation facilitates the legitimacy that the initiative is able to foster both with the engaged actors and networks, as well as within the broader administrative structure (Kattel et al., 2020; Torfing et al., 2020). The reputation and trustworthiness of the lead actor(s) transfers to the collaborative process, thus affecting the contribution of resources and the confidence of other engaged actors (Lewis et al., 2018).

B) *Process-based factors*

Alongside defining the structural design of actor composition and leadership roles within the governance structure, the actors also shape digital initiatives by engaging in different management interventions to foster more effective forms of coordination (Bryson et al., 2015). The management interventions look to bridge the tensions present and foster positive dynamics between the different actors and networks. This includes a wide variety of strategies to foster the collaborative advantage within networks, including agreements regarding the overall goals and objectives, the forms of participation and interaction, exchanging and sharing information, resolving conflicts, and other crucial processes (Klijn & Koppenjan, 2016). The collaborative innovation and collaborative governance literature has highlighted different process-related interventions, which are relevant for managing networks (Bryson et al., 2015; Emerson et al., 2012; Hartley et al., 2013):

- *Building trust.* For digital initiatives, trust is relevant at multiple levels – interpersonal trust, trust in organisations, trust in technologies. Trust reflects confidence in the predictability of the different actors, whether it be the individual, the organisation, or the technology, which affects perception of risks, and thus, the positions and interactions of individual actors (Provan et al., 2009; Klijn et al., 2010; Sun & Medaglia, 2019).
- *Developing capacity for collective action.* Transitioning from an organisation-centric perspective to cross-organisational coordinated activities requires establishing processes for coordinated actions (Chen & Lee, 2018; Emerson et al., 2012; Klijn & Koppenjan, 2016). This includes both formal and informal

norms facilitating cross-organisational interactions (e.g., through rules determining inclusion, decision-making, conflict mediation) as well as networks for exchanging and sharing resources.

- *Establishing meaningful learning processes.* Moving towards productive interactions requires the development of skills for reflection and learning among actors (Tuurnas, 2015; Mergel et al., 2020). Such *learning* occurs during the collaborative process when interactions and the outcomes of digital technologies introduce new cognitive frames to reevaluate existing processes (Young et al., 2019). Through new perspectives, actors may be able to better understand the problems with existing service provision, and thus, re-engineer such processes.

Process-based interventions, i.e., *building trust, developing capacity for collective action, and establishing meaningful learning processes*, are strongly interconnected and facilitate collaborative advantages within networks. However, networks experience limitations in establishing and maintaining process-based interventions as substantive and strategic challenges limit the options as well as their impact. From the substantive side, networks experience divergent interpretations from the blind spots and biases present amongst the engaged actors (Jessop, 2003; Raadschelders & Whetsell, 2018; Trondal, 2023). From the strategic perspective, networks may be composed of divergent interests, which may lead to more powerful actors steering the agenda and problem solving (Bailey & Barley, 2020; Klijn & Koppenjan, 2016). By limiting the available options and the impact of management interventions, substantive and strategic challenges also affect the ability of the networks to establish and maintain collaborative advantage. Due to the challenges in reaching common ground and agreement regarding the decisions taken within the collaborative venues, the actors are unable to recognise and capitalise on cross-organisational exchanges. This results in actors becoming reluctant to contribute and exchange within networks, leading to a collaborative malaise within the network.

Through network management, actors engaged in cross-organisational initiatives decide upon the strategies to shape the design and enactment of digital initiatives. The interventions and challenges change over time, as actors experience new internal and external events that reshape the dynamics within networks. The ability of the networks to formulate a response shapes the potential role of the enacted technologies, with new ideas either discarded or tested through experimentation.

2.3 Institutional context

Contrary to techno-deterministic perspectives, the systems and cultural perspectives emphasise the importance of the surrounding institutions in creating the necessary conditions for the development of digital solutions (Fountain, 2001; Pollitt, 2012). The impact of the surrounding institutions can be both conducive or limiting during the design and use of new technological solutions (Emerson et al., 2012; Randma-Liiv, 2023). To better understand the role of surrounding institutions in enacting technologies in inter-organisational contexts, the thesis focuses on: a) *prior digital developments*; b) *established interaction dynamics*; c) *horizontal and vertical embeddedness*.

Digital innovation initiatives take place in contexts where *prior digital developments* have already been conducted. The *prior developments* have a role in defining the digital solutions in place as well as institutionalising the structures and processes for subsequent digital innovation initiatives (Luna-Reyes & Gil-Garcia, 2011; Kattel et al., 2019; Kempeneer & Heylen, 2023). This creates certain technological trajectories, which can

encourage some digital innovation initiatives, whilst discouraging others (Dunleavy & Margetts, 2023). *Prior digital developments* interact with the digital initiative through a variety of roles, such as through the mandate provided to different networks, through existing digital solutions acting as a tangible resource, through formalising a syntax for public services, and through the provision of new knowledge by way of increased information processing capacity (Ansell & Miura, 2020; Chen et al., 2019; Kattel et al., 2020; Peeters, 2020). However, established digital solutions also nurture path dependencies in technological trajectories, which are difficult for public administrations to overturn (Kempeneer & Heylen, 2023; Vial, 2019). *Prior digital developments* tend to reinforce and infuse specific values and norms, which also steer the direction of follow-up developments (Cordella & Tempini, 2015; Luna-Reyes & Gil-Garcia, 2011). For example, this occurs by formalising specific processes and structures for maintaining accountability and responsibility, establishing automation and standardisation for efficiency gains (Bannister & Connolly, 2014; Cordella & Tempini, 2015). Furthermore, *prior digital developments* reinforce existing interpretations and biases with regard to data, which can impede its use for potential new service provision (Dunleavy & Margetts, 2023). As a result, digital initiatives attempting to introduce new logic and standardisation face more pressure, as they have to engage with resistance from established routines at the operational and technical levels. Alongside the choice of technologies, previous experience also influences perceptions about networks. Networks and actors who have been successful in *prior digital developments* are perceived positively with regard to success in future digital initiatives (Chen et al., 2019). While it streamlines the formation of governance arrangements, it can also create challenges for alternative networks and actors with less technological capacity looking to compete with existing arrangements (Wynen et al., 2019). As a result, *prior digital developments* can foster and nurture an ecosystem for new digital innovation initiatives but can also impede potential new digital initiatives that are incompatible with the established solutions, routines, and processes.

Digital innovation processes take place through *established interaction dynamics* that involve different types of actors (Di Giulio & Vecchi, 2023; Gil-Garcia et al., 2019; Juell-Skielse et al., 2017). Actors rarely possess monopolistic power within a policy field, as they have connections and interdependencies with other actors who also have a mandate to engage in specific processes to do with policy-making and/or service provision (Trondal, 2023). From their position, actors and networks possess the relevant legitimacy to initiate digital innovation initiatives (Breznitz & Ornston, 2013; Juell-Skielse et al., 2017). Public actors can adopt a number of other roles relevant to the digital innovation initiative – from designing the broader framework for steering digital innovation (e.g., detailing technical requirements and standards) to being an active partner within the specific digital innovation initiative (from the legal dimension to business processes to actively developing digital components inhouse) (Dunleavy & Margetts, 2023; Juell-Skielse et al., 2017). While digital innovation initiatives within the public sector are primarily related to public actors, private and societal actors have become increasingly relevant as well, as they become engaged with both the design and implementation of digital solutions (Di Giulio & Vecchi, 2023; Dunleavy & Margetts, 2023). This includes their ability to design the digital and business processes, as well as their potential role as intended end-users (Janssen et al., 2020; Juell-Skielse et al., 2017; Wouters et al., 2023). Through the interdependencies present within a policy field, the venues may steer towards distinct modes of collaboration. For example,

the centralisation of competencies and top-down mandates can lead to centralised digital agencies being seen as the legitimate actor to develop digital solutions for ministries and agencies within a policy field (Juell-Skielse et al., 2017). Collaborations can also include public-private and other public-non-governmental relations, as private and societal actors may possess the relevant resources, legitimacy, and commitment to engage in digital innovation initiatives (Ashaye & Irani, 2019; Sæbø et al., 2011). The *established interaction dynamics* and prominent modes of collaborations (e.g., inter-agency collaboration, collaboration among public and private actors, collaboration among non-governmental and public agencies) shape the choices within the digital innovation initiative regarding both structure and processes. The imbalances and plurality of backgrounds also impact the potential challenges within the digital innovation initiative.

Through the different modes of collaboration and established interaction dynamics, actors experience interdependencies in both *horizontal* and *vertical embeddedness*. The division of resources, tasks, and competencies within policy fields facilitates the formation of different networks of public, private, and societal actors, which necessitate interactions during policy-making and/or service provision (Jugl, 2023; Trondal, 2023). Organisations and networks become more embedded as the division of resources, tasks, and competencies for policy-making and/or service provision becomes more sectioned between different networks. For the digital innovation initiatives operating in the complex landscape of interconnected networks, increased *embeddedness* leads to more diversity in the semantic, operational, and technical logics present in the design and implementation of digital solutions. Engagement in networks leads to agreements regarding the specific use of professional language, mutual understanding regarding operational logic, and established interoperability regarding the digital solutions in place (Quick & Feldman, 2014). Through mutual agreements and compromises, these routines are guided by entrenched goals, values, and norms, which help steer the participating organisations in their actions (Klijn & Koppenjan, 2016). As actors participate in multiple networks to achieve different organisational goals, they have to prioritise their commitment to the different networks and thus choose the proper strategies to balance between different networks (Hinings et al., 2018). From a substantive perspective, increased *embeddedness* can open digital innovation initiatives up to more diverse perspectives, as different professional and organisational backgrounds from networks are engaged during the digital innovation process (Torfing, 2019). The differences within and across policy fields at a semantic (regarding the meaning of key concepts as well as relevant criteria), operational (regarding the provision of different services) and technological dimension (regarding the technological solutions relevant) are engaged and compromised on (Bailey & Barley, 2020; Hinings et al., 2018). From a strategic perspective, *embeddedness* leads to negotiations regarding the values, norms, and goals that engaged actors and connected networks face. Within more heterogeneous venues, i.e., diverse actor backgrounds and multiple connected networks, actors face more variety in proposed perspectives and norms, which create further challenges with transboundary exchanges (Klijn & Koppenjan, 2016; Quick & Feldman, 2014).

2.4 Combining actor characteristics, network management, and institutional context for enacting technologies

Actor characteristics, network management, and institutional context are strongly interlinked with one another, shaping the potential alternatives for the enactment of technologies. *Network management strategies* adopted within the digital initiative are limited to the resources and capacities of actors as well as the decisions previously made in the surrounding context. *Actor characteristics* change the viability of different structure- and process-related strategies for *network management*. Through collaborative and technological capacities of individual actors, networks establish different approaches for mitigating substantive and strategic challenges (Wouters et al., 2023; Kattel et al., 2020). This involves the potential interpretations for the enactment of technologies as well as the position of individual actors and the forms of interactions. The resources and capacities of individual actors are strongly shaped by prior digital initiatives, which often establish the availability for and allocation of resources by setting out clear values and norms that are deemed a priority within the organisation (Kempeneer & Heylen, 2023). The strategies for *network management* can impact the surrounding environment and institutions by shifting existing boundaries and interdependencies (Weerakkody et al., 2016). This occurs as digital initiatives can encourage moving beyond established siloes and boundaries with regards to decision-making and/or service provision, and thus, considering new potential opportunities for maximising the use of enacted technologies. Through positive synergies in *network management* approaches in the chosen structures and processes, both the actors engaged with the digital initiative as well as the external actors may re-evaluate best routines and practices for meeting their organisational goals and adhering to priorities within the policy field (Ibid.). By rethinking the processes and structures in existing networks, the division of resources and tasks may be reconfigured as well.

The combinations of *actor characteristics, network management, and institutional context* shape the opportunities for the enactment of digital technologies. On the one hand, positive synergies may be established, which result in the potential of the underlying digital solution being maximised. However, the connections between the factors can also produce conflict, which limits the enactment of the underlying technologies. Positive synergies are enabled by the connections between *actor characteristics, network management, and institutional context* in expanding the opportunities for enacting technologies (e.g., successes in past digital innovations combined with high technological capacity facilitating broader acceptance of enacting digital solutions). The positive synergies occur as the surrounding institutions, actors, and the engaged network(s) are able to contribute to recognising and utilising the different potential functionalities of the digital solution. This leads to flexible adaptations and adjustments to existing policy-making and/or service provision processes to integrate them. It can occur by way of a variety of strategies, which are able to capitalise on the resources and capacities they have available in the contexts they are in (Juell-Skielse et al., 2017; Wouters et al., 2023). On the other hand, configurations of *actor characteristics, network management, and institutional context* can result in a more restrictive environment for the enactment of new digital technologies (e.g., limited technological capacity and mutual learning leading to an inability to recognise technological functionalities and evaluate their potential value) (Kempeneer & Heylen, 2023). The conflicts begin to hamper digital innovation initiatives when frictions between

actor characteristics, network management, and institutional context discourage the exploration of technological functionalities for digital innovation and limit the integration of the digital solution with existing policy-making and/or service provision processes.

3 Methodology

The primary work for this thesis was conducted while working on the Horizon 2020 project TROPICO (Transforming into Open, Innovative and Collaborative Governments), which analysed the (potential) transformation of public administrations in the digital age through a wide range of public administration theories – from network governance and collaborative innovation to digital government literature. The overall aim of this thesis is to use network perspectives to study digital innovation initiatives by exploring and evaluating the impact of actor characteristics, network management, and institutional context on governing cross-organisational digital initiatives and their impact on enacting digital innovation. Consequently, the thesis aims to answer the following research questions:

- *How do actor characteristics impact the governance of cross-organisational digital initiatives?* (**Article I; II; III and V**)
- *How does network management impact the governance of cross-organisational digital initiatives?* (**Articles I; II; III; IV and V**)
- *How does institutional context impact the governance of cross-organisational digital initiatives?* (**Article II; III; V**)
- *Which configurations of cross-organisational governance are conducive to enacting digital innovation?* (**Article I; II; III and IV**)

As the thesis aims to both explore and understand certain network factors in the field of digital government, it has adopted both explanatory and exploratory approaches through in-depth case studies. The research strategy was guided by the complexity of the research subject. Due to the highly complex nature of multi-actor collaborations, the number of factors impacting the collaborative process and potential outcomes is quite large, which makes case studies a suitable approach (Van Thiel, 2014). The thesis relies on an in-depth study of the cases of digital innovation initiatives. It includes cases of digital innovation in e-health and taxation. The papers employed different approaches for the cases as well as the perspective for studying the venues. While most articles presented cross-case analyses and comparative cases (**Article I; II; IV; V**), one paper (**Article III**) focused on a single case study of the Estonian Employment Register. The articles adopted different perspectives to analyse the interaction venues, including interactions within a single venue (**Article III**), studying the interactions across multiple venues (**Article I; IV**), and adopting a system perspective (**Article II; V**). An overview of the methodological approaches is provided in Table 1.

For data collection, the thesis relied mostly on primary data, which was collected through interviews and surveys. The interview method involved both semi-structured (**Article II; III; V**) and structured formats (**Article I; IV**). In preparation for conducting the interviews, guidelines were designed that included the key themes and topics to be covered in interviews. The survey instruments (**Article I; IV**) included a written questionnaire and a Q-sort, which the respondents filled out during and following the structured interview. Both data collection instruments went through a piloting phase to improve the reliability and validity of the study.

For data analysis, the articles forming the core of the thesis have adopted both explanatory and exploratory approaches. The exploratory approaches included Q-methodology (**Article IV**), qualitative content analysis (**Article III**) and thematic

analysis (**Article II; V**), which aimed to better understand specific traits and conditions relevant to actors and collaborations. The explanatory approaches included fuzzy-set qualitative comparative analysis (fsQCA) (**Article I**), which studied the combined effect of the different set of conditions. The methods chosen were crucial for a deep dive into the conditions relevant for the specific phenomenon as well as for understanding the relevance of individual conditions in producing specific outcomes (Van Thiel, 2014; Schreier, 2012; Ragin, 2008).

The exploratory papers primarily aimed to conduct an in-depth analysis of the role of actor characteristics and the surrounding institutions as well as the management of collaboration regarding digital innovation. This perspective was covered in three articles (**Article II; Article III; Article V**) that provided an overview of the factors relevant for shaping collaboration on the digital initiatives. The articles have adopted different perspectives, from an actor-centric perspective (**Article III**) to comparative perspectives on collaborations (**Article II; V**), which provide different approaches to better understand the relevance of individual actors and networks for initiating and steering digital initiatives.

The explanatory papers focused on the relevant structural and process-based conditions in fostering digital technologies. This was covered in **Article I** and **IV**. The aim of the papers was to delve further into the conditions and look for specific pathways in fostering digital innovation as well as analyse the user-perspective with regards to role formation within established cross-organisational collaborations. This was achieved by surveying the actors in cross-organisational collaborations and obtaining in-depth qualitative information for the explanatory power of the results.

Table 1: Methodological approaches used in the articles

Publication	Case approach	Chosen cases	Method of analysis	Interaction venues
Article I	Cross-case	E-health initiatives	Fuzzy-set qualitative comparative analysis	Multiple interconnected venues
Article II	Comparative cases	Smart city initiatives; national digital initiatives linked to the EU Single Digital Gateway	Thematic analysis	System perspective
Article III	Single case	Estonian Employment Register	Qualitative content analysis	Single interaction venue
Article IV	Cross-case	E-health initiatives	Q-methodology	Multiple interconnected venues
Article V	Comparative cases	Smart city initiatives; national digital initiatives linked to the EU Single Digital Gateway	Thematic analysis	System perspective

Source: Author

Article I discussed the impact of partnership design on technological innovation in eHealth partnerships. The paper studied 19 eHealth partnerships across five countries (Belgium, Denmark, Estonia, Spain, the Netherlands). The data collection process relied on input from 132 interviews and 124 respondents to the survey, consisting of the following: (1) the coordinating actor; (2) public and private partners; (3) users. The data collected was analysed through a fuzzy-set qualitative comparative analysis (fsQCA) to test the hypotheses.

Article II focused on a cross-case design to analyse the interrelatedness of different types of challenges (power, risk, complexity) and digital solutions present in intra-governmental collaborations at the national and local level. Eight digital initiatives from four countries (Belgium, Estonia, Germany, the UK) were analysed through 50 semi-structured expert interviews. The national level cases had to be at or past the

implementation phase, collaborative in nature, and linked with the EU single digital gateway. The local level cases involved the implementation of smart city strategies and had to take place in a city that is considered a digital pioneer in the country and had a population of at least 50,000. The cases were coded using MAXQDA software and analysed for relevant themes.

For **Article III**, a single-case study approach was adopted. The article went in-depth into actor-centric perspectives on the challenges and coordination of the Estonian Employment Register. The choice of the case was related to its perceived success and the cross-organisational collaboration involving multiple technologically capable actors (ETCB and EUIF). The data collection involved desk research combined with altogether eight semi-structured interviews conducted between the period of October to November 2019. The desk research included strategic documents related to the engaged actors, media releases, relevant legislative acts, and surrounding documents. The data was analysed through a qualitative content analysis based on the coding conducted with a concept-driven and data driven coding scheme.

Article IV focused on user perceptions regarding their roles in public-private collaborations. The article theorised and tested four distinct theoretical user roles: (1) legitimators, (2) customers, (3) partners, and (4) self-organisers. The roles were tested using the Q-methodology on users in 19 public-private eHealth collaborations from five countries (Belgium, Denmark, Estonia, Spain, the Netherlands). The findings highlighted the emergence of three hybrid empirical profiles, indicating a variation in the viewpoints of users with regards to their involvement in the design and implementation of digital technologies. The findings reflected the importance of previous experience in shaping views and the need to establish feedback lines with users.

Article V adopted a multi-case study approach, analysing cases of digitalising public services in different administrative traditions. This involved both the digitisation of existing processes (e.g., digitising and centralising the Civil Registry in Belgium) as well as transforming processes (e.g., designing new services on the basis of the data collected with the Estonian Employment Register). The book chapter focused on the link between system context through administrative tradition and pre-existing relationships with specific collaborative process challenges and the subsequent choice of management measures. The book chapter concerned five countries (Belgium, Denmark, Estonia, Germany, United Kingdom) with three different administrative cultures (Continental, Scandinavian, Anglo-Saxon) adopted as perspectives. The data collection involved 36 semi-structured interviews with public, private, and societal users. The interviews were transcribed and coded, with reliability established through a review of results between co-authors.

Whilst the publications forming the core of this thesis used a variety of methodological approaches to improve both the reliability of the research conducted and the generalisability of the findings presented, there are still distinct limitations present. This concerns both the methodological strategies adopted as well as the foci of the individual papers, which affect the reliability of the answers to the different core research questions.

First, the main data collection methods were interviews and surveys, which rely strongly on individual perceptions. This could increase the likelihood of biases resulting from the perception of the interviewees. It can be related to both the initiative and other stakeholders. Furthermore, individuals may have limited memories of the initial phases of the technological initiatives, which can affect the level of data quality. The data

collection included additional steps in sampling as well as interview guidelines to limit the risk of individual perceptions affecting data quality. Throughout the publications, the representativeness of the sample was ensured by having specific criteria regarding characteristics (e.g., public, private, societal actors; core and peripheral roles) to balance the perspectives of different sub-groups. Furthermore, the reliability and validity of the interviews were improved through a variety of methods, e.g., triangulation of data sources, testing for intercoder reliability, pilot studies.

Secondly, the focus was narrowed down to digital initiatives where public sector organisations have an asymmetrical position regarding the design and use of enacted technologies. This is likely to have an effect on some of the results presented within this thesis. The asymmetrical position of public sector organisations impacts the potential roles of private actors and end-users. This can limit certain end-user profiles (for example, the user-innovator) and constrain the advantages provided by private actors (e.g., flexibility in experimentation). It also affects the perceived importance of different actor characteristics and network management approaches. To mitigate potential biases from research findings, different subgroups, i.e., public, private, and societal actors, were included in the sample to incorporate additional perspectives. Furthermore, the interview guidelines included themes and topics on challenges to understand the limitations of the asymmetric structures studied.

4 Main findings

The main findings are structured according to the research questions highlighted in the section “Focus and aim of the thesis” and are based on key findings from the articles.

4.1 How do actor characteristics impact the governance of cross-organisational digital initiatives?

In terms of actor characteristics, the research results indicated the prominence of the following dynamics: a) asymmetric contributions of the lead actor(s); b) collaborative capacity affecting the viable strategies for process-based interventions; c) technological capacity affecting the ability to interpret and enact functionalities in a cross-organisational venue; d) priorities of actors shaping the balance between intra-organisational routines and cross-organisational functionalities.

Regarding the combinations of resources individual actors possess, the studies showed that the reputation, tangible resources, and knowledge of the lead organisation(s) are the most crucial for defining network management strategies. The reputation the lead actors can provide for the digital innovation initiative is important for the perceived legitimacy as seen by external actors as well as engaged partners, affecting their initial contributions (**Article II**). Furthermore, during the development and enactment of digital technologies, knowledge, tangible resources, and reputation are utilised to balance the process-based interventions in mutual learning and trust-building. For example, with the case of the mobile health technology for women with osteoporosis in Denmark, the initiative experienced strategic challenges due to diverging perspectives regarding the enactment of the mobile application. The intervention from the lead actor became crucial for bypassing the collaborative deadlock. As they possessed an asymmetric position in terms of knowledge, tangible resources, and reputation, they were able to replace less relevant and conflicting partners, whilst maintaining the legitimacy and trust of other engaged actors (**Article I**). The resources committed shape the network management strategies. Through different combinations of resources, actors can capitalise on them through structure- and process-based approaches to design and enact digital technologies.

Although resources are crucial for shaping the alternatives for governing digital initiatives, the viability of using a different combination of resources is ultimately shaped by the collaborative and technological capacity of the individual actors. The collaborative capacity impacts the ability of actors to engage in transboundary exchanges, while technological capacity affects their ability to interact with the functionalities of the digital solution. Regarding collaborative capacity, the findings showed the role of the collaborative capacity of individual actors in reaching a common understanding within the policy field regarding the semantic dimension (agreement on core concepts and data definition), operational logic (mandates of actors, rules with cross-organisational interactions), and technical factors (data exchange rules between different information systems) for digital initiatives. Namely, high levels of collaborative capacity enhance the potential for mutual learning, which improves the viability of more diverse actor compositions for cross-organisational digital initiatives. For example, for the case of the eIDAS regulation in Denmark, the lead role was adopted by the Danish Agency for Digitalization, which had considerable experience in steering digital innovation initiatives. Their prior experiences had developed their collaborative capacity, so they were able to capitalise on it to achieve mutual learning within inclusive venues (**Article V**). However, in cases of low levels of collaborative capacity, organisations become

more rigid and fixed on their organisational perspectives and priorities, less able to adjust and capitalise on the potential changes proposed from cross-organisational venues. This was revealed in the case of the Civil Registry in Belgium, where several engaged actors possessed lower levels of collaborative capacity, which affected the quality of cross-organisational interactions (**Article II; V**). Actors with lower collaborative capacity tended to view the changes as violating the established routines and practices for collecting citizen data. Namely, the centralisation to a single database was seen to affect existing practices regarding the information systems in use, the rules and norms for accessing, and the handling and storing of data. Rather than engaging in seeking compromise, the actors exhibited passive and active forms of resistance, with the divergence in rules and norms utilised as justification to resist the changes. This indicates that collaborative capacity affects the viability of certain network management approaches as well as the substantive and strategic challenges experienced.

The technological capacity has an impact on the actors' ability to adjust their perspectives on substantive and strategic issues. This includes the ability to interpret the functionalities of the underlying digital solution and the routines for integrating with existing intra-organisational processes. Namely, actors with low levels of technological capacity possess limited ability to comprehend and articulate the value of the functionalities of the digital technologies. This leads to increased reluctance to engage in digital innovation initiatives that have extensive interactions with established structures, processes, and technologies. Due to low levels of technological capacity, the preference is towards innovations that are highly compatible with prior digital developments. For example, in the case of the Government as a Platform (henceforth GaaP) in the UK, different departments indicated their lack of knowledge (e.g., comprehension of the computer programmes, data exchange rules, the templating language) regarding the information systems present, which impacted their ability to effectively engage in multi-actor collaborations. This resulted in them showing reluctance towards collaborations which had a stronger impact on already existing procedures and routines. Simultaneously, the engaged partners exhibited more openness towards peripheral digital initiatives that resulted in new independent processes (e.g., Notify and Pay) (**Article II**). On the other hand, the findings show that actors with higher levels of technological capacity are more flexible and open to different potential outcomes of the functionalities of the digital solution. In the case of the Estonian Employment Register, certain actors, i.e., the Estonian Unemployment Insurance Fund (henceforth EUIF) and the Estonian Tax and Customs Board (henceforth ETCB), possessed a high level of technological capacity that they had fostered in past initiatives. Through their initiative, they both reformulated existing routines (e.g., data exchange regarding employment data) and created new processes (e.g., the use of data to analyse risks of unemployment) and articulated value for other actors as well (**Article III**). This points to the ability of actors with higher level technological capacity to formulate potential functionalities for technologies and define value for the partners within networks.

The research findings indicate that actor priorities affect the perceived value of the digital initiatives, and thus, the willingness of actors to contribute to the cross-organisational initiative. Actors who see conflict between intra-organisational routines and cross-organisational solutions are more likely to adopt strategic behaviours that tend towards maintaining existing routines and processes. In the case of the centralised patient registration system in Estonia, the collaboration included a diverse set of actors, with the cross-organisational solution conflicting with intra-organisational

routines and processes (**Article I**). The goal within the multi-actor initiative was to centralise the existing routines for appointments. The standardisation resulting from a centralised system limited the *ad hoc* flexibility for managing patients needing follow-up appointments for smaller healthcare providers. As a result, some actors perceived that the digital solution conflicted with their organisational goals regarding user-centric service provision, which led them to distance themselves and reduce contributions to the cross-organisational initiative. This highlights how divergences between organisational and cross-organisational priorities can result in actors being incentivised towards strategic behaviour to maintain existing organisational routines and organisation-centric perspectives. However, cross-organisational goals can be compatible and complement with organisational priorities, which motivates actors to contribute further resources towards the cross-organisational initiatives.

4.2 How does network management impact the governance of cross-organisational digital initiatives?

The findings show different strategies for network management for digital innovation initiatives. The strategies themselves can be aimed at a variety of goals – maintaining the focus of the digital initiative, improving the legitimacy of the decision-making process, and achieving broader acceptance for the initiative. The strategies reflect a compromise between exploring the functionalities of digital innovation and maintaining compatibility with the existing structures and processes. The main results regarding the impact of network management are as follows: a) asymmetric structures due to the central role for the lead actor; b) importance of legitimacy amongst users for scaling up the digital solution; c) balancing between trust-based relations and mutual learning; d) challenges in establishing strategies for transitioning from organisation-centric perspectives to cross-organisational compromises.

When it comes to structure-based approaches, different actor roles can provide multi-actor arrangements with further options for steering the cross-organisational arrangement. The lead actor role is related to both the exploration of the functionalities (e.g., setting the overall vision of the digital initiative) as well as enacting the digital technologies (e.g., establishing ownership relations for the cross-organisational digital solution). The findings indicate that the lead actor adopting a central role is crucial for encouraging the exploration of functionalities, whilst avoiding collaborative deadlocks. For example, in a case regarding digital solutions in a nursing home in Belgium, the lead actor maintained an elaborate accountability structure, formulating an overall vision and maintaining shared understanding to mitigate conflicts. Within the agreed frames, the lead actor created a space for trial-and-error experimentation and encouraged other partners to freely test prototypes and provide open feedback (**Article I**). The centrality of the lead actor is achieved through the contingent roles it adopts to maintain a strong legitimate position. The contingency is exhibited by shifting between different modes – from hierarchical top-down control for maintaining control to shared forms of leadership through collaborative decision-making for exploring different functionalities across organisational boundaries. Lead actors can adopt the contingent approach for roles by having the necessary reputation, as low levels of legitimacy for lead actors affect the engagement of actors, perceived challenges, and efficacy of intervention measures (**Article II; V**). For example, in the case of the Online Access Act in Germany, the fragmentation of tasks and resources between different actors in a federal system

and the low levels of legitimacy of the central coordinating body led to considerable efforts in trying to convince actors of the viability of the initiative (**Article V**).

Alongside lead actors, users are a crucial part of the collaborative process, especially in scaling up and institutionalising digital innovation initiatives within organisations. User perceptions regarding the legitimacy of the network and the perceived digital outcomes affect their willingness to contribute and their acceptance of modifying existing processes. This is upheld by the ability of the network to establish and maintain effective interactions, which provide a space for considering substantive feedback. The findings indicated three distinct user profiles (service consultants, co-designers, hands-off supporters) for cross-organisational digital innovation initiatives in the public sector. These user profiles range from passive roles to more active partner roles. Despite the considerable differences in perceived roles, there were certain commonalities between them. The primary commonality between the user profiles indicates that the minimum requirement for legitimacy among user profiles is the provision of spaces for adopting end-user feedback and a clear vision with regard to the digital solution. With a lack of user-innovating profiles, the findings emphasised the importance of the network in managing the interactions by providing easily accessible and time-efficient interfaces for engaging end-users (**Article IV**). The governance structures therefore need to be able to accommodate to end-users with limited resources (e.g., lack of time, limited motivation) and consider the potential downsides of participation fatigue. This is achieved by prioritising the phases where user contribution is the most critical.

Regarding interactions within the network, actors tend to adopt different combinations of process-based strategies to foster trust, expand mutual learning, and improve collective action capacity. Whilst strategies to improve collective action capacity are noted, the most relevant dynamic concerns balancing between maintaining trust-based relations while engaging in a mutual learning process. While trust-based relationships are critical to fully comprehending the potential functionality of a digital solution, the ability to expand and look for further potential functionalities tends to depend on expanding the network across established boundaries (**Article I; III**). As digital initiatives expand across established boundaries, trust-based relations tend to become less prevalent within the network, with formal measures complementing informal approaches. For example, in the case of the Estonian Employment Register, actors initially utilised informal *ad hoc* interactions based on prior relationships, which enabled them to reach compromises more quickly within a single functionality (e.g., establishing semantic interoperability in categorising different types of employment for implementing data exchange between a variety of actors). By looking to expand the functionalities of the register, the network expanded across established boundaries, including new actors, which also involved a shift in the modes of interactions (e.g., relying on established legal mandate during negotiations to compromise on interoperability in operational logic regarding data storage and retroactive changes between actors) (**Article III**). Whilst moving beyond boundaries can bring new valuable insight and perspectives, multi-actor initiatives experience increased conflicts in perspectives alongside the pressure to implement more formal interaction measures. Transboundary exchanges shift the established balance between trust, mutual learning, and collective action capacity, requiring networks to be more reflexive and modify existing measures.

The choice between structural and process-based measures is also shaped by the collaborative process challenges present within the network. The findings indicate challenges transitioning from organisation-centric perspectives to cross-organisational

compromises. A lack of interpersonal trust, diverging perspectives on the role of digital technology, differences in the technological infrastructure implemented, asymmetric imbalances in available resources and capacities all are prominent issues furthering organisation-centric approaches. As networks increase in size, the organisation-centric perspective becomes more dominant. Even when collaborative deadlocks are bypassed in these larger venues, the divergence in perspectives causes challenges in finding agreement on the purpose and role of the functionalities of the digital solution. An example of the substantive challenges affecting the collaborative process can be seen in the case of a smart city policy in Antwerp. The smart city policy was coordinated within a voluntary network that included shared leadership with considerable autonomy for ideation and implementation. This led to considerable diversity in perspectives yet limited control over the focus within the smart city initiative. Due to a lack of shared understanding of what the underlying policy problems being solved were, the initiative experienced issues with performance, which required reconfiguring to bring in a policy-oriented perspective to a technology-driven initiative (**Article II**). From a strategic perspective, cross-organisational digital initiatives entail shifts in structures, resources, and processes, which may lead to increased uncertainty between actors. Siloisation and power positions result in the predominance of organisation-centric perspectives when negotiating for compromises as opposed to the goals at the cross-organisational level. This was apparent also in the case of the Estonian Employment Register where negotiations for follow-up developments after the initial phase were guided by organisation-centric interests and resources. One of the partners, the Estonian Labour Inspectorate, made a proposition for a follow-up development to improve risk analysis capacities. However, the lack of technological capacity and resources of the Estonian Labour Inspectorate led to the proposition being discarded. Although the lead organisation had a higher level of technological capacity and availability of resources, the lack of direct organisational benefits limited their interest in engaging with the follow-up development. The predominance of organisation-centric mindsets in multi-actor initiatives leads to the enactment of technologies being driven by the balance of resources and capacities of the engaged partners rather than the potential of the functionalities.

4.3 How does institutional context impact the governance of cross-organisational digital initiatives?

The structures, processes, and procedures surrounding the cross-organizational digital initiative are important in shaping the potential pathways for both the design as well as the enactment of digital technologies. As actors look to cross established boundaries within policy domains regarding resource and task allocation, they are impacted by previous digital developments and established interdependencies, which influence viable alternatives and actor compositions. The findings express that: a) prior digital developments entrench specific venues and routines for follow-up cross-organisational initiatives; b) existing interdependencies improve understanding of the different routines present amongst engaged actors and affect the exploration of functionalities.

Experiences from prior digital innovation and digitalisation efforts can have both a positive and a negative effect on multi-actor arrangements. This occurs because prior digital development efforts validate procedures for enacting digital technologies by reinforcing existing practices and institutionalising new pathways for future digital

innovation. By institutionalising certain pathways, prior digital developments can also impose certain priorities for relevant actors and networks (**Article II; V**). As a result, there are advantages for digital innovation initiatives that are largely compatible with the surrounding context. Here, prior digital innovation initiatives affect the legitimacy of other digital developments the actors and networks are engaged in. The routines, processes, and technologies instituted entrench the pathways and compatible follow-up digital developments can enjoy a supportive environment. For example, in the case of implementing the eIDAS Regulation in Denmark, the past digital developments undertaken by the Danish Agency for Digitisation were crucial for instituting specific pathways for follow-up digital innovation initiatives. This also included an established network for digitalisation initiatives where the Danish Agency for Digitisation adopted a central role. The legitimacy this collaborative structure had accumulated reduced concerns regarding both power asymmetries and strategic behaviour (**Article V**). However, limited technological and collaborative capacity and poor network management strategies in prior digital initiatives can lead to negative feedback cycles, which have consequences for future digital initiatives. As a result, the failures in past digital developments can amplify the risk perception in institutions that are already risk averse and affect the reputation of key actors in digitalisation. For example, in the case of the GaaP, the Government Digital Service as a central coordinating actor experienced legitimacy issues. Other public actors were concerned about the history of overambitious and overpromising digital initiatives resulting in considerable costs and limited benefits, which led to caution in committing to follow-up digital initiatives (**Article V**). Positive and negative experiences affect the potential for transformational change, with positive experiences providing actors with more flexibility for designing governance approaches and negative ones limiting the alternatives available.

Through a combination of prior digital developments, technological capacities, mandates provided within the policy field, and other factors, interdependencies between certain clusters tend to become institutionalised for digital initiatives. This tends to reinforce certain interactional patterns between actors, who also use them for digital developments. As a result, established networks tend to be relied on more for inducing digital innovation, with developments and follow-up developments fostered within an established set of actors. Within these networks, actors improve collaborative capacity by becoming more aware of the semantic, operational, and technical logic of other actors. This becomes an important factor in new cross-organisational digital initiatives, with improved collaborative capacity enabling venues with limited interaction costs and the ability to better explore the potential functionalities of digital technologies. For example, in the case of the Estonian Employment Register, the embeddedness of the organisations was important for moving beyond the initial intra-organisational approach during ideation. The initial concept was purposed for the lead organisation, but it expanded into a cross-organisational initiative. Knowledge of organisational needs, awareness of the established semantic, operational, and technical logic, as well as the interdependencies in processes related to monitoring employment relationships incentivised the shift towards a cross-organisational approach. Namely, actors were able to interact and jointly recognise the potential value offered by the register (**Article III**).

4.4 What configurations of governance were conducive towards enacting digital innovation?

The studied cross-organisational digital initiatives showed a variety of governance approaches, which led to different outcomes for enacting digital technologies. Some of the cross-organisational arrangements resulted in digital innovation, where the digital solution led to novel approaches, introducing new or modifying existing processes. In other instances, the collaboration led to no substantive change, as the digital solutions failed to move beyond the piloting phase. The successes and challenges were dependent on both the potential of the underlying technology through its different potential functionalities and also on the ability of networks to adopt and institutionalise them in existing structures and processes (**Article I; II; III; IV**).

A core dynamic for instilling digital innovation in cross-organisational initiatives is to do with establishing agreement over the core functionalities and the value proposition of the digital solution. This includes reaching compromises between the different actors engaged in the network. The compromises include agreements and trade-offs between the actors on the semantic, operational, and technical dimensions. The findings indicate that the configurations conducive to cross-organisational digital innovation were able to consistently adjust process-based strategies in learning and trust-based relations, whilst maintaining the capacity for collective action. Such balancing is required to optimise the mutual learning process, while maintaining overall levels of trust within the multi-actor arrangement in order to foster acceptance. The governance configuration associated with achieving this balance entailed both structure- and process-based characteristics:

- 1) homogeneous actor compositions;
- 2) central position of the lead actor;
- 3) precise vision;
- 4) framing strongly linked with output legitimacy.

An example of this combination can be seen in the use of an AI-based solution to diagnose non-cooperative patients (e.g., children) in Spain, which managed to successfully enact a sophisticated solution (**Article I**). The findings linked the successes of enacting the solution to exploring different functionalities in a controlled setting. Namely, by constricting the overall focus to a specific problem, linked to a concrete process and end-user group (i.e., non-cooperative patients), the network managed to develop a clear understanding of the tools (e.g., information systems in use, data available) and the alternatives available. The precise vision was possible because of the limited inclusion of actors with connections from prior developments and/or compatibility in terms of the semantic, operational, and technical logic. This enabled the network to flesh out a limited set of ideas with functionalities, rather than remain stuck trying to find compromise between diverging sets of ideas with limited prospects of being developed into potential functionalities. The findings showed that by limiting the diversity of perspectives, digital initiatives managed to bypass collaborative challenges and establish a clear frame for the collaborative process (**Article I**).

The advantages of combining homogeneous actors, the role of a strong lead organisation, precise vision and framing towards output legitimacy enable mitigating potential impeding conflicts in substantive and strategic collaborative process challenges, whilst also nurturing both the exploration of functionalities and their enactment. The conflicts in substantive challenges are curtailed by having a mutual understanding of the semantic, operational, and technical logic present, with actors possessing significant overlap through homogeneity (**Article I; II**). The strategic challenges are mitigated

through the central position of the lead organisation, who is crucial for negotiating clear responsibility and accountability structures (**Article I; III**). By way of clear responsibility and accountability structures, actors agree upon the ownership of different functionalities, which encourage better understanding of the potential value of digital innovation initiatives. With the homogeneity of actor characteristics and a strong lead actor role, digital initiatives are better positioned to act against the pressures to maintain existing routines, and thus, engage in more transformational change (**Article III**). Their enactment is further enabled by a precise vision and framing towards output legitimacy. As actors have a better understanding of the potential impact with regards to effectiveness and/or quality in comparison with existing processes, they can also better comprehend the pathways to integrating the digital solution with existing processes and its adoption (**Article IV**). Over time, the precise vision can be broadened within multi-actor networks, as positive feedback cycles amongst actors lead to further resources and increased commitment towards follow-up developments. Actors build confidence on the basis of successful network management approaches regarding mutual learning, trust-building and collective action capacity, which factors in when considering the potential for follow-up developments.

5 Discussion

Digital innovation has provided public administrations with additional options for handling increasingly complex problems and conditions. By enacting digital technologies, public administrations address the existing boundaries between organisations and institutions, as digital technologies provide new potential routines and practices for effectiveness, efficiency, and accountability gains (Chen et al., 2019; Wouters et al., 2022). Through the practices and routines related to digital solutions, existing organisational interdependencies are reshaped and new ones formed, which has raised the importance of networks for governing digital initiatives. The thesis aims to contribute to existing literature by discussing some of the fundamental dynamics present in cross-organisational digital innovation initiatives through network perspectives – actor characteristics, network management, institutional context. Through this, the thesis also aims to contribute to developing stronger connections between public management and e-government literature, which still largely remain disjointed (Bannister & Connolly, 2020; Dunleavy & Margetts, 2023; Gil-Garcia et al., 2017; Pollitt, 2011). The empirical findings contribute to existing knowledge regarding the relevance of organisational and institutional factors in digital innovation, such as the relevance of technological capacity for lead actors to nurture cross-organisational thinking, finding balance between mutual learning and trust building, and challenges in defining viable spaces for collaboration.

The findings indicate that successful cross-organisational digital innovation initiatives are based on the combination of homogeneity of actors, the central role of the lead actor, agreement on a precise vision and framing towards output legitimacy (**Article I; Article III**). The cross-organisational digital initiatives that sport this combination are composed of actors that are similar with regards to the available knowledge sources as well as priorities. Furthermore, the access to decision-making within the network is limited to a small set of actors and the lead actor adopts a central role in which they utilise command and control measures. Within this governance approach, the positive feedback loop is maintained by providing a clear value proposition through a precise and narrow vision and framing the initiative regarding output legitimacy (**Article I; Article III**). Whilst other combinations and configurations are present in cross-organisational digital innovation initiatives, they tend to face more issues in enacting functionalities that cross existing boundaries. This is due to the substantive and strategic challenges and limited network management strategies impeding mutual agreement regarding semantic, operational, and technical logic. The existing literature in collaborative governance and collaborative innovation sees the core dynamic in inducing innovation as being linked to diversity in ideas and trust-based relations (e.g., see Hartley et al., 2013; Torfing, 2019). This is connected to the actors being able to engage each other in a trust-based environment and have as many relevant perspectives available as possible (Torfing, 2019). The findings from the thesis indicate certain nuances about the salience of this dynamic for digital innovation initiatives within the public sector. While the findings do emphasise the critical role of trust-based relations, the diversity of ideas was perceived as less relevant (**Article I**). The shift towards homogeneity of actors and exclusivity of the network even indicates a potentially contradictory shift to low levels of diversity in ideas. Whilst low levels of diversity are preferred, mutual learning, which is also at the core of collaborative innovation (e.g., see Sørensen & Torfing, 2011), remains a priority for the engaged actors.

A potential reason for the seeming inconsistency, i.e., presence of both low diversity of ideas and high levels of learning, may originate from issues with miscalculating

interdependencies (e.g., see Elston et al., 2023; Hamilton et al., 2021). The engagement of a diverse set of actors with limited collaborative capacity may result in a negative impact on networks through erosion of trust and diminishing mutual learning ability as organisation-centric priorities and bargaining overtake the collaborative capacity of the actors (**Article II; V**). As diverse actors perceive the value of cross-organisational initiatives differently due to their individual priorities, it can be challenging to have larger venues that are able to establish trust between engaged stakeholders (Elston et al., 2023). Trust is built upon the predictability of actors and their unwillingness to take advantage of other actors through opportunistic behaviour (Klijn et al., 2010). As networks become more diverse, the findings indicate that the network management strategies undergo increasing challenges in facilitating positive dynamics in trust-building and mutual learning. Furthermore, such diversity can lead to an ideational overload from individual priorities during the decision-making process, which causes collaborative deadlocks and affects the perceived value of cross-organisational initiatives. Here, the risk-aversion characteristic of public sector actors may also further affect the perception of the value of the cross-organisational initiative, leading to more reluctant and cautious behaviour in taking on additional risks (Kempeneer & Heylen, 2023; Mikhaylov et al., 2018). Through homogeneous networks, the process of mutual learning is directed towards a more controlled environment where actors possess the resources and flexibility to engage in trial-and-error practices with a limited set of ideas, rather than being overwhelmed by a plurality of perspectives and interests.

Alongside ideational overload, diverse actor compositions and heterogeneous networks also experience inertia within the collaborative process due to organisation-centric priorities. Namely, the emphasis on organisation-centric priorities leads to challenges in finding mutual understanding regarding semantic, operational, and technical logic across existing boundaries (**Article III; V**). As a result, the diversity of actors provides additional pressures within the cross-organisational collaboration, as additional technological legacies and intra-organisational path dependencies (from outdated data, formats, standards, information systems, processes) need to be addressed at the cross-organisational level (Kempeneer & Heylen, 2023). This also provides important nuances for collaborative innovation and collaborative governance theories regarding the collaborative advantage from diverse in-depth knowledge and broad inclusion (Ansell et al., 2023; Torfing, 2019). As individual actors have tied their technical know-how very strongly with the established digital infrastructure, embracing new semantic, operational, and technical logic requires a reframing of the structures and processes already in place. The translation of the functionalities of the digital solution into potential intra-organisational value necessitates the presence of technological capacity alongside trust-based relations and mutual learning. Due to the varying levels of technological capacities within the public sector, some public actors may have a limited ability to interact with the new functionalities of technologies beyond their established digital infrastructure and thus to evaluate the value of the solution. This also leads actors to misevaluate the potential of cross-organisational exchanges and makes the actors more prone to opting for the strategic position to maintain existing technological legacies. In an attempt to limit the likelihood of collaborative deadlocks that comes from diverse settings, i.e., ideational overload and inertia from organisation-centric priorities, cross-organisational digital innovation initiatives have shown more preference towards low diversity settings.

Although cross-organisational initiatives include a number of actors who provide resources and capacities for the initiative, the lead actor tends to remain central in digital

innovation initiatives in terms of steering communication and affecting the eventual output. This includes setting frames within which to focus on the full development of single ideas as well as encouraging the collaborative process (**Article III**). Their role is not only limited to managing the interactions within the network but lead actors are also the main representative of the network during communication with external actors and networks in the surrounding environment (**Article I; III**). The role of the lead actor(s) has a considerable emphasis in existing literature as well, with their presence being crucial for facilitating collaborative dynamics within the networks and interacting with the surrounding environment (Tangi et al., 2021; Vial, 2019). Through this central role, they shape the potential for expanding on the functionalities and scaling up the adoption of technologies as they have a significant role in maintaining boundary spanning and cross-organisational interpretation. With digital innovation induced by the process of mutual learning and trust-based relations, the hierarchical measures available for the lead actor provide them with the tools to steer the digital initiative from emulation towards transformational framing (**Article III; V**). This corresponds with existing e-government literature where the shift from emulation to transformation entails both an exploration into the design of the technologies, evaluating the surrounding environment the technology is embedded in, as well as an active search for potential improvement opportunities (Tangi et al., 2021). The centrality of the lead actor leads them to be responsible for finding the balance between maximising existing functionalities and shifting towards new functionalities.

While lead actors do have significant influence, often being the driving force behind the cross-organisational functionalities of the digital solution, the findings also show that they adopt primarily cautious and incremental approaches (**Article II; V**). With the complexity of the interconnections between the actors, the networks they operate in, and the surrounding environment – e.g., limited technological capacity of actors resulting in further efforts to define functionalities, diverse actor interests (e.g., legal requirements, privacy and security concerns) affecting the enactment process, interconnectedness between different information systems and overall IT architecture – the viable governance alternatives for maintaining positive dynamics become limited for the lead actor(s). As technologies become more transformational by new routines and practices for organisations, the combination of challenges shifts increasingly towards the strategic dimension, which further nudges lead actors towards incremental approaches. The main challenge during this process is maintaining the commitment of other partners to cross-organisational interaction. Through transformational change, lead actors have to put in increasing effort to translate the potential value of cross-organisational interactions to the engaged partners. Actors with lower technological capacity tend to pose a larger challenge, as the lead actor must put more effort into reframing the cross-organisational goals for their perspectives. This aligns with ideas regarding established technological and institutional path dependencies, which entrench a specific interpretation about the technological solution as well as its adoption in surrounding structures and processes (Kempeneer & Heylen, 2023; Dunleavy & Margetts, 2023; Abraham et al., 2019). As expanding technological functionalities requires a compromise between actors regarding the semantic, operational, and technical logic, the lead actor is crucial in avoiding the negative dynamics of collaborative excess by attempting to establish a limited set of functionalities and negotiate a value proposition for the different individual actors engaged with the process.

Although the cross-organisational arrangements most conducive towards successfully enacting digital innovation were homogeneous and strongly controlled by the lead actor(s), they could still uphold acceptance and legitimacy for the engaged partners as well as the end-users connected to the digital innovation. The findings indicate that the perceived benefit from adopting and integrating the digital solution (output legitimacy) into existing structures and processes was crucial for enabling cross-organisational exchanges. Both the partners within the network as well as the intended end-users stressed the importance of effective resource usage and the limited room for error, which creates the need for a clear and precise vision regarding the potential functionalities of the digital solution and its integration into surrounding structures and processes (**Article III; IV**). This resulted in the connected actors being willing to compromise on the design of the decision-making process, thus providing the lead actor(s) with a considerably asymmetric position. It enabled the collaboration to facilitate a mutual learning process, whilst still being closed and exclusive.

A key factor in enabling the adoption and scaling up of digital innovation is also the willingness to establish spaces for receiving user input and valuing their contribution. The nature of user knowledge (both easily transferrable as well as stickier long-term specialised knowledge) is crucial for understanding the potential value proposition of the different functionalities of the technology as well as the potential deviations that occur during the enactment of the digital solution (**Article IV**). However, these spaces are often designed to assign end-users with passive roles, rather than enabling an equal partnership. Despite their limited roles, digital initiatives with a clearly stated vision and framing towards output legitimacy manage to maintain a high level of legitimacy amongst users (**Article III; IV**). With the strong emphasis on results in a viable digital solution (output legitimacy), the questions regarding the relevance of other sources of legitimacy for innovation arise – i.e., inclusion of perspectives (input) and open decision-making (throughput) (Torring, 2019; Linders, 2012). A potential reason for the limited importance of input and throughput legitimacy for digital innovation initiatives may originate from the cooling enthusiasm for broader inclusion (Loeffler & Bovaird, 2016; Elston et al., 2023; Kempeneer & Heylen, 2023). Furthermore, the findings suggest that both the engaged actors in the network as well as end-users show willingness to engage in a trade-off where they prioritise the precise vision and high output legitimacy for the digital solution and agree on a decision-making structure that is more asymmetric, i.e., the power is concentrated in the lead actor(s) (**Article II; IV**). With resources and technological capacities often concentrated with specific actors and networks over the course of different digital innovation initiatives, these venues are more accepted and seen as legitimate. As a result, they can provide potential solutions and changes to long-term acute problems and tensions, which makes actors and end-users more open to different configurations as long as they perceive its ability to produce change.

In conclusion, whilst cross-organisation digital innovation initiatives may lead to the enactment of transformative digital technologies, the change is likely to occur in specific conditions. Cross-organisational digital innovation initiatives are more likely to achieve success by combining the homogeneity of actors, the central role of the lead actor, a precise vision, and framing towards output legitimacy. This combination enables reducing the potential substantive and strategic challenges that impede positive dynamics from balancing mutual learning and trust-building. Furthermore, it manages to limit the plurality of perspectives and focus more on comprehensively testing out a limited set of ideas, which is overseen by a strong lead actor.

6 Conclusions

By focusing on cross-organisational digital innovation, the aim of the thesis was to provide new conceptual and empirical insights into the governance of technological innovation processes in the public sector. The empirical insights were informed by the network governance perspectives and based on in-depth case studies of multi-actor digital innovation cases in the public sector. The thesis highlighted that substantive change through enacted technologies requires governance approaches, which include homogeneous actors and are steered hierarchically. Within these cross-organisational approaches, the interactions are based on high levels of interpersonal trust, which provides actors with confidence regarding the potential of the digital solution. These interactions occur in a context of low diversity of ideas, where actors have high levels of mutual understanding regarding the semantic, operational, and technical logics present. The success of enacting digital technologies is linked with the flexibility to engage in trial-and-error practices with a limited set of ideas rather than emphasising the plurality of perspectives. The cross-organisational digital initiatives manage to maintain positive feedback by having a precise vision and framing through output legitimacy, which avoids ideational overloads.

Based on the results of the thesis, several key topics have been highlighted that require further research. First, this study is primarily based on cases from the field of health care and taxation. These policy sectors were chosen due to high levels of technological capacity present within the respective fields, which enabled to better study digital initiatives. However, this also includes specific institutional contexts (e.g., cultures affecting professional and organisational backgrounds) as well as actor characteristics, which may not be easily generalisable to different policy fields. The thesis suggests that enacted technologies are more likely to be engaged in transformative change when the governance venues are exclusive to homogeneous actors, who are steered in a top-down manner by a lead actor. The salience of the findings would benefit from further analysis by looking at alternative governance configurations, countries, and policy sectors. This could help to better understand the dynamics between actor characteristics, network management, and institutional context.

Second, there is a significant amount of literature on the role of users and their contributions to fostering digital innovation and creating new innovative spaces. The findings of the thesis highlight different hybrid user profiles (co-designer, service consultant, hands-off supporter) and perceived priorities, yet indicate a distinct lack of user-led innovation. For future research it would be of value to delve further into the role of users in digital innovation. As this study focuses predominantly on the perceptions regarding user roles through Q-methodology, other qualitative and quantitative methods would help to investigate user profiles further. It would also be helpful to understand whether the lack of user-led innovation is affected by the framing of the collaboration, analysis of prior experiences, characteristics of the user group, or whether the user-innovator role is limited for public sector innovation.

Third, while the thesis combines network and e-government perspectives through analysing actor characteristics and network management, temporal dynamics have been included to a limited extent. Whilst the in-depth case studies provide insight into temporal shifts, this relies on the perceptions and *ex post* evaluations. A possible future research avenue would be to study the agility and adaptability of governance structures over time to better understand the developments that take place from the design of the

functionalities of the digital solutions to their enactment. This would help to validate the findings of the thesis and provide further insight into their impact over different time periods.

In conclusion, the combination of network and e-government perspectives for the study of digital innovation initiatives within the public sector provides new potential insight for understanding the developments taking place during the digital age. As digital technologies become increasingly sophisticated and provide public, private, and societal actors with opportunities to cross existing boundaries, an understanding of the enablers and hindrances becomes more salient. With interdisciplinary research combining public management and e-government perspectives remaining few and far between, the potential to further the knowledge of digital innovation initiatives within the public sector warrants further studies.

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Acknowledgements

This Thesis marks the end of an adventure, which started already in 2018 with a meeting with one of my supervisors, Prof. Tiina Randma-Liiv. As I was starting my Master's and applied for a job as a project assistant, she offered an opportunity to conduct research through the TROPICO project. Although I had no way of knowing it back then, that offer paved the path towards one of the most fulfilling and exciting journeys.

This journey hasn't been without a fair share of ups and downs, which have improved me academically as well as personally. Furthermore, through these different phases I have had the opportunity to meet and collaborate with remarkable people from the projects as well as from the Nurkse Department. From short exchanges in the hallways to long discussions on publications, the people around me have been a major source of inspiration. Whilst I'm grateful towards more people than I could mention here, I would like to separately mention a few, who have been instrumental during my journey. My first thanks go to Prof. Tiina Randma-Liiv. She recognized my potential for having a career in academia and her help and guidance have been instrumental for following through with this path. Her ability to always find the right things to say have been so valuable for successfully navigating the more challenging parts of this journey. Whether it be at moments of self-doubt with the publications, the complete exasperation with project deliverables, the dread of informing about the destruction of two laptops containing weeks of unsaved work, her advice has helped me through some of these critical moments. I hope to carry on with the wisdom and knowledge that she has provided for future journeys.

My second biggest thanks go to Prof. Veiko Lember. He has always asked the necessary questions, whether it be with regards to the publications or with my own personal progress and aspirations. These questions have provided me with much needed clarity about where to make my next steps and to ensure that these steps are my own. Sometimes asking the seemingly simple question of "what do you want to do" is critical and he has ensured that I would reflect on my progress and future. He has always been available to calmly listen to all my frustrations and has provided gentle nudges, whenever I have needed a push. His light-hearted responses to the dumbfounding situations I experienced over the years were very much needed. In an effort to reduce these dumbfounding situations in the future, I promise to have and keep my work connected to the cloud.

I also would like to thank Prof. Külli Sarapuu. She provided critical advice at one of the most difficult times for me and has been always present with great guidance. At the beginning of my journey, when I was still very anxious about a career in academia, her words helped me set forward towards my path. By telling me that the relentless drive towards perfection is the surest way of burning out, she has helped me process and face some of my insecurities at the beginning of my academic career. By taking pride in the work that is already good enough and not get stuck with endless tinkering, I have been able to get off the ground and moving.

Additionally, I would like to express my gratitude to Prof. Wolfgang Drechsler. His lectures have always been inspirational and instilled me with the desire to find the stories interesting for me in academia. He has shown, how our research subjects are fundamentally connected to the culture, traditions and values surrounding us and how important it is to acknowledge them. Furthermore, he has been a role model for engaging and communicating effectively with others to share perspectives and knowledge. By overfocusing towards validity and reliability in methodology we tend to forget the

story we are trying to share and how we communicate. He has shown that by developing our abilities in communicating and storytelling, we are able to capture the minds and hearts of our audiences in a way that an overstuffed set of slides never will.

Throughout my PhD studies I have also had the opportunity to collaborate with researchers from different universities across the world. Here I would like to specifically mention the people at the University of Antwerp, who hosted and collaborated with me through the different papers. Despite being extremely busy, Prof. Koen Verhoest has always shown incredible support for my progress and found time to provide feedback for my work for which I'm very grateful. Alongside Koen, I would also like to give my thanks separately to Chesney, Susana and Chiara, who have been inspiring and great partners throughout the different collaborations. My gratitude also goes out to other co-authors in papers, Professor Erik-Hans Klijn, Professor Gerhard Hammerschmid, Associate Professor Lena Brogaard, Professor James Downe, Professor Vicente Pina, Assistant Professor Jan Boon, Dr. Jaime García Rayado, Dr. Jessica Breaugh-Bossdorf, Dr. Maike Rackwitz, Dr. Benedetta Bello and Dr. Dries Van Doninck. Each publication provided a great learning opportunity, which have led me to where I am today.

This journey wouldn't have been possible without all the people working at the Nurkse Department and the incredible atmosphere there. It has offered a supportive environment for conducting research. A big part for this is due to the director of the department Prof. Erkki Karo, who has managed shape an environment, where everyone can feel encouraged to improve and learn. I would also like to express gratitude to Dr. Leno Saarniit, who was the head of the BA programme and offered me an opportunity to further my skills in teaching by being a TA. A big part of the heartfelt and warm environment is due to Piret Kähr, who has always been there to help with any kind of issue, no matter how big or small. I also want to highlight the fellow junior researchers and PhD students, who shared their pains and their successes during the journey. This includes the leaders of the PhD student cohort (even after finishing it) in Jaanus and Shobhit, who provide an inspiration and a beacon for all junior researchers to follow. My thanks also go out to Colin, Luiza, Mergime, Aleks, Radu, Sara, Francesco, Mariliis, Kadi-Maria, Mehmet, Nikiforos and others who all have been a part of this journey. I also have to give thanks to the members of room 438 in Marc, Ayberk and Eva. The time spent together with all of you has brought a lot of laughter and joy over the past few years. Every time I stepped into the office, the passionate debates on the most random topics and the different games always taught me something new. All of you are terrific researchers in the making and it has been a pleasure to share a part of the journey.

Finally, I would like to thank those outside of academia, who supported me. First of all, my mom Ulvi, who sent me a link to the BA programme at Nurkse Department and said that this seemed to align with my interests. Her adamant support to choose the path that I'm passionate towards has encouraged me and my decisions over the years. My gratitude also goes out to my brothers Sander and Silver, who have provided mental support and fun banter to help me get through the most difficult periods of my PhD studies. Finally, throughout the past 3 years I couldn't have made the progress I did without my partner Dika. From rejoicing over the successes in publishing to frustrations over further rounds of revisions, her support and partnership helped me rediscover a smile and happiness that I had missed for a long time.

Research that forms the core of this dissertation was supported by the following funding sources: Horizon 2020 project TROPICO (grant number 726840), Horizon Europe project ROBUST (grant number 101061272), Estonian Research Council funding through the project RITA1/02-96-12.

Abstract

Governance of Cross-Organisational Digital Innovation in the Public Sector

Digital innovations have become an important mainstay within the public sector, with technologies improving effectiveness, responsiveness and transparency of public policy and administration (Dunleavy and Margetts 2023). Despite the irreplaceable role of digital technologies, their enactment in the public sector has been far from a straightforward success, with past decades providing a myriad of examples of low performance outcomes, unintended consequences and even downright failures (Kempeneer and Heylen 2023). Whilst some of the failures have to do with overoptimistic expectations, the main challenges tend to originate from the integration of new technologies with established administrative structures and processes. The complex interactions between the actors, networks and institutions influence the potential for capitalising on technological functionalities and thus inducing digital innovation (Pollitt 2011). Whilst researchers have stressed the importance of integrating e-government research with broader public administration debates to better comprehend the role of structures and processes (see for example Gil-Garcia et al., 2017), the respective research communities remain detached from one another. This has resulted in a research gap regarding the effect of the role of structures, actors and processes central to the public sector in enacting technologies.

The aim of the thesis is to provide new conceptual and empirical insights into the governance of cross-organizational digital innovation processes in the public sector. This is achieved by combining network and e-government perspectives for the analysis of digital innovation initiatives. Introducing a network approach for the analysis of digital initiatives provides an alternative perspective for the study of interactions between the technical, organizational and the institutional dimensions. The thesis focuses on the role of actor characteristics, network management and institutional context in affecting the governance of cross-organizational digital innovation initiatives within the public sector.

This thesis shows that mutual learning built on trust-based relations can induce digital innovation in cross-organizational initiatives, when utilized for a limited set of ideas, where actors can comprehensively test the functionalities of the digital solution through trial-and-error. The thesis points out that homogeneous venues with lead organizations adopting a central role through command and control are best able to achieve the dynamics for capitalising on the potential for digital innovation. This is due to the ability of the configuration to simultaneously nurture positive dynamics, i.e. mutual learning and trust-building, whilst limiting negative dynamics, i.e. substantive and strategic challenges. The asymmetric position of the lead actor enables cross-organizational initiatives to maintain the overall focus and bypass collaborative deadlocks. The homogeneity of actors improves mutual understanding regarding the semantic, operational and technical details, thus increasing the quality of cross-organizational exchanges. The cross-organizational digital initiatives maintain their legitimacy and acceptance by adopting a narrow vision and framing the value from engaging within the initiative through output legitimacy.

Lühikokkuvõte

Avaliku sektori organisatsioonide koostöö digitaalse innovatsiooni juhtimisel

Digitaalne innovatsioon on muutunud avaliku sektori lahutamatuks osaks, kus läbi tehnoloogia on parendatud poliitikakujundamise ja elluviimise tõhusust, reageerimisvõimekust kui ka läbipaistvust (Dunleavy and Margetts 2023). Tehnoloogia asendamatu rollist hoolimata ei ole digitaalsete lahenduste kasutuselevõtt avalikus sektoris olnud vaid sirgjooneline edulugu. Viimased kümnendid on pakkunud näiteid nii ootamatustest kõrvalekalletest kui ka läbikukkumistest (Kempeneer and Heylen 2023). Kuigi mõned väljakutsed on tingitud ebarealistlikest ootustest tehnoloogiate suhtes, kipuvad peamised probleemid pärinema olemasolevatest struktuuridest ja protsessidest. Seotud osapoolte, ümbritsevate võrgustike ja institutsioonide omavaheline dünaamika mõjutab võimalusi tehnoloogia funktsioonide rakendamiseks ning digitaalse innovatsiooniks (Pollitt 2011). Kuigi eelnev teadustöö on rõhutanud vajadust e-valitsemise ja avaliku halduse uurimissuundade paremaks integreerumiseks struktuuride ja protsesside mõistmiseks (vaata näiteks Gil-Garcia et al., 2017), on need kogukonnad jäänud üksteisest eraldatuks. See on põhjustanud puudujäägi meie teadmistes avalikus sektoris olevate struktuuride, osapoolte ja protsesside rollist tehnoloogiate rakendamises.

Käesolev doktoritöö keskendub uue kontseptuaalse ja empiirilise arusaama loomisele avaliku sektori organisatsioonide koostööst digitaalse innovatsiooni juhtimiseks. Doktoritöö teostamiseks kombineeriti võrgustikupõhist ja e-valitsemise kirjandust digitaalse innovatsiooni algatuste analüüsimiseks. Võrgustikupõhise perspektiivi rakendamine võimaldab luua uut arusaama tehniliste, organisatsiooniliste ja institutsionaalsete tegurite rollist. Kõnealune doktoritöö on keskendunud seotud osapoolte omaduste, võrgustikupõhise juhtimise ja institutsionaalse konteksti mõjule organisatsioonidevahelise digitaalse innovatsiooni algatustes.

Käesolev doktoritöö toob välja, et avaliku sektori organisatsioonide koostöö on võimeline juhtima digitaalset innovatsiooni kindlates tingimustes, kus usalduspõhised suhted võimaldavad üksteiselt õppimist. Kui osapooled keskenduvad piiratud hulk ideedele, kus nad on võimelised põhjalikult testima digitaalse lahenduse funktsioone katse-eksitus meetodil, siis see soodustab digitaalse innovatsiooni teket. Antud doktoritöö näitab, et homogeensetest osapooltest koosnev koostöö koos kesket positsiooni omava juhtorganisatsiooniga, kes kasutab ülalt-alla juhtimismeetmeid, on kõige tõhusam kooslus digitaalse innovatsiooni loomiseks. See on tingitud selle koosluse võimekusest samaaegselt säilitada positiivseid dünaamikaid, s.o vastastikune õppimine ja usalduse loomine, ja piirata negatiivseid arenguid, s.o sisulised ja strateegilised väljakutsed. Juhtorganisatsiooni asümmeetriline positsioon võimaldab säilitada üldist fookust ja ületada ummikseise lihtsamalt. Osapoolte homogeensus parendab üksteise mõistmist semantilistes, operatiivsetes ja tehnilistes detailides, täiustades avaliku sektori organisatsioonide koostööd. Avaliku sektori organisatsioonide koostöö säilitab legitiimsust kitsa visiooni ja väljundipõhise raamistamise abil.

Appendix

Publication I

1.1 Verhoest, K., Callens, C., Klijn, E.-H., Brogaard, L., García-Rayado, J., Nõmmik, S. (2024). "Designing Cross-Sector Collaboration to Foster Technological Innovation: Empirical Insights from eHealth Partnerships in Five Countries." *Public Administration Review*, 1–18. <https://doi.org/10.1111/puar.13785>

Publication II

1.1 Breugh, J., Rackwitz, M., Hammerschmid, G., **Nõmmik, S.**, Bello, B., Boon, J., Van Doninck, D., Downe, J., Randma-Liiv, T. (2023). “Deconstructing complexity: A comparative study of government collaboration in national digital platforms and smart city networks in Europe.” *Public Policy and Administration*, 1–22.
<https://doi.org/10.1177/09520767231169401>

Publication III

1.1 Nõmmik, S. (2024). "Cross-organisational collaboration management of digital innovation in the public sector – the case of the Estonian Employment Register" *NISPAcee Journal of Public Administration and Policy*. 17(1), 1–27.
<https://doi.org/10.2478/nispa-2024-0007>

Publication IV

1.1 Callens, C., Verhoest, K., Klijn, E.-H., **Nõmmik, S.**, Pina, V., Brogaard, L. (2023). "How service users envision their engagement in processes of collaborative innovation: A Q-methodological study on user involvement in eHealth collaborations." *Public Policy and Administration*, 1–25. <https://doi.org/10.1177/09520767231170298>

Publication V

3.1 Breugh, J., Nõmmik, S. (2024). "The coordination of digital government platforms: the role of administrative tradition and collaboration history." *In*: Verhoest, K., Hammerschmid, G., Rykkja, L., Klijn, E.-H. (eds.) *Collaborating for Digital Transformation How Internal and External Collaboration Can Contribute to Innovate Public Service Delivery*. Edward Elgar, 81-102. <https://doi.org/10.4337/9781803923895>

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1.1 **Nõmmik, S.** (2024). “Cross-organisational collaboration management of digital innovation in the public sector – the case of the Estonian Employment Register” *NISPAcee Journal of Public Administration and Policy*, 17(1), 1–27. <https://doi.org/10.2478/nispa-2024-0007>

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