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Rethinking Digital Governance – How Collaborative Innovation Strategies Advance the Development of Digital Innovations in Public Organisations

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Abstract

Digital innovations bear the potential to increase the efficiency and transparency of governments and create more accessible and user-centric public services. However, public organisations are facing several challenges in the development of digital innovations and the unique democratic requirements imply that digital services cannot simply be procured from private contractors. Hence, a new strategy called collaborative innovation appears to be a possible solution, but few institutional designs have been found to sustain collaborative innovation in the present governance system. Therefore, this thesis investigates the unexplored phenomenon of innovation fellowship programmes by conducting a diagnostic case study about Tech4Germany with a focus on the research question: How does the fellowship programme Tech4Germany contribute to the development of digital innovations in German public sector organisations? Interviews with participants of Tech4Germany revealed that fellowship programmes are a suitable institutional design for collaborative innovation as they create an attractive setting for tech experts and provide public employees a unique room to experience agile and user-centric approaches. In particular, mutual learning is stimulated, and the implementation resistance reduced.

Keywords: Collaborative innovation; Fellowship programmes; Public innovation; Digital transformation.

1. Introduction

The interest in public innovation has intensified among public administration scholars. The public sector is facing new challenges such as ageing society, skilled labour shortage and various 'wicked' problems, hence a growing number of scholars agree that innovation is central to the public organisation's capacity to deal with those challenges (DeVries, Bekkers, & Tummers, 2016; Hartley, Sørensen, & Torfing, 2013; Lindsay et al., 2017). Particularly, the emergence of advanced technologies like robotic process automation, artificial intelligence (AI), or machine learning offer the potential to increase the efficiency, transparency, and effectiveness of governments (Gil-Garcia, Dawes, & Pardo, 2018). Furthermore, digital innovations can potentially be a response to rising citizen expectations towards faster, more accessible, and user-centric public service delivery (Mergel, 2019). However, public organisations are encountering several challenges in the development of digital innovations. It has been well-rehearsed in the pertinent literature that traditional organisational characteristics of public organisations such as hierarchy, silo structures, and red tape are severe barriers to public innovation (Bommert, 2010; Damanpour, 1991; DeVries, Tummers, & Bekkers, 2018; Rainey, 2014). Moreover, the political environment and multitude of stakeholders tend to increase the complexity of public services and public organisations have a comparatively small innovation budget as well as long-term financial planning horizons (Borins, 2001; Cinar, Trott, & Simms, 2019). Of particular relevance for digital innovations is the lack of personnel with the required technical skills and a deficient usage of modern working methods like design thinking and agile project management (Coglianese, 2020; Mergel, 2016).

At the same time, it has been shown that public employees are not intrinsically less innovative and there are also distinctive drivers of innovation in the public sector, such as the political and normative pressure for improvement (Hartley et al., 2013; Sørensen & Torfing, 2011). Moreover, it is acknowledged that the unique rules and procedures in the public sector usually serve a democratic purpose, for instance, equal opportunities (Neumann, Matt, Hitz-Gamper, Schmidthuber, & Stürmer, 2019). Therefore, digital innovations are only justifiable when they create public value and it is emphasised that practices and solutions from the private sector cannot simply be transferred to the public sec-

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tor (Heartley, 2005). Additionally, scholars point to the risk of an overreliance on external information technology (IT) providers as private contractors "may not be sufficiently sensitive to the particular demands on government for explainability, due process, or avoidance of bias" (Coglianese, 2020, p. 49). Given this tension between potential benefits and risks, it is a key question in the research of public innovation how to develop digital innovations *within* public sector organisations.

In recent years, a new strategy to spur public innovation has been developed which is termed *collaborative innovation* and can be defined as "multi-actor collaboration that [...] may foster innovation by bringing together public and private actors with relevant innovation assets, facilitating knowledge sharing and transformative learning, and building joint ownership to new innovative visions and practices" (Sørensen & Torfing, 2012, p. 1). This new research field combines theoretical knowledge about collaborative governance (Ansell & Gash, 2008) with findings and theories of innovation (Borins, 2001; Chesbrough, 2003; Greenhalgh, Robert, Macfarlane, Bate, & Kyriakidou, 2004; Moore & Hartley, 2008). As such, collaboration is not new to the public administration literature but is closely related to the concepts of co-production (Verschuere, Brandsen, & Pestoff, 2012) and co-creation (Voorberg, Bekkers, & Tummers, 2015). However, co-production has primarily been used to encourage user participation in public service delivery (Fledderus, Brandsen, & Honingh, 2014) and has only recently been extended to the question of public sector innovation. Here, the work of Sørensen and Torfing (2011) and Torfing (2016) are frequently referred to as the key theoretical foundation (DeVries et al., 2018).

The emergence of *collaborative innovation* can be embedded in the wider paradigm shift towards the New Public Governance (NPG) model (Osborne, 2006). Hence, it can be distinguished from *hierarchical innovation strategies* which have been predominant in the Traditional Public Administration (TPA) paradigm and *competitive innovation strategies* that emerged in the New Public Management (NPM) era (Hartley et al., 2013; Heartley, 2005; Torfing, 2019). As hierarchical and competitive strategies inhere some limitations, collaborative innovation has been suggested as one possible approach for public organisations to mitigate the emerging challenges (Hartley et al., 2013; Torfing, 2019). A growing number of studies found empirical evidence for a positive impact of multi-actor collaboration (McGann, Wells, & Blomkamp, 2021; Neumann et al., 2019). At the same time, recent literature is concerned with the challenges and limitations of collaborative innovation (Agger & Sørensen, 2018; Torfing, Sørensen, & Røiseland, 2019; Wegrich, 2019).

However, the question of how collaborative innovation can be supported and sustained in the present governance system has not yet been resolved since there is no history or tradition of systematically opening up public bureaucracies to citizens and third sector organisations (Bommert, 2010; Hartley et al., 2013; Torfing, 2019). Mostly, collaborative innovation appears either in form of one-time projects (see for instance Neumann et al., 2019 and Lindsay et al., 2017) or in institutionalised and permanent innovation labs (Gascó, 2017; McGann, Blomkamp, & Lewis, 2018; Whicher & Crick, 2019). The former induces the problem that learning effects about the collaborative process itself cannot be sustained and the scope is relatively limited (Torfing, 2016). The latter faces the challenge that innovations are again developed in a separate setting outside the public organisation and often constricted to the development of ideas, thus facing challenges in reaching the implementation stage (McGann et al., 2021). A very new phenomenon that has not been covered by the peer-reviewed literature so-far are *innovation fellowship programmes*. Hereby, citizens with relevant skills and expertise spend a short-term stay in the federal government to collaboratively create innovative solutions for specific problems together with the government employees. Mergel (2016, p. 520) mentioned these innovation fellowship programmes as "innovative HR policies" in the context of agile innovation management in public organisations, yet there is a crucial research gap since this new practice has neither been systematically analysed nor connected with the existing scientific knowledge about collaborative innovation. As a growing number of scholars emphasize the untapped potential of collaborative innovation (Hartley et al., 2013) and fellowship programmes might be a suitable approach to overcome the outlined barriers, it is of high scientific importance to analyse the mechanisms, potentials, and limitations of this new practice. This thesis aims to fill that gap by conducting a diagnostic case study about Tech4Germany, a fellowship programme that brings citizens with relevant technical skills into the German national ministries for three months to develop digital innovations for prevailing problems. To systematically investigate the new phenomenon of innovation fellowship programmes, the following research question will be answered in the course of this research:

> *How does the fellowship programme Tech4Germany contribute to the development of digital innovations in German public sector organisations?*

From the main research question, three sub-questions are derived to guide the analysis of this case study in alignment with the existing knowledge about collaborative innovation. Each sub-question investigates one phase of the innovation cycle. Thereby, it is aimed to develop an in-depth understanding of the fellowship programme by analysing whether the theoretical mechanisms of collaborative innovation are observable. It is asked:

(1) In what ways does the fellowship programme Tech4Germany enable the collaboration of empowered actors to contribute to the generation of innovative ideas?
(2) To what extent does the fellowship programme Tech4Germany stimulate mutual and transformative learning to contribute to the development of digital innovations?
(3) To what extent does the fellowship programme Tech4Germany stimulate the creation of joint ownership of

the innovation among the involved actors to facilitate the implementation of digital innovations?

By answering the proposed research questions, the study adds to the existing scholarship in several ways. Firstly, since fellowship programmes are emerging as a third space between one-time projects and innovation labs, this theory-guided case study provides highly relevant scientific insights to the question of how collaborative innovation can be initiated and sustained in public organisations. Secondly, by connecting the theorised mechanisms of collaborative innovation with empirical observations of a so-far unexplored form of collaboration, the study adds to the existing knowledge about the causal relationship between collaboration and innovation. Lastly, the study provides empirical findings about digital innovations which have only recently begun to receive attention from public administration researchers (DeVries et al., 2016).

Therefore, the study is also of high social relevance. The digital transformation is one of the most pervasive transformations of the public sector (Dunleavy, Margetts, Bastow, & Tinkler, 2006). Governments increasingly use new forms of data analysis and emerging technologies that no longer solely automate existing processes but instead induce entirely new forms of governing societies and running public organisations (Gil-Garcia et al., 2018; Peeters & Schuilenburg, 2020). This development comes with a severe tension between the potential benefits of digital innovations and various identified risks (Wirtz, Weyerer, & Geyer, 2019). One concern is that public employees rely on technology without having insights and control about how the algorithms produce their results (Peeters & Schuilenburg, 2020). Thus, it is called for new ways to deal with digital innovations and to strengthen the understanding of new technologies among the employees (Wirtz et al., 2019). Since collaboration in form of fellowship programmes may be one approach to increase the in-house capacity of public organisations to develop, implement and oversee new technologies in line with democratic principles (Coglianese, 2020), this thesis entails socially important findings and provides relevant practical implications for policy and governance regarding new digital innovation strategies.

To answer the proposed research questions, the thesis is structured into five major sections. The next chapter provides the theoretical foundation for the case study. Here, the concept and mechanisms of collaborative innovation are granularly elaborated to develop the analytical framework that will guide this study. Subsequently, the methodology will be outlined, including a description of the investigated case. In the fourth chapter, the case Tech4Germany will be analysed by applying the analytical framework to the empirical evidence. Hereafter, a critical discussion of the results and the limitations of the research is presented to answer the three proposed sub-questions. Finally, the thesis concludes with an answer to the overall research question and practical implications as well as suggestions for future research.

2. Theoretical foundation

This chapter provides the theoretical foundation for the research. It starts with conceptualising digital public sector innovation, followed by an elaboration of the concept of collaborative innovation. Subsequently, the evolution of innovation strategies in the public sector is outlined. The fourth section explains the theoretical mechanisms of collaborative innovation, complemented by a description of the key limitations and challenges of collaborative innovation. The chapter concludes with connecting collaborative innovation and digital innovations and a summary of the developed analytical framework.

2.1. Digital public sector innovation: a definition

Digital innovation is a social construct that has different meanings in different contexts. Since there is not one commonly used definition in the public administration literature, this section clarifies how digital innovation is conceptualised in the study. On the most general level, innovation can be understood as "an idea, practice, or object that is perceived as new by an individual or other unit of adoption" (Rogers, 2003, p. 12). Based on a systematic literature review of studies about public sector innovation, DeVries et al. (2016, p. 152) define three facets as necessary and sufficient conditions for public sector innovation: the perceived novelty, the first adoption of an idea by a given organisation, and a discontinuity with the past. Together, these dimensions differentiate innovation from reform, change, or new ideas (Sørensen & Torfing, 2011, p. 849).

As this definition still includes a wide range of different innovation forms, DeVries et al. (2016) distinguish four types of public sector innovation: administrative or technological process innovation, product or service innovation, governance innovation, and conceptual innovation. This study investigates digital innovation, thus the focus lies on technological process innovation that is defined as the "creation or use of new technologies, introduced in an organization to render services to users and citizens" (DeVries et al., 2016, p. 153). Simultaneously, literature from the private sector refers to digital innovation as "innovating products, processes, or business models using digital technology platforms as a mean or end within and across organizations" (Ciriello, Richter, & Schwabe, 2018, p. 565). Taken together the outlined dimensions, this study defines digital public sector innovation as *the first adoption of a technology that is perceived as new by the given public organisation and produces a significant change in the specific context*.

Importantly, the presented definition does not include anything about whether the innovation produces good or bad consequences (Heartley, 2005). Even though the term has a positive connotation and the goal in most cases is to create an improvement, the risk of failure is usually very high and the perception of whether an innovation is an improvement or debasement is a subjective valuation (McIvor, 2020; Torfing, 2019). Therefore, critical innovation theories point to a "pro-innovation bias" (Godin & Vinck, 2017, p. 8) as several

scholars and practitioners tend to assume that innovation is always the solution and always leads to improvement. Since the study does not aim to evaluate whether the collaboratively developed digital innovations are an improvement, this debate will not be further elaborated. However, the critical view will be considered in the discussion of the results.

2.2. The concept of collaborative innovation as a new strategy for the public sector

The concept of *collaborative innovation* presents the key theoretical foundation for this study. At its core, the strategy is characterised by the feature that "the private and third sector and citizens are integrated into the innovation cycle (idea generation, selection, implementation and diffusion) from the earliest stage onwards" (Bommert, 2010, p. 16). This definition emphasises that collaborative innovation does not refer to the output but to the process that (potentially) leads to innovation. Thereby, innovations are developed in a complex, nonlinear, and iterative process (Eggers & Singh, 2009). Hence, to reveal the mechanisms of collaborative innovation, four analytical phases of the so-called innovation cycle can be depicted (Figure 1). The first stage, the *generation of ideas,* typically starts with the identification and analysis of the problem, followed by the clarification of the goal. Then, a set of possible solutions and creative ideas is developed. Subsequently, the *selection of ideas* evolves around the decision of which ideas should be further pursued by designing, testing, and redesigning prototypes. The *implementation of new ideas* refers to the conversion of ideas into concrete products, procedures, practices, or services (Eggers & Singh, 2009).[1]

Secondly, the collaborative element remains to be clarified. Torfing (2016, p. 64) defines *collaboration* as "a temporal process through which a plurality of actors work together in an organized way to transform problems and opportunities into joint solutions that rest on provisional agreements that are formed despite the persistence of various forms of dissent." In the context of public innovation, those actors can on the one hand include politicians, public managers and government employees, and on the other hand private companies, civil society organisations, and citizens (Lopes & Farias, 2020). In sum, collaborative innovation in the public sector can be conceptualised as *a temporal process in which nonstate actors are integrated into the innovation cycle from the first stage onwards whereby the involved groups - public and external actors - engage in collaborative activities to jointly develop and implement public innovation.*

2.3. The evolution of innovation strategies in the public sector

In order to illustrate how the strategy of collaborative innovation may help to spur innovation in the public sector, it is contrasted with hierarchical and competitive innovation strategies in the following. Hereby, it is acknowledged that the outlined strategies are not mutually exclusive but co-exist and might develop hybrid forms of innovation approaches (Wegrich, 2019).

Hierarchical strategies tend to favour in-house innovation initiated in a top-down approach by public managers or leaders (Hartley et al., 2013). Beyond the already mentioned organisational barriers, this approach seldomly produces innovative ideas that break with the past because public leaders have few incentives for change, carry the whole responsibility for possible failure and solely rely on their own ideas which limits the scope of developed solutions and tends to create group-thinking and blind spots (Cinar et al., 2019; Eggers & Singh, 2009; Wegrich, 2019). Competitive strategies are strongly characterised by the adoption of modern business practices in the public sector during the NPM era and aim to counteract the deficiencies of TPA strategies with the "creation of quasi markets and the adoption of new forms of strategic leadership and performance management" (Hartley et al., 2013, p. 824). Even though the new management practices can enhance public innovation in some dimensions, new barriers like a tendency towards standardisation, control and a reluctance to share knowledge can be induced by the strong focus on competition and performance (Torfing, 2019). Therefore, collaborative innovation has been suggested as one possible approach for public organisations to mitigate the challenges and limitations of hierarchical and competitive strategies by including empowered actors with diverse knowledge, skills and perceptions in a collaborative process (Hartley et al., 2013; Torfing, 2019).

Importantly, this new strategy "requires a reformulation of the traditional roles of public and private actors" which resembles a wider trend in the shift towards NPG (Hartley et al., 2013, p. 827). Whereas citizens have been mainly perceived as passive clients in the TPA model and as customers in line with the market orientation of the NPM era, they are required to take on an active role as co-creators in the collaborative innovation strategy (Hartley et al., 2013). At the same time, the role of public managers shifts from providing standardised public services as professional bureaucrats (TPA) or running public organisations like a business in the role of managers (NPM) to taking the role of mediators in the NPG model (Heartley, 2005; Sicilia, Guarini, Sancio, Andreani, & Ruffini, 2016). In the context of collaborative innovation, this includes encouraging and empowering different actors and constructively managing interdependencies (Sørensen & Torfing, 2015). Concluding, the roles and key characteristics of the outlined innovation strategies are summarised in Table 1.

2.4. From collaboration to innovation: the underlying mechanisms

Based on the previously outlined conceptualisation, Torfing (2016) theorised the causal relationship between collaboration and public innovation by connecting interdisciplinary theoretical building blocks with empirical findings. Hereby, it must be noted that it is not a fully developed theory of

[1] Due to the limited scope of this study, the dissemination phase will not be analysed.

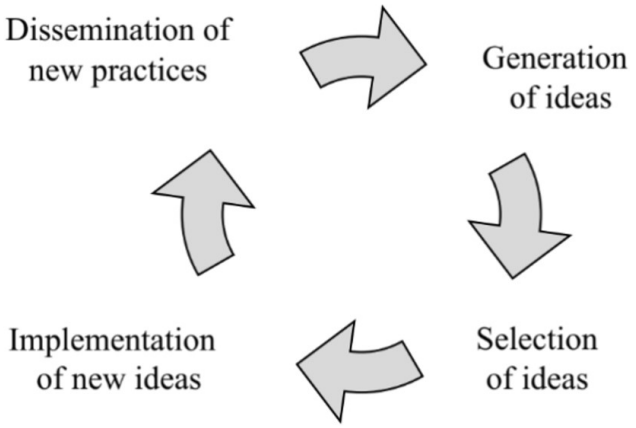

Figure 1: The cycle of innovation

Source: Sørensen and Torfing (2011, p. 851)

Table 1: The evolution of innovation strategies

	Hierarchical innovation	*Competitive innovation*	*Collaborative innovation*
Related Paradigm	Traditional Public Administration	New Public Management	New Public Governance
Organisational values	Hierarchy, control, bureaucracy	Market orientation, focus on performance, contracting in/out	Multi-actor networks, inter-organisational relationships
Innovation	In-house innovation by public managers (top-down)	Innovation through competition between actors	Innovation through collaboration of diverse actors
Role of public managers	Providers	Managers	Mediators
Role of population	Clients	Customers	Co-creators

Source: Adapted from Heartley (2005) and Sicilia et al. (2016)

collaborative innovation. Nonetheless, it provides a solid and suitable foundation for this study as it allows scrutinising fellowship programmes as a new form of collaboration in the light of the existing scholarship. The key proposition is that collaborative innovation between actors with diverse experiences, skills, and knowledge positively influences all phases of the innovation cycle through three underlying mechanisms: empowered actors, mutual and transformative learning, and joint ownership (Torfing, 2016). The following sections outline each of these causal relationships to develop the analytical framework for this theory-guided case study.

2.4.1. Collaboration of empowered actors

The first theoretical mechanism proposes that collaboration has a positive effect on the first phase of the innovation cycle, the idea generation, when *empowered actors* - that are affected and relevant actors - engage in collaborative problem-solving by exchanging different experiences and challenging prevailing opinions (Torfing, 2016). The *"affected actors"* are social or political actors who are directly impacted by the benefits or inconveniences induced by the innovation and can therefore provide a comprehensive understanding of the problem and first-hand experiences with the circumstances (Torfing, 2016, p. 131). *"Relevant actors"*

are actors with knowledge, skills and ideas that are essential for developing and implementing an innovation (Torfing, 2016, p. 132). Depending on the problem to be solved, the form of expertise can differ. In the context of digital innovations, there is a strong demand for technical skills, agile project management, design thinking, interdisciplinary problem-solving and building (software) prototypes (Mergel, 2016). To empower these actors to collaborate, the theory suggests including a third group in the collaboration, the *"boundary spanners",* who are capable of translating and connecting the diverse knowledge of affected and relevant actors in order to leverage potential synergies (Torfing, 2016, p. 133). Importantly, collaboration does not occur inadvertently. It must be initiated, facilitated, and organised in a way that enables the actors to produce the desired outcome (Agger & Sørensen, 2018; Ansell & Gash, 2008). Hence, empowerment requires *clear ground-rules* including the definition of roles, responsibilities, and procedures to prevent conflicts and provide room for creative thinking and constructive discussions (Sørensen & Torfing, 2017). Also, it is essential that all involved actors develop a *shared understanding of the goal* to prevent misunderstandings (Neumann et al., 2019). Concluding, the first theoretical argument proposes that collaborative innovation allows public organisations to include affected and relevant actors into the innovation cycle. That in turn is positively related to the likelihood of innovation as the empowered collaboration between both is expected to create a group that is most capable of developing an innovative solution that meets the requirements of the specific context (Bommert, 2010; McGann et al., 2021).

2.4.2. Mutual and transformative learning

The second causal relationship proposes that collaboration stimulates learning processes through which the actors acquire new skills and expand or revise their knowledge, and these learning processes can spur the development of innovations (Torfing, 2016; Voorberg, Bekkers, Timeus, Tonurist, & Tummers, 2017). The first dimension of the mechanism is grounded in the assumption that the collaborative innovation strategy encourages learning when empowered actors with diverse knowledge and opinions engage in iterative rounds of the outlined innovation cycle and "participate in a joint and cross-disciplinary assessment of the content, feasibility, and potential gains and risks of competing ideas" (Torfing, 2016, p. 65). The second dimension of the mechanism is based on constructivist learning theories which theorise that learning from and with diverse actors has a positive effect on the development of innovations (Sørensen & Torfing, 2011; Voorberg et al., 2017). To elaborate on this relationship, it can be distinguished between mutual and transformative learning.

Mutual learning refers to a continuous dialogue and mutual exchange of experiences and ideas that stimulate collective, creative, and experimental problem-solving (Lindsay et al., 2017; Torfing, 2016). Hereby, it is assumed that one individual usually does not have all the needed knowledge and abilities to solve a complex problem (Ansell & Torfing, 2015). Thus, every actor has some relevant expertise and through the circulation of that knowledge, collaboration contributes to overcoming information asymmetries between public agencies and public service users (McGann et al., 2021). Further, learning theories emphasize that collaboration broadens the repertoire of solutions through the communicative search for new ways of doing things and can spur innovation through inspiration and imitation (McGann et al., 2021; Torfing, 2016). Hence, this type of learning has an instrumental focus that facilitates the acquisition of practical skills and knowledge to produce the desired innovation (Lindsay et al., 2017; Torfing, 2016).

Transformative learning goes one step further as the actors not only get to know new approaches but also new ways of thinking and reframing the problem (Voorberg et al., 2017). Whereas individually acquired knowledge and skills are often continuous with former assumptions, mindsets, and habits, collective learning of social actors can disrupt bounded forms of thinking through critical and collective reflection (Neumann et al., 2019; Torfing, 2016). Furthermore, exchanges of actors who are different in terms of their cognition and culture are likely to prevent group-thinking and blind spots that are often a problem in closed circles (Wegrich, 2019). Since innovation requires by definition a disruption of old ways of doing things, transformative learning is expected to positively influence public innovation as it enables creative ways of understanding a complex problem and exploring new opportunities that break with the past (Agger & Sørensen, 2018; Torfing, 2016). Concluding, it is theorised that multi-actor collaboration stimulates mutual as well as transformative learning and therefore increases the likelihood of public innovation.

2.4.3. Joint ownership of innovations

The third proposition states that collaborative innovation has a positive effect on innovation because it can create a "joint ownership" of new ideas that reduces the *implementation resistance* (Sørensen & Torfing, 2011, p. 852). Joint ownership is understood as the shift of the *decision-making authority* from the public agency to the collective of the involved actors (Ansell & Gash, 2008). Moreover, it implies a form of commitment since ownership creates a *shared responsibility* for the project (Ansell & Gash, 2008; Neumann et al., 2019). The theoretical mechanism is based on sociological planning theories stating that not sufficiently taking the stakeholder dynamics into account can lead to implementation failures because the involved actors develop a severe resistance when they do not have ownership of the plans and new developments (Cinar et al., 2019; Sørensen & Torfing, 2011). Given the uncertain and destructive character of innovation, this risk is particularly high for innovations as the implementation phase bears potential conflicts, power struggles, and failures (Wegrich, 2019). Hence, enabling an active exchange between the affected public stakeholders and the actors responsible for developing an innovation can provide the government employees with the opportunity to actively control and shape the outcome which increases the chances of a successful implementation (McGann et al., 2021). In

sum, the theory proposes that through the creation of joint ownership of the innovation among the involved actors, collaboration enhances the implementation stage of the innovation cycle and is therefore positively related to the likelihood of public innovation.

2.5. Limitations and challenges of collaborative innovation

The core value of collaborative innovation is the interactive engagement of actors with highly diverse skills, knowledge, and perceptions. At the same time, this characteristic creates severe challenges as collaboration in such a constellation faces the risk of losing the capacity to constructively work together. Hence, the existing knowledge in this aspect is presented in the following to critically investigate innovation fellowship programmes.

According to Wegrich (2019), the collaborative innovation strategy inherits two key *limitations*. First, a divergent understanding during a collaborative process is likely to persist when the commitment towards the goal of the innovation project is superficial or weak. As a consequence, the diverse actors may have different interpretations of the objectives which might lead to *misunderstandings and conflicts*. In strong contrast, the second limitation is that collaboration might lead to too much alignment of the involved actors, ultimately inducing the risk "that one particular world view and approach to doing things becomes dominant" (Wegrich, 2019, p. 17). In this case, the previously outlined mechanisms would not work properly, and the benefits of collaboration disappear. Furthermore, several studies reveal the potential problem that the process can be manipulated by influential interests (Ansell & Gash, 2008), and collaboration tends to have high transaction costs in terms of time and resources (Hartley et al., 2013).

Lastly, the notion of collaborative governance itself is not undisputed. McIvor (2020) points to some dangers and unintended consequences of the normative and political stakes in collaborative governance. He outlines how collaboration policies can serve as an ideological justification of government actions and that the outcome of collaboration in terms of its success is likely to be perceived quite differently by public managers and politicians than by civic groups or citizens. Moreover, "interest group pluralism can too easily slide into corporatist models of governance" and in that case rather serve business value than public value (McIvor, 2020, p. 512). In conclusion, these limitations illustrate that collaborative innovation is not a suitable strategy for all contexts and social actors will not necessarily collaborate constructively.

2.6. Connecting the collaborative innovation strategy with digital innovations

The outlined theoretical foundation of collaborative innovation is applicable to many different types of public sector innovation. Thus, the specific arrangement "should be determined by the problem or challenge at hand" (Torfing, 2019, p. 4). The challenge investigated in this study is the lacking capacity of public organisations to develop and implement *digital* innovations. Therefore, the question remains why this strategy may be suitable for the unique setting of digital public sector innovations. The first reason is that governments need personnel with technological skills to create and develop digital solutions (Coglianese, 2020; Wirtz et al., 2019). Particularly, because the NPM era incentivised outsourcing of digital public service delivery, technical skills like coding and user-centric web design are mostly not available among civil servants (Dunleavy et al., 2006; Wirtz et al., 2019). Therefore, the inclusion of empowered actors, in this case empowered by technical skills, is a prerequisite to creating digital innovations.

Secondly, the development of digital innovations requires very different working methods than what is traditionally established in public organisations. Especially, design thinking and agile project management are crucial in software development and digital innovation projects (Mergel, 2016). Simultaneously, private actors are presumably not conversant with the unique organisational structure, processes, and requirements of a public organisation (Coglianese, 2020). Thus, the process of mutual and transformative learning is expected to have a positive influence on digital innovations as the diverse actors might help each other to acquire the necessary skills for the successful development of digital innovations in the specific setting of public organisations. Lastly, resistance towards transformative change is expected to be particularly strong in the case of new technologies because the affected government employees might not fully understand their functionality and possible consequences (Wirtz et al., 2019). Therefore, creating joint ownership by including them in the innovation process has the potential advantage, compared to outsourcing it to external IT-providers, that the public employees may be offered an opportunity to understand the new technologies and their potential risks and benefits.

2.7. Analytical Framework

Concluding, the theorised mechanisms of collaborative innovation serve as the analytical framework for this study as summarised in Figure 2. Thus, it allows connecting the existing knowledge about collaborative innovation with the so-far unexplored phenomenon of innovation fellowship programmes. In all, it is expected that the three outlined mechanisms potentially explain how the investigated fellowship programme contributes to the development of digital innovations in public organisations.

3. Methodology

This section clarifies and justifies the chosen methods for answering the beforementioned research question. It starts with elaborating on the research design of this study, followed by a justification of the case selection and a description of the case. Hereafter, the unit of analysis and units of observation are specified. Lastly, the data collection method and data analysis are described.

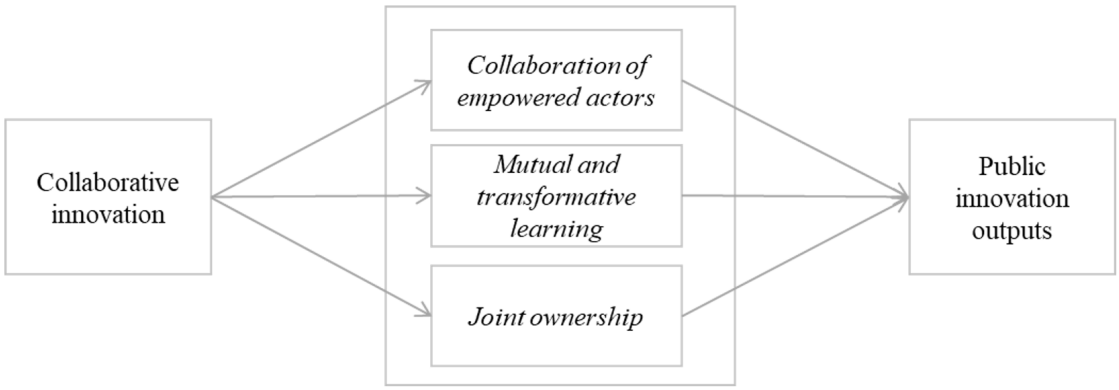

Figure 2: Analytical framework: Mechanisms of collaborative innovation

Source: Own representation, based on Torfing (2016)

3.1. Research design

In line with the main research question that aims to uncover the underlying mechanisms of how Tech4Germany contributes to the development of digital innovations, this study is designed as an explanatory single-case study (Swanson & Holton, 2005; Yin, 2003). This research design arises directly from the proposed question because the thesis investigates one unique case, Tech4Germany, and "[t]he case study method is most likely to be appropriate for 'how' and 'why' questions" (Yin, 2003, p. 22). Moreover, since the objective of this study is not to analyse one specific variable but to develop a comprehensive understanding of the causal mechanisms, a case study is "uniquely predisposed to taking into account a broad and diverse set of explanatory factors" (Blatter & Haverland, 2012, p. 5). Further, this case study follows a diagnostic approach. Generally, this type of applied research is "concerned with using the knowledge acquired through research to contribute directly to the understanding or resolution of a contemporary issue" (Ritchie, 2003, p. 24). As outlined in the introduction, fellowship programmes are a so-far unexplored form of collaborative innovation. At the same time, the theory and scholarship about collaborative innovation are well established. Therefore, a diagnostic case study is the most suitable research design because it allows the researcher to develop an in-depth understanding of a unique phenomenon by connecting the empirical observations with the theoretical concepts and existing knowledge (Blatter & Haverland, 2012; Swanson & Holton, 2005). Hence, the study will be theoretically-guided by the analytical framework that was deductively derived from the theory of collaborative innovation in chapter 2 (see Figure 2).

Given the uniqueness of the case and the outlined diagnostic case study design, this study does not attempt to generalise its findings to a wider population. However, the generated knowledge may be transferable to other cases, namely other fellowship programmes (Lewis & Ritchie, 2003). In regard to the internal validity, multiple sources (contracts, project reports, and semi-structured interviews) are collected and triangulated to ensure that the findings conform with reality (Lewis & Ritchie, 2003; van Thiel, 2007). Furthermore, triangulation mitigates the subjectivity in the research process and therefore strengthens the overall reliability (van Thiel, 2007).

3.2. Case selection

As outlined above, the case is not assumed to be statistically representative of a wider population but was chosen for "intrinsic" reasons (Swanson & Holton, 2005, p. 330). The selection of this particular case is justified by three arguments. First, the case is very "information-rich" (Patton, 1990, p. 169) and scientifically relevant because it applies the strategy of collaborative innovation in an unexplored form. The analysis of this case is therefore predestined to fill the identified research gap. Secondly, Tech4Germany is the only fellowship programme of its kind in terms of the organisation in project groups that actively work together for a short term of three months and its explicit focus on digital innovations. Even though there are comparable fellowship programmes in other countries, for instance, the Presidential Fellowship Programme in the USA (Obama White House Archives, 2021) and the No. 10 Innovation Fellowship Programme in Great Britain (HM Government, 2021), they take place over a longer period and are not organised in unchanging groups of citizens and public employees. The project characteristic of Tech4Germany therefore provides an especially bounded and clear setting to investigate the collaborative process (Swanson & Holton, 2005). Additionally, the accessibility of Tech4Germany is very high as relevant documents and names of former participants are provided online (van Thiel, 2007). Lastly, Germany offers a striking setting because it ranks comparatively low, on place 21 in the European Union, in terms of the provision of digital public services (European Commission, 2020). Hence, it is particularly interesting to analyse how German public employees experience the collaboration with tech experts from the civil society and the potential clash of cultures.

3.3. Case description

The fellowship programme Tech4Germany started as an initiative of a young German citizen in 2018 with the goal to "expedite the digitalisation of Germany and thereby learn from and with each other" (Tech4Germany, 2021c, p. 1). The core idea of the fellowship programme is to bring talented citizens in the fields of software engineering, product management and User Experience (UX) or User Interface (UI) design into the national ministries or agencies where they work together with public employees to solve a concrete problem or improve public services by using new technologies (Tech4Germany, 2021b). Each year, about 30 citizens collaboratively work on digital innovation projects with the government employees for twelve weeks. The project teams consist of four citizens, the so-called *Fellows*, and two to four public employees, the so-called *Digitallotsen* (Tech4Germany, 2021b). Hereby, the Fellows get a small monetary contribution in form of a scholarship by Tech4Germany to cover their living costs (DigitalService4Germany, 2021d). The projects explicitly focus on user-centric and agile approaches to develop a technological prototype (Tech4Germany, 2021c). Examples are a chatbot for the German Ministry of Family Affairs that navigates families through a large amount of available information and an online tool for pensioners to file their tax returns (Tech4Germany, 2021b).

From the very beginning, the initiative operated under the patronage of the head of the federal chancellery which underpins its high political relevance. After the successful pilot year, the initiator founded the non-profit start-up 4Germany GmbH together with two other young citizens which received pilot government funding in 2019 (DigitalService4Germany, 2021a). Hereafter, Tech4Germany presented the developed innovations of the second cohort to the German chancellor and federal cabinet, and was called the technology taskforce for the German government (Presse- und Informationsamt der Bundesregierung, 2020). In September 2020, the non-profit start-up was bought by the German government and turned into the DigitalService4Germany GmbH. It is now fully funded and owned by the state (DigitalService4Germany, 2021b) and can therefore be categorised as a "[g]overnment enterprise" (Rainey, 2014, p. 75). Next to the fellowship programme Tech4Germany and a second fellowship called Work4Germany, the DigitalService4Germany GmbH currently builds a digital service team that operates as a permanent in-house coding force (DigitalService4Germany, 2021a; see Mergel (2019) for a scientific analysis of digital service teams).

3.4. Unit of analysis and units of observation

Derived from the main research question, the unit of analysis is Tech4Germany. The research objective to develop a comprehensive understanding implies that the case is not divided into smaller sub-units or specific variables (Yin, 2003). Instead, the unit of analysis can be specified to be the whole process that was undergone during the collaborative innovation projects (Yin, 2003). The "[s]ampling within a case should be guided by the research questions and by the theory that underlies the initial conceptualization of the case" (Swanson & Holton, 2005, p. 336). In accordance with the analytical framework (Figure 2), information about the collaboration and the experiences of the involved actors needs to be gathered. Therefore, actors who have actively participated in the collaborative innovation process are the units of observation. This translates into conducting interviews with the participating Fellows and Digitallotsen. Given the highly individual character of collaboration, for instance the experience of learning, it is indisputable to directly talk to former participants of the fellowship programme to fully understand its mechanisms and dynamics. Further, it is essential to talk to both groups since the perception might differ significantly among the actors (Torfing, 2019). As both groups are very limited in their number, the selection of the interviewees was "purposive" based on three criteria (Ritchie, Lewis, & Elam, 2003, p. 78): the respondents participated in different projects in 2019 or 2020, took on different roles (Engineering, Design or Product Fellow or Digitallotse), and are diversified in terms of their gender. These criteria allow to gain insights from diverse perspectives and increase the internal validity of the study (a list of the interviewees is provided in Appendix B).

3.5. Data collection method and data analysis

The study draws on two sources of evidence. First, a mix of materials was collected whereby the website of Tech4Germany (Tech4Germany, 2021b) was the main source. Precisely, the documents include project reports, contracts, information brochures, and guidelines (a list of documents is provided in Appendix A). Further, secondary data such as personal experience reports of Fellows and press statements were investigated to enrich the perspective and mitigate the potential subjectivism of information published by Tech4Germany itself (Finnegan, 2006). Additionally, podcasts with the founders of Tech4Germany were consulted which provide relevant information as they reflect the position and experiences of the third involved group in the collaborative process, namely the core team of Tech4Germany. The analysis of these documents sets the foundation for the conducted interviews and serves as supplementary information for the analysis.

The second and main source of evidence are in-depth interviews with former participants of Tech4Germany. In total, six interviews were conducted, three with former Fellows and three with Digitallotsen. The method of semi-structured interviews was chosen which "involves the implementation of a number of predetermined questions and special topics" while the interviewer has the freedom to ask follow-up questions and go beyond the prepared standardised questions (Berg, 2009, p. 107). This is the most suitable method because it allows to structure the interviews in accordance with the theoretical framework and it simultaneously provides the flexibility to dive deeper into a topic that occurs to be particularly relevant for the investigated case (van Thiel, 2007). Following the outlined research design, the interview guideline was

deductively derived from the analytical framework. Thereby, each theoretical dimension (empowered actors, mutual and transformative learning, and joint ownership) was operationalised into concrete questions (presented in Appendix C), whereby the abstract concepts were translated into everyday language to ensure the interviewees can understand what is asked (Kvale, 2007). While using the same dimensions in all interviews, the specific questions have been slightly adopted for the Fellows and Digitallotsen to take the different functions and perspectives into account. The interviews took on average 35 minutes and were conducted via a video meeting on Zoom with one exception via phone.

The interviews were recorded, transcribed and anonyvmised to prepare the data for the qualitative content analysis which is understood as the "nonnumerical examination and interpretation of observations, for the purpose of discovering underlying meanings and patterns of relationships" (Babbie, 2013, p. 390). As the diagnostic research design implies, the coding scheme was developed based on the deductive category assignment method whereby the analysis is systematic, theory-driven and rule-bound (Mayring, 2015). Hence, the analytical framework was operationalised into specific codes in order to apply the theoretical frame to the interview transcripts. After a first familiarisation with the data, the software "ATLAS.ti" was used to apply the theoretical codes to the empirical data. In a third step, it was scrutinised whether the deductively derived codes capture all data or further inductively developed codes are needed (Mayring, 2015; Swanson & Holton, 2005). To increase the reliability of the qualitative data analysis and interpretations, the coding scheme is provided in Appendix D.

4. Analysis

In this chapter, the findings that were derived from the content analysis are presented in the light of the analytical framework whereby each section provides the results of one code group. In accordance with the theoretical foundation, the chapter starts with presenting the data regarding the collaboration of empowered actors, followed by mutual and transformative learning, and joint ownership of the digital innovations. Lastly, the identified limitations and challenges are presented.

4.1. Findings regarding the collaboration of empowered actors

Upon exploring in what ways Tech4Geramany enables the collaboration of empowered actors, the first key finding is that Tech4Germany is responsible for the *initiation of the collaboration* (Fellow 2, 2021). One of the co-founders describes Tech4Germany in an interview as "an independent intermediary who lowers the obstacles for both sides so that [the collaboration] is attractive" (Lang, 2020, l.73f.). Particularly, they address professions such as designers who usually do not find job advertisements in German public organisations and provide a setting that is attractive for young tech talents who otherwise would have not considered working for a public organisation (Fellow 1, 2021; Fellow 3, 2021). Simultaneously, Tech4Germany creates a unique room for public employees who are willing to approach their digital innovation project with new methods but do not have the available resources, knowledge, or opportunity to do so (Anton & Hupperth, 2020b; Digitallotse 3, 2021). To ensure the feasibility of the digital innovation project, Tech4Germany selects the participants through an application process. The Fellows are chosen based on their technical skills, methodological expertise, and motivation (DigitalService4Germany, 2021d). The Digitallotsen apply with a concrete project (Digitallotse 3, 2021) which is assessed by an external jury (including representatives of the administration, science, civil society and Tech4Germany alumni) based on three criteria: impact, open-endedness, and feasibility (Tech4Germany, 2021a). However, it appeared in one case that a Digitallotse was not involved in the application process but appointed to join the fellowship because another department led the application process and nobody else from his/her department wanted to participate (Digitallotse 2, 2021).

To analyse whether the projects of Tech4Germany meet the concept of collaborative innovation, it was investigated whether the selected participants qualify as the in chapter 2.4.1 outlined roles of empowered actors. Hereby, it was identified in the document study that the Digitallotsen suit the theoretical concept of affected actors and the Fellows the role of relevant actors (see for instance Rodríguez (2021); project reports, Appendix A). In the interviews, these roles were clearly confirmed. The Digitallotsen described that they were directly *affected* by the problem to be solved in their working life as they work in the responsible department and therefore had detailed knowledge of the problem and its context. This coincides with the perception of all interviewed Fellows who experienced that the Digitallotsen had "many direct points of contact" (Fellow 1, 2021, l.64) with the problem and their expertise was "very detailed" (Fellow 3, 2021, l.60). During the project, Digitallotse 2 perceived his/her *role* to be a "mediator [...] between the Fellows and the department or the house [ministry] in general" (ll.38ff.). Hereby, the main responsibilities spanned providing support in regard to special requirements like data protection and accessibility (Fellow 2, 2021), connecting the Fellows with other important stakeholders (Digitallotse 1, 2021), putting their political opinion into context (Digitallotse 3, 2021), and providing direct access to the end-users of the developed innovation (Fellow 1, 2021). Therefore, all Fellows stated that "it would have not been possible to realise [the project] without the Digitallotsen" (Fellow 3, 2021, ll.208f.).

All interviewees reported that the Fellows had relevant and necessary *skills* to develop the digital innovation which confirms their characterisation as relevant actors. Particularly, it was emphasised that the teams were interdisciplinary, and their expertise complemented one another well (Digitallotse 1, 2021; Digitallotse 2, 2021). Besides others, these skills include UX-/UI-design, coding, design thinking, agile software development and user-centric problem-solving (Fel-

low 1, 2021; Fellow 2, 2021; Fellow 3, 2021). What stands out is that the methodological expertise is generally more emphasised than purely technical skills. Hence, the Fellows mainly took on the *role* of project and product managers who structured the projects as an iterative innovation cycle and enabled the collaborative development of the prototype with the outlined working methods (Fellow 2, 2021; Fellow 3, 2021). Particularly, identifying the actual problem from a user-perspective and investigating the problem with an unprepossessed view was stated to be a key value (Digitallotse 1, 2021; Digitallotse 2, 2021). Thus, all Digitallotsen described that they could not have achieved the same results without the Fellows.

Secondly, it is a key premise that the projects can indeed be characterised as *collaboration* between the Digitallotsen and Fellows. Overall, all interviewees reported an active and intense collaboration throughout all project phases. Hereby, the Fellows did a large part of the analytical work like conducting and synthesising user interviews whereby the Digitallotsen helped the Fellows to understand the problem and were available the whole time to answer questions or provide additional information. One day a week, the Fellows and Digitallotsen collaboratively worked on the digital innovation in form of workshops which included open discussions, ideation sessions, brainstorming, prioritising of ideas and testing prototypes (Digitallotse 1, 2021; Digitallotse 2, 2021; Fellow 1, 2021). Especially because the Digitallotsen participated in the innovation activities without hierarchical structures (Fellow 2, 2021) and as full members of the team (Digitallotse 2, 2021; Digitallotse 3, 2021; Fellow 3, 2021), these workshop activities accord with the theoretical understanding of collaboration. Hereby, Digitallotse 3 emphasised the "co-creative momentum" (l.102) which strongly differentiated the fellowship from the relationship to an external IT-provider. Therefore, the findings suggest that the collaboration of diverse actors with interdisciplinary skills contributed to the *generation of innovative ideas* (Digitallotse 3, 2021; Fellow 1, 2021; Fellow 2, 2021).

Having found that the projects are indeed a form of collaborative innovation, the question remains how Tech4Germany enables the relevant and affected actors to collaborate. Beyond the initiation of the collaboration, the data indicates that Tech4Germany meets the theoretical description of a *boundary spanner.* One of the co-founders described her role in a podcast as "enabler and problem-solver *[Probleme-aus-dem-Weg-Räumer]*" (Lang, 2021, l.86). Precisely, Tech4Germany facilitated the start of the collaboration by providing each group with relevant information and setting the *ground-rules,* for instance, the meeting and time schedule (Digitallotse 1, 2021; Fellow 1, 2021) and the legal foundation (DigitalService4Germany, 2021c). Since all participants apply for a specific role (Engineering, Design or Product Fellow or Digitallotse), Tech4Germany also implicitly prescribed the responsibilities (Fellow 2, 2021). Moreover, the core team organised an onboarding week and workshops whereby the Fellows learned about the processes and vocabulary of public organisations and the Digitallotsen about the working methods and vocabulary of the digital economy (Anton & Hupperth, 2020a; Fellow 2, 2021; Tech4Germany, 2021c). This coincides with the outlined theoretical role of a boundary spanner to translate and link the diverse knowledge of the actors (Torfing, 2016). Both groups, Fellows and Digitallotsen, perceived those measures to be helpful for the collaboration as they also allowed to get to know each other in a safe setting (Digitallotse 2, 2021; Fellow 1, 2021).

Regarding a *shared goal,* Tech4Germany did not prescribe a concrete objective for each project but only guiding principles like a strong focus on user-centricity and the aim to finish the project with a prototype (Fellow 2, 2021). Hereby, the Fellows and Digitallotsen had a divergent understanding of the objectives in the beginning but developed a shared goal over time (Digitallotse 2, 2021; Fellow 3, 2021). However, in line with the design thinking and agile approach, it was not a fixed goal but reframed constantly (Fellow 2, 2021). During the course of the project, Tech4Germany was not actively involved in the collaboration (Digitallotse 1, 2021; Fellow 1, 2021), but "they provided the frame and [the participants] could fill this frame completely free and independently" (Fellow 2, 2021, ll.157f.). Tech4Germany regularly asked whether everything was going well (Fellow 1, 2021), provided additional feedback and help when the project teams had problems (Fellow 3, 2021) and moderated between the Fellows and Digitallotsen in cases of conflict which was perceived as very helpful (Digitallotse 2, 2021). The key findings are summarised in Table 2. Additionally, the code frequencies and paraphrased key messages per interviewee which serve as the basis for the analysis are presented in Appendix E.

4.2. Findings regarding mutual and transformative learning

The analytical framework ascribes an important role to mutual and transformative learning for the development of innovations through collaboration. In the case of Tech4Germany, this importance is reflected in the official contracts, stating that the DigitalService4Germany GmbH "runs the programme Tech4Germany [...] for the development of digital competencies *[Digitalkompetenzen]* of the public employees" (DigitalService4Germany, 2021c, p. 1) and "provides the talents *[Fellows]* a platform for open-ended thinking in regard to digitalisation processes through an open-ended knowledge transfer in an 'experimental' space" (DigitalService4Germany, 2021d, p. 1). In the interviews, it was investigated whether these official statements conform with reality.

For the dimension of *mutual learning*, all interviewed Digitallotsen reported they learned new methods, particularly agile project management skills and design thinking techniques. Additionally, some got to know new workshop formats and tools for digital collaboration (Digitallotse 1, 2021). The learning experience is underpinned as the Digitallotsen continued using the acquired methods and tools after the project (Digitallotse 1, 2021; Digitallotse 2, 2021). However, all interviewees did not acquire new technical skills,

Table 2: Collaboration of empowered actors: Key findings

Key finding	Number of responding interviewees who confirmed key finding*	
	Fellows	*Digitallotsen*
Digitallotsen are directly affected by problem/innovation	3/3	3/3
Digitallotsen take on the role of mediators	3/3	3/3
Fellows have relevant skills for the innovation project	3/3	3/3
Fellows take on the role of project/product managers	3/3	3/3
Tech4Germany takes on the role of a boundary spanner	3/3	3/3
Tech4Germany initiates the collaboration	3/3	2/3
Active collaboration takes place in form of weekly workshops	3/3	3/3
A shared goal is developed throughout the project	3/3	3/3
Tech4Germany sets the ground-rules	3/3	3/3
The collaboration contributes to the generation of innovative ideas	3/3	2/2

*In the illustration x/y, y indicates the number of interviewees who gave a relevant response to the attribute and x indicates the number of interviewees who confirmed the key finding. A finding counts as confirmed if any indication that the attribute applies was made.

either because they already had advanced IT-skills (Digitallotse 1, 2021), they were not interested in technical issues (Digitallotse 2, 2021), or the time was not sufficient to develop advanced technical skills (Digitallotse 3, 2021). From the perspective of the Fellows, the willingness to learn differed among the participating Digitallotsen. Whereas most were eager to learn new working methods and it was observable that they acquired new techniques, some were sceptical because they either assumed to already know these working methods (Fellow 2, 2021) or they did not acknowledge the value of the new approaches (Fellow 1, 2021).

Concerning the *transformative learning*, the findings are mixed. On the one hand, the attitude towards digital innovations in general did not change (Digitallotse 1, 2021; Digitallotse 3, 2021). To a large extent, this can be explained by the fact that the participating public employees already had a positive attitude towards digital innovations before the collaboration (Fellow 1, 2021). On the other hand, two Digitallotsen described that their thinking on how to approach a digitalisation project changed significantly. Especially, Digitallotse 2 reported that s/he thought little about whether a product or service even makes sense for the citizens beforehand, and then learned how to approach problems from a user-centric perspective from the Fellows. Hereby, it was emphasized as a key value of Tech4Germany that new working methods are not taught in a training but can be experienced in a real digital innovation project (Digitallotse 3, 2021; Fellow 2, 2021; Fellow 3, 2021). The importance of this real-life experience is underpinned by the statement of Digitallotse 2 that the degree of transformative learning appeared to be "related to [...] the degree how strongly one was involved in the process" (ll.109f.). Additionally, the Digitallotsen "disregarded existing rules to imagine how it could look like in an ideal world" (Digitallotse 2, 2021, ll.315f.) and the used methods in the workshops aimed to "break with the gridlocked administrative thinking" (Digitallotse 2, 2021, l.94), which again indicates the experience of transformative learning. At the same time, it was mentioned that it was rather a first encounter and "it takes more to really learn the mindset of design thinking" (Fellow 2, 2021, ll.226f.).

On the side of the Fellows, all interviewees described that they experienced *mutual learning* during the project. Partic-

ularly, because the public administration was perceived as a "Blackbox" (Fellow 2, 2021, l.206) before the project, they acquired new knowledge about the requirements, decision-making and administrative processes in public organisations. Furthermore, some learned new skills from the other participating Fellows and during the workshops organised by Tech4Germany (Fellow 2, 2021; Fellow 3, 2021). However, there were few findings that suggest *transformative learning*. Only Fellow 2 experienced a mindset shift away from career and monetary success towards purposeful work to such an extent that s/he started working for the public sector after the Tech4Germany project. In sum, it was reported to be highly important that the collaborative learning allowed for a "more realistic" (Fellow 2, 2021, l.354) *development of suitable digital innovations* because without the expertise of the Digitallotsen, the Fellows would have not been able to understand the specific context of the public organisation (Fellow 3, 2021). To conclude, the key findings are summarised in Table 3.

4.3. Findings regarding joint ownership of digital innovations

Concerning the third theoretical dimension, the data clearly indicates that joint ownership of the digital innovation was created among the actively involved participants. Firstly, a *shared responsibility* is observable since all interviewees felt strongly responsible for the success of the digital innovation project. Fellow 1 explained that the implementation of the developed prototype "was only possible because [the] project partners were very committed" (l.221). Also, the Fellows and Digitallotsen equally contributed to the success of the project (Fellow 3, 2021). The positive impact of the collaboration is confirmed by the statement of Digitallotse 3 that s/he would have not cared about the project's success that much if it was a normal relationship with an external IT-provider. Secondly, it can be derived that all important decisions were made together in the team and in many cases even consensual (Digitallotse 1, 2021; Fellow 2, 2021). Thus, the *decision-making authority* moved from the public agency to the collective of the involved actors.

In line with the theoretical mechanism, this joint ownership led to a reduced *implementation resistance* among the actively involved Digitallotsen as they all personally advocated the implementation of the developed digital innovation and took action to make the implementation possible after the project ended (Digitallotse 1, 2021; Digitallotse 3, 2021). The importance of the collaboration is underpinned by the finding that the implementation resistance of the public employees who were not involved partly remained. For instance, some rejected the changes that would have come along with the digital innovation as they "got the feeling to do everything wrong and now the young people come and want to tell [them] how public administration works" (Digitallotse 2, 2021, ll.100ff.). In contrast, those who regularly noticed the progress and observed the applied methods became more open-minded and did not oppose digital innovations and modern approaches anymore (Digitallotse 2, 2021).

Another important aspect is that the collaboration with Tech4Germany in some projects directly helped to get the necessary support for a digital innovation the Digitallotsen have unsuccessfully tried to implement for many years because the Fellows were able to present a concrete prototype to the important actors and illustrate the benefits more precisely (Fellow 1, 2021). Further, it was essential that the projects with Tech4Germany were often supported and promoted by high political decision-makers who were involved through presentations of the progress and results, for instance the state secretary or federal minister (Digitallotse 3, 2021; Fellow 1, 2021). Concluding, the key findings are summarised in Table 4.

4.4. Findings regarding limitations and challenges of fellowship programmes

As the past three sections outlined in what ways the three theoretical mechanisms of collaborative innovation are observable, this section presents the key challenges and limitations of collaborative innovation in form of fellowship programmes to allow for a critical assessment of the concept of Tech4Germany.

Firstly, several *conflicts and misunderstandings* were reported. At the beginning of the collaborative innovation process, it was perceived as a challenge that the public employees and digital experts used different vocabulary and talked about processes neither of them knew of the other (Fellow 1, 2021). Additionally, there was disagreement about the chosen communication tools (Digitallotse 2, 2021). Moreover, a conflict occurred because the Fellows decided the aspired solution does not make sense for the specific context which was met with disappointment by some Digitallotsen (Fellow 2, 2021). In one case, a Digitallotse "even rejected to take part in workshops" (Fellow 1, 2021, l.184) because s/he feared ridicule and did not see the value of those methods. However, all interviewees stated that these were minor conflicts that could either be solved or did not strongly impair the overall project.

Beyond that, some circumstances caused *limitations*. Many of the tools used by the Fellows were not compatible with the IT-equipment of the public employees or not allowed due to security regulations (Digitallotse 2, 2021; Fellow 1, 2021; Fellow 2, 2021). Furthermore, time was described to be a key limitation factor because the Digitallotsen participated in the Tech4Germany project on top of their daily work, resulting in a very limited time frame and a reduced learning opportunity (Digitallotse 3, 2021; Fellow 1, 2021; Fellow 2, 2021). In addition to that, three months is a very short time frame for a digital innovation so the end product usually was a good prototype but not a functioning minimum viable product (MVP) and not all prototypes were implemented afterwards (Digitallotse 1, 2021; Fellow 2, 2021). Moreover, the findings show that even if all three outlined mechanisms are observable, there are still *barriers to the implementation* that cannot be changed by

Table 3: Mutual and transformative learning: Key findings

Key finding	Number of responding interviewees who confirmed key finding*	
	Fellows	*Digitallotsen*
Digitallotsen experience mutual learning	3/3	3/3
Fellows experience mutual learning	3/3	n.a.
Digitallotsen experience transformative learning	2/3	2/3
Fellows do *not* experience transformative learning	2/3	n.a.
The collaboration contributes to the development of a suitable innovation	3/3	3/3

* In the illustration x/y, y indicates the number of interviewees who gave a relevant response to the attribute and x indicates the number of interviewees who confirmed the key finding. A finding counts as confirmed if any indication that the attribute applies was made.

Table 4: Joint ownership: Key findings

Key finding	Number of responding interviewees who confirmed key finding*	
	Fellows	*Digitallotsen*
Fellows and Digitallotsen share the responsibility	3/3	3/3
Decisions are made collectively	2/2	1/1
The degree of implementation resistance is reduced by the collaboration	3/3	3/3

* In the illustration x/y, y indicates the number of interviewees who gave a relevant response to the attribute and x indicates the number of interviewees who confirmed the key finding. A finding counts as confirmed if any indication that the attribute applies was made.

Tech4Germany, for instance, limitations due to data protection and accessibility requirements, technical issues in the larger IT-system of the public organisation, and procedural regulations (Digitallotse 1, 2021; Fellow 2, 2021). Additionally, the Digitallotsen usually do not have the full authority to decide about the implementation (Digitallotse 1, 2021). Lastly, the contact *restrictions due to the Covid-19 pandemic* strongly impaired the digital innovation projects in 2020 as collaboration is more fruitful in presence than in digital formats (Digitallotse 1, 2021; Fellow 1, 2021; Fellow 2, 2021).

In sum, two key points regarding the *scope and impact of Tech4Germany* can be derived from the findings. On the one hand, the concept is limited in its scope as the above-outlined mechanisms mainly apply to the comparatively small number of active participants. In this aspect, the difficulty to communicate these new approaches to the entire ministry and to really "live" the mindset was described (Digitallotse 2, 2021, l.153). Thus, it will take a relatively long time until Tech4Germany has an impact beyond the directly involved actors. Nonetheless, all interviewees strongly emphasized that the fellowship programme is a valuable concept that should be continued. Hereby, the identified key value is that Tech4Germany opens-up the public organisations and provides a setting where the public employees can experience an interdisciplinary, cross-sectional, and agile way of working (Fellow 2, 2021). Therefore, Tech4Germany is described by the participants as a very important first step initiating a process of change and thus paving the way for further dig-

ital innovations projects that are approached from an agile and user-centric perspective (Digitallotse 2, 2021; Fellow 2, 2021; Fellow 3, 2021). Hence, the impact of Tech4Germany was summarised with the words: "Constant dripping wears away the stone" (Digitallotse 2, 2021, l.358).

5. Discussion

5.1. Results

The presented findings serve to answer the sub-questions of this study. Regarding the ways the fellowship programme enables the collaboration of empowered actors, it became clear that Tech4Germany meets the role of a boundary spanner by bringing together the Digitallotsen in their position as affected actors and Fellows whose technical and methodological skills make them relevant actors. Therefore, Tech4Germany provides a space where both groups can collaboratively work together on a concrete digital innovation by defining the basic structure, rules and responsibilities. Beyond that, the workshops and onboarding week facilitate the collaboration by linking and translating the diverse knowledge and vocabulary. What must be noted is that the active collaboration between the affected and relevant actors only takes place one day a week, whereas the rest of the time the interaction can rather be described as mutual support. Furthermore, Tech4Germany does not operate as a boundary spanner throughout the whole collaboration but is available upon request, for instance in cases of conflict.

The findings for the second sub-question are mixed, indicating that mutual and transformative learning was experienced in some cases but highly depends on the individual motivation, previous knowledge, and extent to which the actor was actively involved. Hereby, it stands out that the Digitallotsen did not learn new technical skills which must be noted as a limitation as this study investigates the development of *digital* innovations. On the other hand, the public employees clearly acquired new methodological competencies and changed the way they approach digital innovation projects towards user-centric and agile thinking. Since it is widely acknowledged that these approaches are crucial for digital innovation projects (Mergel, 2016), it is concluded that the actors overall learned relevant skills for the development of digital innovations in the specific context of public organisations.

Concerning the third sub-question, it was found that the actively involved actors evidently created joint ownership as they shared the responsibility and decision-making authority. Therefore, the collaborative innovation contributes to a low level of implementation resistance among the involved public employees. Similar to transformative learning, this effect seems to depend on the degree of involvement and gets weaker the fewer contact points a public employee had with the Tech4Germany project. At the same time, the sheer presence of Tech4Germany helped to reduce the implementation resistance of decision-makers by illustrating potential benefits and increasing the political attention.

All in all, the results show that the theoretical mechanisms of collaborative innovation apply to a very large extent and the theory of Torfing (2016) provides relevant propositions to explain how a fellowship programme contributes to the development of digital innovations in public organisations. At the same time, it appears that even if all mechanisms apply, the developed prototypes were not necessarily transformed into digital innovations. Hence, there are most likely relevant antecedents affecting the implementation of collaboratively developed digital innovations beyond the proposed mechanism of joint ownership among the involved actors. The findings of this study indicate the organisational design and support of decision-makers as important factors. Therefore, a possible explanation for an unsuccessful implementation is a hierarchical decision-making structure in the public organisation. Although the public employees who are affected by the innovation in their daily work are included in the collaboration process and advocate the implementation of the developed prototype, political leaders or public managers with the decision-making authority to determine the continuation of the digital innovation project can still impede the implementation. Consequently, the organisational design and particularly the decision-making structure of the public organisation should be considered in the analysis of collaborative innovation projects.

5.2. Limitations of the research

With regard to the limitations of the thesis, this single-case study does not allow generalising the findings to other fellowship programme but only provides transferable indications and starting points for further studies. Additionally, the small sample size implies that it was not possible to empirically validate the extent to which the theoretical mechanisms apply in this case. Since not all participants have been interviewed, some perspectives might be missing, and no conclusion can be drawn about the overall impact of Tech4Germany. Particularly, it stands out that all interviewees generally had a positive attitude towards the fellowship. Thus, the selection process might have induced a bias as not all persons replied to the interview request and it may be that advocates of Tech4Germany were more willing to share their experience than sceptics. Moreover, since all participants are publicly named on the website of Tech4Germany, they might have an intrinsic motivation to present the programme in a positive light.

Beyond that, the exceptional circumstances during the Covid-19 pandemic infer that the experiences of the respondents who participated in 2020 might differ in comparison to other years and contain elements that are not representative for the fellowship programme. However, it was found that the key findings coincide between the participants of 2019 and 2020 which mitigates this limitation. Lastly, all interviews have been conducted in German so the translated quotations may have different connotations and thus can lose some of their meaning.

Table 5: Limitations and challenges: Key findings

Key finding	Number of responding interviewees who confirmed key finding*	
	Fellows	*Digitallotsen*
Conflicts or misunderstandings occur	3/3	1/3
The limited time capacities of the Digitallotsen and/or insufficient IT-equipment impair the collaboration	3/3	2/2
External barriers impede the implementation	2/2	2/2
The Covid-19 pandemic impaired the collaboration	2/2	1/1
Tech4Germany has a positive impact on the development of digital innovations, but the scope is limited	3/3	3/3

* In the illustration x/y, y indicates the number of interviewees who gave a relevant response to the attribute and x indicates the number of interviewees who confirmed the key finding. A finding counts as confirmed if any indication that the attribute applies was made.

6. Conclusion

While it is known that collaborative innovation adheres key advantages compared to hierarchical and competitive innovation strategies, no setting in which collaborative innovation can be supported and sustained in the present governance system had been found yet. Therefore, this study aimed to analyse the so-far unexplored concept of innovation fellowship programmes by answering the research question of how the fellowship programme Tech4Germany contributes to the development of digital innovations in German public organisations. The core finding of this study is that the scientific phenomenon of fellowship programmes qualifies as a form of collaborative innovation as the theoretical mechanisms are observable to a large extent. Therefore, fellowship programmes can be described as a third space between one-time collaboration projects and innovation labs. In theoretical terms, a fellowship programme thus contributes to the development of digital innovations by providing a new institutional design for collaborative innovation. Hence, this study fills the identified research gap by contributing important findings to the discussion on suitable ways to integrate collaborative innovation in the current governance system.

Precisely, fellowship programmes enable collaborative innovation by lowering the transaction costs for the public organisations, creating a setting that attracts digital innovation experts and providing the basic structure and rules for constructive collaboration. Importantly, the new institutional design simultaneously provides a unique room in which public employees can experience new ways of working, particularly agile and user-centric approaches that are crucial in digital innovation projects. Experiencing new methods in a real project stimulates mutual and transformative learning, thus implying a positive impact on the development of digital innovations beyond the single project. However, the findings in this aspect are mixed, indicating that the experience of learning depends on individual characteristics and the degree of involvement in the collaboration. In addition to that, fellowship programmes create joint ownership of the developed prototype, leading to support for the implementation of the digital innovation among the involved public employees. As current research found that reaching the implementation stage is a key challenge in separated institutional designs such as innovation labs (McGann et al., 2021), this finding emphasises the relevance of the embeddedness of innovation fellowship programmes within the public organisation.

The outlined mechanisms strongly differentiate the collaboration of public employees with digital experts from contracting-out the development of digital innovations to external IT-providers. The study therefore aligns with the wider theoretical paradigm shift towards New Public Governance. Particularly, the results illustrate how installing an intermediate instance like the management team of Tech4Germany helps to overcome former barriers of collaborative forms of governance. By initiating the first step towards opening-up public organisations for interdisciplinary and cross-sectional expertise and allowing the public organisations to experiment with agile and user-centric approaches in a secure setting, fellowship programmes hence contribute an important building block to the research about new forms of governance in the digital age. Additionally, the unique institutional design points to the theoretical importance of overcoming simplified discussions about contracting-in or

contracting-out digital public services, instead looking beyond established organisational forms.

Having systematically analysed the fellowship programme in the light of the existing scholarship of collaborative innovation, this study sets the initial groundwork for future research on the scientific phenomenon of innovation fellowship programmes and provides promising starting points for further studies. First, quantitative studies are needed to measure the impact of fellowship programmes. Here, an interrupted time series design based on a questionnaire answered by all participants in the beginning and at the end of each project appears to be a valuable research design. Given the bounded setting of Tech4Germany, the case also provides opportunities for different data collection methods, for instance focus groups or observations of behaviour. This would allow to further investigate the before outlined theoretical implications, particularly the analysis of additional antecedents like the organisational design and decision-making hierarchy. Moreover, a study that evaluates the long-term impact and the degree of improvement through the developed digital innovations is recommended. Beyond that, case studies of different fellowship programmes and especially cross-country comparative studies would increase the validity of these findings and would allow to analyse which institutional design of fellowship programmes provides the best setting for collaborative innovation.

In addition to the implications for research, the study provides recommendations for practitioners in politics, public administration, and governance. Concerning the specific setting of Tech4Germany, the findings clearly suggest that the Digitallotsen should be granted more time to actively collaborate with the Fellows and thus need to be freed from some of their daily responsibilities. This would increase the positive effect of mutual and transformative learning and therefore also the long-term impact on the development of digital innovations. Particular attention should also be paid to including public employees in the collaboration who are sceptical about digital innovations and modern working methods. Even though this might increase the transaction costs of the collaborative projects, it is essential to establish a cultural change and ultimately reach the goal of Tech4Germany to "expedite the digitalisation of Germany and thereby learn from and with each other" (Tech4Germany, 2021c, p. 1).

From a wider perspective, fellowship programmes appear to be a suitable alternative or supplement to innovation labs and one-time collaboration projects as they not only create digital innovation prototypes but may also increase the in-house capacity of public organisations to develop and oversee digital services and products. Hence, it is recommended to establish more fellowship programmes, for instance on the federal state level. This seems to be realistic as this study shows that experts from the digital economy are generally willing to contribute their technical knowledge to a trustful relationship with the public entities and the number of applications by far exceeds the number of projects that Tech4Germany can implement (Anton & Hupperth, 2020a). Beyond the unique concept of fellowship programmes, this study revealed the importance of actively leveraging the knowledge and experiences from outside the public sector without fully outsourcing digital services to IT-providers. Therefore, it is recommended to overall work towards a stronger emphasis on collaborative interactions between digital experts and public employees since opening-up public organisations to new forms of collaboration bears the potential to develop digital innovations in line with democratic principles.

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