

Digitalization of education

A case study of a local initiative for innovative pedagogical practices

Sarah Figenschou



Master's thesis

TIK Centre for Technology, Innovation, and Culture

Master of Society, Science, and Technology in Europe (ESST)

UNIVERSITY OF OSLO

Spring 2022

© Sarah Figenschou

2022

Digitalization of education

A case study of a local initiative for innovative pedagogical practices

Sarah Figenschou

<http://www.duo.uio.no/>

Abstract

The recent digitalization has transformed the way we do things in all areas of society, including education. The Norwegian school reform from 2020 integrated the use of digital tools in the curriculum, putting technological competences on the agenda. Recent studies on technological competences in school found that the students are not lacking technological competences, what inhibits technological development work in schools are teachers' lack of pedagogical competences on ICT.

During the Covid-19 pandemic schools were forced to conduct their classes digitally. This became a steep learning curve for teachers with little digital competence. As the pandemic is coming to an end and classes are back to being conducted physically, we find that teachers' technical competences on digital tools have increased considerably during these two years. This forms a good basis for further development work on the pedagogical use of ICT.

This thesis examines the processes around enhancing teachers' second order digital literacy in the Norwegian school system. The study focuses on a single, local case, a project called 'the Learning Tracks', contextualized through political intentions derived from various policy documents. The development processes within the Learning Tracks are investigated to identify enabling and constraining factors present in current efforts to enhance pedagogical competences on ICT amongst teachers.

The empirical findings in this study are retrieved from semi-structured interviews and observation on service- user and producer level, and document analysis on a digitalization strategy for education and it's following action plan for the policy-level. Among the findings are insights to how cultural, organizational, interorganizational and institutional drivers and barriers have enabled and constrained initiatives for second order digital literacy amongst teachers.

Acknowledgements

This master's thesis marks the end of two years at the Centre for Technology, Innovation, and Culture at University of Oslo. Although the Covid-19 pandemic did make an honest attempt at limiting this experience to a minimum, I'd like to mention some people that made these years invaluable.

At first, I'd like to thank my supervisor Markus Bugge for valuable insights, discussions, and support along the way.

I'd also like to thank the research team from NIFU and workers from SEIL for interesting discussions and insights to the project. I'd like to give a special thanks to Arne Bergan for always being available to answer questions.

To the informants that took time off their busy schedules to participate in interviews, thank you for your helpfulness and engagement in my study.

I would like to thank my fellow students at TIK, who have made my time here fun and memorable.

Finally, I would like to thank friends, family, and Morten, for continuous support and proofreading.

List of abbreviations

TB	Traditional Bureaucracy
NPM	New Public Management
NG	Networked Governance
SEIL	Center for Innovation and Learning

Concepts that need clarification

Continuing education - education for adults, provided after they have left the formal education system. These typically consist of shorter courses.

List of figures

Figure 1. Analytical framework model (Bugge and Skålholt, 2013).....	23
Figure 2. Data structure model (Gioia et al., 2013).	31
Figure 3. Reproduction of Figure 1. with empirical findings.	54

Appendix

Appendix A.....	64
Appendix B.....	66
Appendix C.....	67

Contents

1. Introduction.....	9
1.1 Background and relevance	9
1.2 Research question.....	10
1.3 Delimitations	11
1.4 Structure of thesis.....	12
2. Theoretical framework.....	12
2.1 Innovation in the public sector	13
2.2 Drivers and barriers in public innovation.....	16
2.3 Governance paradigms in public innovation.....	17
2.3.1 Traditional bureaucracy	17
2.3.2 New Public Management.....	17
2.3.3 Networked Governance	18
2.4 Leading innovation processes for public value	19
3. Methodology and research approach	23
3.1 Qualitative method and case study.....	24
3.1.1 Selecting the case.....	25
3.1.2 Selecting participants:.....	26
3.2 Strategy for data collection	27
3.2.1 Designing and conducting the interviews.....	27
3.2.2 Observation.....	28
3.2.3 Document analysis.....	28
3.3 Strategy for processing and analyzing the data.....	29
3.3.1 Ensuring rigour	32
3.3.2 Construct validity	32

4. Political context and case study	33
4.1 Political context.....	34
4.2 The Learning Tracks	35
5. Empirical findings.....	36
5.1 Service users.....	36
5.1.1 Organizational barriers	37
5.1.2 Interorganizational barriers.....	37
5.1.3 Cultural driver and organizational barrier	38
5.2 Service production.....	39
5.2.1 Interorganizational drivers.....	39
5.2.2 Cultural drivers	40
5.2.3 Organizational barriers	40
5.3 Policy.....	40
5.3.1 Institutional barriers.....	41
5.3.2 Organizational barrier and interorganizational driver	42
6. Analysis and discussion	43
6.1 Two approaches to second-order digital literacy	44
6.2 Collaborative innovation in second order changes to digital learning	46
6.3 Public governance regimes within the Norwegian School System.....	50
6.3.1 Traditional Bureaucracy	50
6.3.2 New Public Management.....	51
6.3.3 Networked Governance	53
6.3.4 Drivers and barriers within public governance regimes	53
6.4 Moving towards initial policy intentions of digital literacy.....	54
7. Conclusion	56
References.....	59

1. Introduction

This thesis will examine the processes around enhancing teachers' digital literacy in the Norwegian school system. The study will focus on a single, local case, a project called 'the Learning Tracks', contextualized through political intentions derived from various policy documents. By examining the development processes within the Learning Tracks from a systems perspective I will be focusing on the four levels: policy making, administration, service production and service users.

The Learning Tracks is funded by the Research Council in the period 2020 – 2023 and aims to establish systematic processes for collaborative work around school development in Asker municipality, specifically development on the pedagogical use of digital tools. Empirical data retrieved from interviews and observation of the service user- and production level and a document analysis of the policy-level within this initiative will be applied to theory on collaborative innovation and governance paradigms to address the main drivers and barriers in current processes set to increase the digital competences amongst teachers.

By applying theory on public innovation and service production my study aims to analyse Asker municipality's ability to drive innovation in schools in the context of the municipal merger, the new school reform of 2020, and recent political efforts to enhance continuing education for teachers.

1.1 Background and relevance

The Norwegian school reform from 2020 integrated the use of digital tools in the curriculum, putting technological competences on the agenda. Recent studies on technological competences in school found that the students are not lacking technological competences, what inhibits technological development work in schools are teachers' lack of pedagogical competences on ICT. A report from 2017 states that teachers' lack of digital competences is the main barrier for the pedagogical use of ICT in education (The Ministry of Education and Research, 2017). Following this report was several measures focused on expanding the offer for continuing education on the pedagogical use of ICT. The expansion in offers for continuing education included the strengthening of existing university-level educations and increasing local offers on municipal-level.

The municipal merger in 2017 reduced the number of municipalities in Norway from 428 in 2017 to 356 in 2020, an action that was expected to increase the autonomy of local authorities. This merger was justified by the argumentation that local authorities were best fit to provide adapted solution for their communities (Ministry of Local Government and Regional Development, 2017). A report from 2020 emphasizes the municipalities' central role in public innovation and expresses the need for a shift in focus from considering innovations as single events to enabling processes for continuous renewal. The same report also mentions the demand for increased cross-sectoral and radical innovations with a focus on value creation for society and citizens (Meld. St 30, 2020).

The Covid-19 pandemic has been a significant backdrop for the developments of the innovative work intended for the educational sector over the past two years. Findings from ongoing research on school development in Asker municipality show that time previously set aside for school development has been used to keeping up with continuously changing infection control measures and carrying out digital teaching during the pandemic. Although the pandemic has had a negative impact on innovative school development, a longitudinal study on the changes in education during the Covid-19 pandemic found that the teachers had gotten increased knowledge and a more positive attitude towards the use of ICT tools in teaching and collaboration with colleagues (IEA, 2021). These changes in technological competences and attitude amongst teachers have the potential to be a great starting point for further efforts to increase the pedagogical competences on ICT. The increase in collaboration with colleagues can be the change in culture required to develop professional communities for continuous development work in schools.

1.2 Research question

Reviewing the literature on the topic of pedagogical use of ICT and discussing with the research team from the Learning Tracks, I found that the projects' struggle to drive pedagogical development work on digital tools had only been examined from a service-production perspective. Making use of The Research Council's digital map providing an overview of publications related to innovation in the education sector, I found no publications studying the continuing education for teachers' second order digital literacy (KSU and The Research Council, 2021). Examining the literature further I reviewed relevant publications from utdanningsforskning.no and the research referred to in policy documents on this subject. I found a bias in the research where most publications were oriented on innovative

approaches for continuing education at a service production level. A high number of publications also revolved what would qualify as first order digital literacy, the technical competences of ICT.

Suggesting that these challenges may be rooted in barriers occurring further up in the system than service production, I will study the current efforts to enhance pedagogical competences on ICT amongst teachers from a systemic perspective. By examining cultural, organizational, interorganizational and institutional barriers, I will move past the service-production level to include policy-level empirical findings. Hopefully, taking this holistic view will lead to some generalized conclusions that will be transferable to the many other initiatives to enhance second order digital literacy amongst teachers that are taking place within this system. To further specify the area of my study, I have chosen the following research question:

What enables and constrains second order digital literacy in the Norwegian school system?

1.3 Delimitations

The study will only include the digital literacy of teachers in schools, not the students. This is because enhancing the teachers' digital competences are crucial for them to be able to communicate this knowledge to their students. It has also been defined as one of the main constraining factors to digital literacy in schools through various policy documents (NOU 2019:23; The Ministry of Education and Research, 2017).

Although the thesis will be studying the Norwegian School system, the data collection consisting of interviews and observation will be limited to include the participating actors from the chosen case, the Learning Tracks, namely teachers, ICT-teachers, school leaders and school owners from Asker municipality. The findings categorized on policy-level will be a result from perspectives derived from service production, users, and relevant policy documents that will be introduced in chapter four.

The study will make use of a theoretical framework retrieved from Bugge and Skålholt (2013). However, the original framework includes four levels within the Norwegian municipal innovation system, whereas my thesis will focus on three of them. This is because my empirical data have been collected from the service- user, producer and policy-level. The fourth level, administration, will be presented in figure one as it's an important level within

the system, but will not be pursued any further in this thesis as later chapters will be presenting methods and analysis of my empirical data.

1.4 Structure of thesis

Chapter one has introduced the area of my study by providing a contextual background, topicality, research question, and delimitations. Chapter two will present the theoretical framework that my analysis will be based on, including literature on governance paradigms, public innovation, drivers and barriers in collaborative innovation, and value creation. Chapter three will describe the methodological choices I have made from selecting case study to the strategy for data collection and analysis. Chapter four will introduce the political context of the case by presenting relevant policy documents and explain the main actors in the Learning Tracks, the projects' goal, and the research teams' area of study. Chapter five will provide an overview of the empirical findings relevant to my study, by separating main drivers and barriers within the case into the categories service users, service production and policy. Chapter six will draw on the empirical data from chapter five and the theoretical framework from chapter two to analyze the research question. The second part of this chapter will include a discussion on how the current system can reach the political intentions described in the policy strategies. Chapter seven will summarize the study and conclude, discuss the limitations of the study and suggest areas for further research.

2. Theoretical framework

In the first section of this chapter, I will discuss some central concepts within the literature on (public) innovation: radical and incremental innovation, open and closed innovation, and innovation as isolated incidents or continuous improvements. To identify enabling and constraining factors I have included literature around drivers and barriers in collaborative innovation. Presenting Torfing's (2019) five categories for drivers and barriers in collaborative innovation, this structure will be applied to my empirical findings and revisited in chapter three and five.

In the third section, I will present three central approaches to governing public innovation: Traditional Bureaucracy, New Public Management, and Networked Governance (Hartley, 2005). Based on findings from the literature indicating that elements from each of these paradigms co-exists in the current public innovation climate (Bugge and Skålholt, 2013), I

will apply these perspectives to my case in the analysis chapter, to identify how elements from these paradigms function as drivers and barriers for the innovation processes around The Learning Tracks.

Central literature concerning value creation will also be presented as this may potentially be an effective tool for measuring the success of a public innovation and illuminating the power-structures in an innovation system. Elaborating on the most recent paradigm, networked governance, I will present two central approaches for leading innovation: metagovernance and balanced empowerment. These concepts will be revisited in the analysis as possible enablers for collaborative innovation.

2.1 Innovation in the public sector

Reflecting on the use of the terms: ‘improvement’, ‘transformation’, ‘reconceptualization’ and what they imply, Torfing (2019) discusses innovation in the context of directionality, newness, proactive efforts, and implementation. He defines innovation as:

“... an intended but inherently contingent process that involves the development and realization, and frequently also the spread, of new and creative ideas that challenge conventional wisdom and disrupt the established practices within a specific context”.

Elaborating on his choice of definition, Torfing further explains how “... innovation can neither be programmed nor planned; instead, it requires a mental state characterized by curiosity, open-mindedness, and courage, as well as a pragmatic attitude toward accidents, contingencies, risks, and failures”. These characteristics provide valuable insights for governing innovation, by shifting the focus from planning specific actions to encouraging the creation of a collective mentality for renewal. This perspective roots in the view that innovation should not be a goal, but a means to an end (Torfing, 2019).

Describing innovation in the context of the public sector, Bason (2018) make use of the very simple notion: new ideas that create value for society. Despite the seemingly simplistic approach to an arguably broad and complex term, the definition does embrace a key feature that’s often referred to when discussing the main differences between private and public innovation: the value creation. For a private actor, economic value determines the firms’ ability to survive and expand, and any innovative efforts to increase the efficiency of production can be interpreted as a means to achieve this. In public sector innovation, the

value creation reaches beyond the economic one, to include additional dimensions such as: personal well-being, whole-life experiences, service outcomes, capacity creation and societal value (Strokosch and Osborne, 2020).

Presenting various definitions of innovation, Bugge and Siddiq's article (2021) highlights one that particularly emphasizes the innovation's 'usefulness'. Further discussing what a useful innovation means, they mention the success of implementing the innovation as an essential factor for it to be deemed useful. A similar statement reads as follows: "A service hasn't been provided before it's been received" (Rønning, 2021), further elaborating that the emphasis on the implementation and recipients' active participation in innovation processes can therefore be understood as a key element in public innovation.

A central distinction that's made in innovation studies is between the two concepts *incremental* and *radical* innovation. Bason (2018) defines incremental innovation as "... a gradual improvement of existing processes or products," whereas "...radical innovation is characterized by entirely new processes or products". Based on these definitions, Torfings' encouragement to create processes for continuous renewal would typically be categorized as an incremental innovation, whereas his descriptions of "new and creative ideas that challenge conventional wisdom and disrupt the established practices" would resemble radical innovation.

Similar to Torfing's perspective, and also reflecting on the balance between incremental and radical change in innovation processes, is Hartley's (2005) description that innovation should "...produce a stepwise change that is more than a "continuous improvement," which merely gives us more or less of what we already have, and less than a "radical transformation," which replaces one action system with another". Discussing the occurrence of radical and incremental innovations, Fuglsang and Sørensen (2011) claim that incremental innovation is favored in the public sector service-production, further drawing on examples to problematize that there might be innovations "...concealed in the interaction with the client". This occurs more often in the public sector because innovation often happen 'ad hoc' and even unintentionally, resulting in the possibility that some innovations may not be recognized as such.

Innovations of both incremental and radical nature are found in government processes (Bugge and Siddiq, 2021). Radical innovations are typically found in central government, whereas

non-central government institutions typically produce incremental innovations. Based on the actuality of these findings, the authors posed the potential for non-central government institutions' dependence on central-government institutions. Confirming the presence of radical innovations in public sector, Rønning (2021) mentions several examples of radical innovation processes in Norway, such as the discovery of oil reserves on the Norwegian continental shelf and the innovative processes that followed as we specialized ourselves on this sector.

Torfinning's definition noticeably mentions open-mindedness, characteristic often attributed the term 'open innovation', which is a central term in the literature around public innovation. Mu and Wang (2022) describe open innovation in the public sector as "...the act of governments leveraging resources and knowledge contributed by peer government departments, citizens, and private sector organizations to solve public problems, increase the innovativeness of public services, and more importantly contribute to the creation of public value".

Acknowledging the considerable upswing in publications on open innovation, Mu and Wang (2022) refers to their analysis that shows an increase from 24 articles in the period between 1995-2011 to 150 articles published from 2012-2020. In their literature review they included studies that used the following terms, thereby regarding them as categories within open innovation: open, collaborative, inter-sectoral, cross-sectoral, inter-agency, co-production, public-private, e-governance, and digital governance.

In his book, Rønning (2021) presents three central paradigms in public innovation: traditional bureaucracy, New Public Management, and networked governance. Explaining how they all have different approaches to innovation and were launched in different periods of time, he argues that elements of all three approaches can be found in the current landscape of innovation management. In their article Bugge and Skålholt (2013) interpret the findings of a survey on innovation activities in Norwegian municipalities where they too conclude that elements from all three forementioned paradigms seemingly co-exists in innovation-practices in Norway. They go on to provide an analytical framework to understand the characteristics of public innovation in Norwegian municipalities. This framework is based on the three management levels: policy making, administration and service production. To contextualize my case in the theoretical framework I have made a graphic representation of this analytical framework with elements from my case included. This model will be revisited in the analysis.

2.2 Drivers and barriers in public innovation

To give a structured overview of drivers and barriers in collaborative innovation, Torfing (2019) provide an overview of five contexts drivers and barriers typically occur in: cultural, institutional, interorganizational, organizational, and identity related. Explaining these contexts further he elaborates “... drivers and barriers may arise from *cultural* norms and values, *institutional* logics, *interorganizational* relations, *organizational* routines, or the *identities* of the key stakeholders” (Torfing, 2019, p. 106).

Acknowledging the importance of disseminating innovations, Torfing (2019) emphasize that one should work to understand the context that drivers and barriers occur in to be able to disseminate the innovation throughout the public system. Elaborating on his five contexts, he mentions the importance of understanding the structure of the system that should disseminate the innovation. Examining organizational- and identity factors are relevant to understand how interpretation and translation of the innovation contribute to determine if an idea will work better in one organization than the other. Creating interorganizational communication is a key concept in collaborative innovation, however, cultural- and institutional codes may complicate interorganizational collaboration.

To examine the dissemination of an innovation, looking at drivers and barriers within the interactions between cultural, organizational, interorganizational, institutional and identity-related contexts will likely provide you with a comprehensive understanding of what the enabling or constraining factors are, and what contexts these drivers or barriers occurred in (Torfing, 2019). The four contexts; cultural, institutional, interorganizational and organizational will be revisited in later chapters as they will be used to structure the empirical findings.

Other academic literature focused on drivers and barriers within public innovation include Chapman (2002) and Mulgan and Albury (2003). Identifying some key barriers within public policy making, Chapman highlights the aversion of failure amongst politicians, explaining that politicians may be hesitant to drive risky innovations in fear that opposition politicians and media will use this to weaken them. The pressure for uniformity in public services and lack of evaluation of previous policies are other elements highlighted as a constraining factors, whereas a culture for experimentation, joint learning and creating innovative spaces are mentioned as key drivers (Chapman 2002, Mulgan and Albury 2003).

2.3 Governance paradigms in public innovation

In the following section I will introduce Hartley's (2005) three paradigms Traditional Bureaucracy, New Public Management and Networked Governance, by presenting what the literature considers the main drivers and barriers of innovation in each approach. Elaborating on the most recent paradigm, Networked Governance, I will go on to discuss different approaches for interactive governance within this paradigm. This will include perspectives from metagovernance, and balanced empowerment.

2.3.1 Traditional bureaucracy

Traditional bureaucracy (hereby referred to as TB) dates back to the post-war period and was the main method for governing states until the 1980's. This approach is based on clear distinctions between political and administrative functions (Hartley 2005, Bugge and Skåholt 2013), emphasizing stability, hierarchical rule, and compartmentalized decision making (Torfing 2019, Rønning 2021). Acknowledging some key features of this approach that may spur innovation, Torfing (2019) highlights the setting of clear agendas, the mobilization of resources and exploring and exploiting new ideas, as potential drivers. However, some barriers for this approach are its slow, standardized bureaucratic processes and lack of collaboration and continuous improvements, as these may lead to inefficiency. The anchoring to the past through the focus on previous experiences creates a level of path dependency, providing a risk that bringing old understandings of problems and solutions into the present may leave them with an innovation that is no longer relevant or applicable by the time it's implemented (Rønning, 2021).

2.3.2 New Public Management

Following years under a static government with slow processes came New Public Management (hereby referred to as NPM) in the late 1980's. Inspired by the dynamic and efficient processes from the private sector, NPM focused on the competitive tendering of public service production (Hartley 2005, Torfing 2019). This included reducing the governments' role, increasing productivity in the public sector through the application of private sector methods, and increasing focus on citizens by recognizing them as demanding customers and users of services (Bugge and Skåholt, 2013). Inspired by private sector values,

policy formulation and service production were kept separately, and competition and market principles were highly valued.

At first glance, the increased focus on citizens may translate to a potential driver through more responsive processes between public organizations and citizens. However, this approach also led to certain barriers as the market perspective focused more on generating economic value, rather than public value. Following this approach was a product-dominant focus with little regard to processes that didn't lead to any obvious economic returns (Strokosch and Osborne 2020, Fuglsang and Sundbo 2016). The scope of user involvement in this approach is limited to creating products *for* users, not *with* users.

The fragmentation of the public sector constitutes another potential driver, leading to increased freedom following the detachment from policymaking and as a result, increased employee-driven innovation. However, the lack of synchronization between service production and policy making may be a barrier for comprehensive policy formulation as daily practice does not reach political leadership and could thus inhibit the learning potential (Bugge & Skåholt, 2013). Mentioning additional aspects of NPM that could enhance innovation, Torfing (2019) highlights the elements of competition, strategic leadership, and performance management. He also points out that although the successes of NPM-processes may be disputed, it did lead way for a new perception of the public sector as an innovator. However, in a more recent publication, Osborne and colleagues argue that although the competition orientation that followed the NPM approach admittedly increased the performance of individual public service organizations, this happened at the expense of the "...overall effectiveness of public service delivery ecosystems in responding to need and of the ability of individual PSO's to respond to emergent social/economic issues" (Osborne, et al., 2021, p. 173).

2.3.3 Networked Governance

According to Torfing (2019), the two previous approaches have surprisingly little to offer in terms of explaining the *creation* of public innovation. An explanation to this alleged inability lies in the focus on managing innovation, a task that was previously deemed impossible by Torfing, rather than the facilitation of collaboration through open interactions that will naturally induce innovative initiative.

Rønning (2021) elaborates on this issue by arguing that the previous approaches have focused too much on internal processes, failing to appreciate the strength that lies in open collaboration with external actors. Discussing the hierarchical structure of the previous approaches that both authors find apparent, a horizontal structure is favored for collaboration, thus introducing the main concept of the more recent approach to governing innovation in national systems: Networked Governance (Hartley 2005, Torfing 2019, Rønning 2021).

Bugge and Skåholt (2013) equated Networked Governance (hereby referred to as NG) with collaborative innovation, co-creation, and community governance, drawing on their similar emphasis on concepts like broad alliances between actors from both public-, private- and voluntary sector and the blurred line between policy formulation and service production. NG is defined as “... the use of formal and informal institutions to allocate resources and coordinate joint action in a network of organizations” (Kapucu and Hu 2020, p. 5). Another important concept of NG is the possibility for mutual learning, and the aim to create solutions *with* users as opposed to *for* users (Bugge & Skåholt 2013, Torfing 2019). This approach also re-evaluates the functions of innovation, arguing that it should no longer be regarded as an episodic and accidental event that occurs in response to a system failure, but rather as a continuous and constant process for renewal (Torfing, 2019). On the one hand, the mobilization of various actors may be a crucial driver to solving complex, societal challenges. On the other hand, the involvement of various actors may pose challenges of coordination and lead to limited power of action and reduced implementation ability (Bugge and Skåholt, 2013).

2.4 Leading innovation processes for public value

The emphasis on innovation as a continuous process of renewal presented by Torfing (2019) is discussed in the context of leading second-order educational change in schools (Genlott, Grönlund and Viberg, 2019). In this context second order change is characterized as a cultural change, challenging fundamental beliefs about learning and teaching. The term is considered the next step from the concept ‘first order change’ which means a continuation of old practices with new technology. An example of first order change could be the implementation of Chromebooks in schools instead of writing with pen and paper (NIFU, 2019). Second order changes on the other hand, requires a more innovative approach where procedures are redefined, such as the implementation of e-government that allowed the service users to do several tasks themselves that would traditionally be done by government

staff (Genlott, Grönlund and Viberg, 2019). In the context of The Learning Tracks, first order change would be the implementation of Chromebooks as new digital tools, and the second order change would be changes in teaching methods as a result of this implementation. As this case concerns the implementation and adoption of digital tools, first- and second order changes can be understood as digitization and digitalization, where digitization is defined as the replication of offline processes, whereas digitalization is defined as the full review and revision of existing services (Mergel, 2018). Discussing how digital services are dependent on the users' adoption of their service for it to be successful, this creates a shift of focus where public value is at the center (Mergel, 2018). To move beyond the digitization-phase and to a digitalization where the service isn't just delivered, but also received, the service production needs to include the users through co-creation. Second order changes will therefore take place first when the service has been received through co-creation processes aimed at creating public value.

Research on the implementation of Chromebooks performed on the same schools that are enrolled in The Learning Tracks showed that the implementation of this digital tool led to the successful creation of first-order changes, the authors further stated that more work was required to reach second order changes (NIFU, 2019). A guide to enable second order changes is proposed by Genlott, et al., (2019), highlighting the embracement of teachers' diversity and the extension of existing social systems as two crucial factors, arguing that this will require a sustained effort from both school- leaders and owners.

Managers' involvement in innovation processes are often considered crucial, and the success of a project have typically been associated with a hands-on management style. However, recent perspectives on the managing- and governing processes of public innovation contests the traditional closed decision-making focused on internal processes. Instead, they opt for a new approach through inter-organizational value creation and the engagement of various actors (Strokosch and Osborne, 2020). This is by no means a devaluation of the managers role in collaborative innovation processes, but rather a redefinition of what this role should include. Providing a guide for managers' involvement in enhancing public innovation processes, Bason (2018) highlights the importance of creating innovative spaces, embracing divergence, empowering staff to self-reflect, recruiting talents and encouraging small-scale experimentations and learning.

Similar approaches appear in the redefinition of the government's role in innovation processes, with Torfing (2019) discussing the fine balance between hands-on and hands-off in processes where one is to govern a self-governed network. Further discussing the functions of a governance network, he points out a common misconception of this approach: that increased governing happens at the expense of government, or as he put it, a 'hollowing out of the state' (Torfing 2019, p. 256). To clarify the new tasks of government officials, Basons (2018) provides an overview, mentioning the formulation of an innovative vision, investment in innovation capacity, engaging managers in dialogues about innovation, making strategies for innovation and providing a licence to innovate.

Many public innovation processes are initiated through top-down processes, for example by the release of national directional policies, the school reform from 2020 is an example of such an initiative (The Norwegian Government, 2020). For these top-down initiatives to be considered successful in the perspective of public value, a bottom-up inclusion of the users must take place as well (Osborne, 2020). Approaches that embrace both top-down and bottom-up processes in innovation includes *balanced empowerment* at management level (Sundbo 1996, Bugge and Siddiq 2021) and *metagovernance* at the government level (Torfing, 2019). Balanced empowerment is described as the enabling of innovation through "... a dual approach of empowerment (agency) and control (structure)" (Bugge and Siddiq 2021, p. 2). Linking the concept to the public sector they go on to exemplify the concept, explaining that the governments' decision to "... restrain from power execution by delegating power to professional employees in the practice field" is an example of balanced empowerment (Bugge and Siddiq 2021, p. 2). Metagovernance is defined as "... reflexive governance practices aiming to govern more or less institutionalized governance arenas that produce concrete acts of governance" (Torfing 2019, p. 256). Similar to balanced empowerment, a key concept to metagovernance is monitored delegation. An important aspect in obtaining both top-down and bottom-up processes to lead innovation processes is the political embracement of science. A study performed in Norway compared the policy green papers (documents formulated by expert commissions) with white papers, (policy formulations). They found that a modest number of 9.5 percent of the references presented in green papers occurred in the following white papers, insinuating a low level of uptake of research in policy formulations (Khamsi, Karseth and Baek, 2020).

Central to both managing and governing public innovations are the four characteristics: consciousness, capacity, co-creation and courage (Bason, 2018). Elaborating on these characteristics, Bason further suggest four leadership roles that can provide a clearer overview of the expected characteristics of a leader in public innovation based on their position in the system: The visionary is a politician, his task is to create a joint vision that demands innovation and delegate resources to enable the execution of these policies. The enabler is a top executive that should encourage innovative activity and provide a license to innovate. The 360-degree innovator is a mid-level manager whos' task is to apply innovation to problem solving and creating an innovative space. Last, but not least, is the knowledge engineer; a head of institution that empower staff and encourage experimentation (Bason, 2018). Reflecting on the qualities required by leaders in public sector to drive collaborative, co-creating innovation, Bason (2018) emphasizes confidence and courage as the most important features. This is because innovation and radical innovation in particular, always comes with a degree of risk (Bason 2018, Brown and Osborne 2013). Elaborating on the role of central government in driving radical innovations, he emphasizes the need to recognize that this will require personal responsibility and a re-evaluation of the 'perceived boundaries' of traditional practice and mindset.

Underneath is a model that sums up the analytical framework that will be applied on the selected case. The model is retrieved from Bugge and Skåholt's (2013) analytical framework for public innovation in Norwegian municipalities and adjusted to the context of the selected case, The Learning Tracks. The model illustrates two different approaches to public innovation, with the left side representing processes typically found in TB and NPM, whereas the right side illustrates collaborative processes typically associated with NG. The 'administration'-level has a dotted line to illustrate that my study will focus on the levels policy making, service production and service users since this is the groups that I have retrieved my empirical data from.

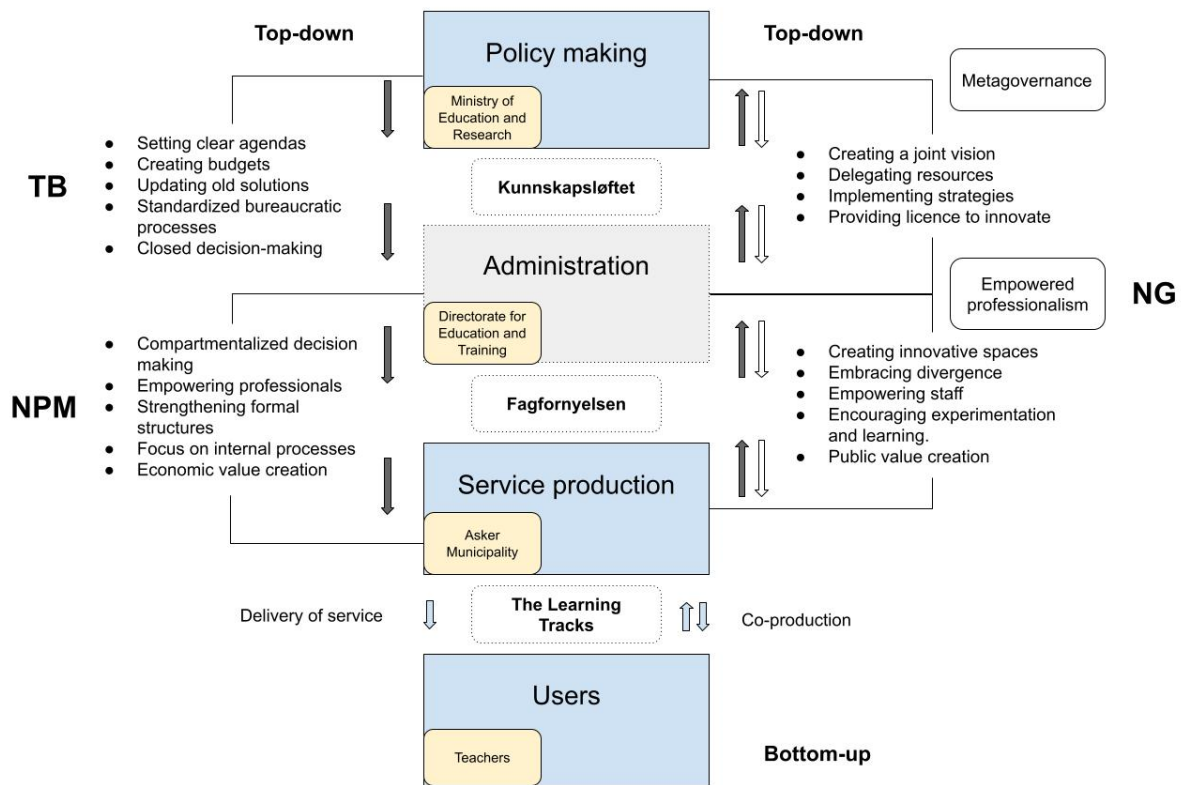


Figure 1. Visualization of open and closed approaches to public innovation in Norwegian municipalities, in the context of The Learning Tracks. Inspired and reproduced from Bugge and Skåholt (2013).

3. Methodology and research approach

In this chapter I will present my research design and explain the different methodological choices I made throughout my process. First, I'll explain the reasoning behind choosing a qualitative approach with a single case study. Next, I will go on to explain my choices around selecting the case and its participants and the choices made for my data collection and analysis. To create a level of transparency I have included a model providing a visual presentation of my interpretation of the data material and how it correlates with the theoretical framework. Finally, I present some specific approaches I have made to ensure a rigorous research design, drawing on Yin's four concepts: construct validity, internal validity, external validity, and reliability (Yin, 2018).

3.1 Qualitative method and case study

As I'd chosen to write my thesis on a specific, ongoing project, some of the concretization had already been made beforehand. Available to me were quantitative surveys mapping out the use of digital tools in education based on school subjects, and a set of qualitative interviews on the users' perception of the meetings arranged through the Learning Tracks. Upon deciding which data set I wished to proceed with, I had to consider the main characteristics of qualitative and quantitative methods to see how these matched with my study of interest.

Quantitative research typically aims to measure the stable patterns in society through the generalization of quantifiable data. Qualitative research on the other hand seeks to understand human environments and human experiences by examining social structures or individual experiences through oral, textual, and observational methods (Hay, 2016). Furthermore, qualitative research is often associated with subjective approaches, whereas quantitative research is often perceived as more objective. Another common conception is that intensive qualitative research investigates with a wider scope, emphasizing the social structures around the phenomenon they're examining, whereas extensive quantitative research is associated with a narrower approach, focusing on the tangible aspects. (Hay, 2016).

Studying enabling and constraining factors requires that one acknowledges that these concepts depend on subjective perceptions. For example, the government may perceive the process of delegating responsibility out to the municipalities as an enabler for public innovation as this contributes to open and collaborative public processes and frees up more time for other tasks. However, the same action may constrain the innovative capacity in the municipalities as time set aside for innovation is spent on evaluating whether systems comply with laws and regulations for GDPR, a process that could've been less time consuming if there existed clear guidelines and recommendations from national level. Since subjective elements are hard to measure in quantifiable data, taking a qualitative approach seemed the most appropriate choice for this study. I chose an inductive approach for my data analysis, as it's considered relevant if one aims to study the actions of people in real-world settings, thereby allowing the researcher to build theory on perspectives from reality (Gioia et al., 2013).

Yin (2018) provides an evaluation of three steps that one should consider when debating whether a case study would be fitting for their study. These three steps include: types of research questions, the researchers control over the behavioral events and the presence of a contemporary phenomenon.

Explaining that case studies typically focus on questions starting with ‘how’ and ‘why’, Yin (2018) continue to mention that questions starting with ‘what’ can be justified if they have an exploratory nature, aiming to study a phenomenon in depth (Yin, 2018). I argue that my research question meets the same criteria of exploratory openness as ‘how’ and ‘why’ questions as it’s formulated in a broad manner with few presumptions other than the existence of constraining and enabling factors for innovation in the Norwegian school system. Additionally, one should have little or no control over the behavioral events, as opposed to experimental approaches. But in contrast to a historic approach there’s a possibility for observation and reporting from relevant people. Given that I’m studying an ongoing, contemporary project I have had the opportunity to observe meetings administrated by the Learning Tracks and perform interviews of both users of the service (teachers) as well as the service-deliverers (people from the municipality). I thereby concluded that a case study would be the preferred approach as my study meets the criteria of both control of behavioral events and contemporariness.

3.1.1 Selecting the case

During my studies at the center for Technology, Innovation and Culture (TIK) at the University of Oslo I decided to specialize in innovation studies. This module included several lectures on public innovation, a subject that caught my eye. Pursuing this interest I wrote my following submissions on open innovation in the public sector, and eventually came across a report from the Technology Council named “A streaming service for learning” (Teknologirådet, 2020). This report refers to findings from OECD (2018) which concludes that one third of the Norwegian working force will experience radical changes to their work tasks over the coming years, leading to a considerable demand for continuing education for our workers to stay relevant in tomorrow’s labor market.

The same technologies that are expected to radically change our jobs, can be used to help workers to keep up with the technological development. But to use this technology in new ways requires innovative efforts. The current services provided for continuing education are

limited to traditional university-degrees or courses on specific subjects offered by the employer. Both build on old concepts of continuing education happening as a single event, rather than a continuous development made possible by that facilitation of routines, cultures, and opportunities for constant renewal.

Wanting to study the technological opportunities for continuing education in Norway I talked to my supervisor, who informed me of an ongoing project he worked on oriented on digital literacy amongst teachers in Asker municipality. The project consists of a research team from NIFU that follows and studies the Learning Tracks initiative through the following research question: ‘What inhibits and promotes pedagogical development work in schools with 1:1 coverage?’. I decided on a wider, systemic approach to the matter. However, studying all technological innovation processes around continuing education in Norway is a task that extends far beyond the limitations of a master thesis. To specify my research further, I made use of Miles, Huberman and Saldaña’s (2019) two concepts for sampling by setting some boundaries that define the case by linking it to the research question and creating a conceptual frame that can help identify key processes that undergirds your study. The boundaries I set included focusing on the Norwegian school system and the continuing education on digital competences amongst teachers. The selected conceptual frame is the concentration on enabling and constraining factors found in the Norwegian school-systems processes around this work.

3.1.2 Selecting participants:

The qualitative interviews from the existing database focused solely on the ICT-teachers and school leaders. A recurring theme in the interviews of the ICT-teachers seemed to be separated into two challenges: the structural challenges of finding time to participate in the courses and further deciding what was relevant to their staff. The second challenge was how to engage a staff of busy teachers with varying levels of expertise in the field. Would a one size fits all be the most efficient strategy, or should they ask the school leader for more time set aside to individual follow ups? The school leaders on the other hand discussed the difficulties of meeting the new criteria of increased digital competences, knowing what subjects to invest their money in and clearing the schedule and thus taking time off other important topics such as management and operations. Common to both groups seemed to be the challenges revolving engaging the teachers that didn’t already have an interest or experience in the field. The data-collection done by the research team involved resource-

teachers, school leaders and a team of two providers of the Learning Tracks service from the municipality. The goal of these interviews was to ask direct users or participating individuals about the use and relevance of the service. As I had decided to study the broader system around the Learning Tracks' I concluded that supplementary interviews of the remaining teachers that had no resource-function and additional people from the municipality working on enhancing digital literacy in the schools would provide a better insight into the processes on the different levels.

3.2 Strategy for data collection

For my data collection I relied on three approaches: semi-structured interviews, observation, and document analysis. As I joined an on-going project, I was able to access a data base of retrieved data material of both quantitative surveys and qualitative interviews. Having decided on taking a qualitative approach I transcribed the semi-structured interviews as this had yet to be done. The project had retrieved data from the ICT-teachers and school leaders, and I concluded that supplementing these interviews with additional ones from the teacher- and municipal perspective would provide a solid data material from different perspectives within in the system.

My second approach for data collection was attending the meetings conducted by the Center for Innovation and Learning in Asker (hereby referred to as SEIL). This gave me the opportunity to take on a role as a silent observer and see if the findings I'd collected from the interviews would be expressed in a different context. The third approach included reviewing relevant policy-documents concerning the digitalization of schools that had been published within the last five years.

3.2.1 Designing and conducting the interviews

Reflecting on the complex nature of interviews as opposed to other data collection methods, Yin (2018) emphasizes the importance of a researcher that is prepared to adapt, listen, and avoid preconceptions. Keeping these attributes in mind I started designing the questions of my interviews. Having chosen semi-structured interviews I expected this to help me obtain the adaptiveness that was required. The semi-structure also allowed me to write fewer questions, this could possibly help me take on a listening role. It could potentially also lead to

a more diverse, and reliable dataset as people were able to talk about what they found the most relevant within the theme of my choosing.

To be able to ask good questions I first had to map out what my preconceptions were before entering the interview. Having already transcribed some interviews for the project, I was aware of possible preconceptions that my interviews would lead to similar findings. Taking this into consideration I prepared a guide of the key themes I wanted to explore, without specifying other than some general opening questions and additional follow-ups if the conversation steered off the topic of relevance. Inspired by Hay's (2016) approach I started off by asking general questions to prepare both interviewer and interviewee to the situation and topic before continuing with more complex questions.

All interviews were conducted digitally as they took place during the Covid-19 pandemic. I used the video-call function on Zoom to create a situation similar to a physical meeting and asked for permission to record before the interview started. All interviewees had received a document stating the purpose of my research, their rights and privacy as informants beforehand, including the contact information of my supervisor and myself if they had any additional questions.

3.2.2 Observation

As part of my data collection, I took part in two meetings arranged by SEIL where teachers, ICT-teachers and school owners met with two workers from SEIL to learn more about the purpose and area of use for the Learning Tracks. During these two meetings, one digitally, I was able to observe as the users interacted with each other in discussions regarding the implementation of service in their respective schools and different drivers and barriers during these projects. Another important purpose of these meetings was knowledge-sharing, and the users were encouraged to share different methods for using the Learning Tracks. The workers from SEIL shifted from presenting about the initiative and interacting with the groups to help them individually. This gave me valuable insights into the interactions between users and other users, as well as between the users and the providers of the service.

3.2.3 Document analysis

The strengths of a document analysis include the stable nature of documents, their unobtrusiveness to the case as they were not written in relation to the study, their broadness

and specific qualities including names, references, and details of events. However, some weaknesses involve biases related to the selection of documents, access, retrievability and possible unknown biases to the authors (Yin, 2018). The documents of my choosing are very accessible and retrievable as the database for policy documents are available to anyone. They're also written by several authors which can possibly reduce the potential bias of the authors. By providing a clear review of my processes around the search for documents I hope to reduce the biases related to the selection.

As I wanted to examine the political context that my case occurs in, I have made use of several policy documents particularly relevant to my study. On the webpage 'regjeringen.no' there's a search function to help filter out relevant documents from the extensive database of policy-related publications. The selection of documents varied from strategies and plans to reports, hearings, propositions, laws, regulations and many more. The presentation of various policy documents that will be presented in chapter four constitutes a limited selection of policy documents I found relevant to explain the contextual background. However, as my study aimed to compare political intentions to the concrete realities in the system, the strategy for collecting documents for the document analysis included performing an advanced search selecting only strategies and plans. Searching for documents relevant to the Norwegian School System I limited the advanced search to only include publications from the Ministry of Education and Research within the time frame of the last five years. This resulted in 37 documents, and further considerations involved the documents relevance to the digitalization of schools. This is how I came across the two documents used in my document analyses: The Digitalization strategy for basic education 2017–2021, 'Future, renewal and digitalization' (the Ministry of Education and Research, 2017) and the following 'Action plan for digitalization in basic education' from 2020 (the Ministry of Education and Research, 2020).

3.3 Strategy for processing and analyzing the data

Some of the data had already been partly coded before the interviews, through the structuring of interview-guides. An example is the increased focus on personal experiences with the service when interviewing users as opposed to the focus on the processes behind the creation of service when interviewing service providers. Another pre-defined coding process was the separation of drivers and barriers already expressed in the research question. Although some themes were defined already, I structured an interview guide with relatively open questions to ensure the possibility of unexpected, but relevant, themes being brought up. By identifying

reoccurring themes that the interviewees discussed during interviews and observation, I was able to map out a general overview of the key themes within this system through a thematic analysis.

The processing of data started out with transcribing the interviews. As I have made use of interviews that were performed both by myself and by other researchers on the project, I chose to do the transcription by hand to make sure that I had an equally good overview of the data retrieved from the projects data base as the ones I had done myself. This decision was based on the reasoning that an important aspect of interpretation lies in the tone of voice and other additional information one may miss if you don't listen to the audio-file. Both rounds of interviews were transcribed no longer than a couple of weeks after they were done, resulting in one transcription process of the data-base material in June, and the following transcription process of my own interviews in February.

- I started off by coding the data material, writing down all the findings from the interviews, observations, and policy-documents into one document. A lot of awareness was put into the translation from English to Norwegian to ensure that the wording was as similar as possible to the wording they had used, to follow Gioia's 1st order concept (Gioia et al., 2013). In my model the original term '1st order concept' has been translated to 'Uninterpreted' to avoid confusing the term with the similar term 'first order change' used in my thesis to describe digitization processes in schools.
- Giving each finding its own box, I started to move them around, trying out different structures by sorting them into different umbrella themes, trying to link the findings to my research. The sub-categories I ended up with functioned as what Gioia calls 2nd order theme (Gioia et al., 2013). Like the 1st order concept, I also changed the 2nd order theme to 'Categorized'.
- Finally, the sub-categories provided in the second step was considered in light of the theoretical concepts, thus concluding the model with Gioia's (2013) third concept; Aggregate dimensions. Providing a review and graphic visualization of my interpretation from raw data to theoretical assumptions contributes to a transparent analyzation process.

Upon structuring my findings into sub-categories I decided to sort the categorized findings into sections of drivers and barriers in the processes around the Learning Tracks initiative,

elements retrieved from a model of drivers and barriers for collaborative innovation (Torfing, 2019). The fifth context ‘identity bound’ will not be applied in my study because no such findings occurred during my data collection, possibly because my systems-oriented approach wasn’t the preferred method to identify factors of this sort. I also decided to separate the aggregate dimensions into service users, service producers and policy. Since the empirical findings from interviews and observation have been retrieved from the user and service production perspective, these categorizations seemed logical. I have chosen to combine the levels ‘administration’ and policy making’ to ‘policy’. This category includes findings expressed in interviews and observations that were considered national challenges or drivers reaching beyond the authority of the service- users and producers, and findings from relevant policy documents. Structuring the findings into these respective levels was essential considering the previously mentioned aspect that a barrier on service user-level may be the same as what’s described as a driver on service producer-level. By using these levels this model shares some elements to previous graphics I have presented in chapter two (see Figure 1), creating a better understanding of the correlation between data material and theory.

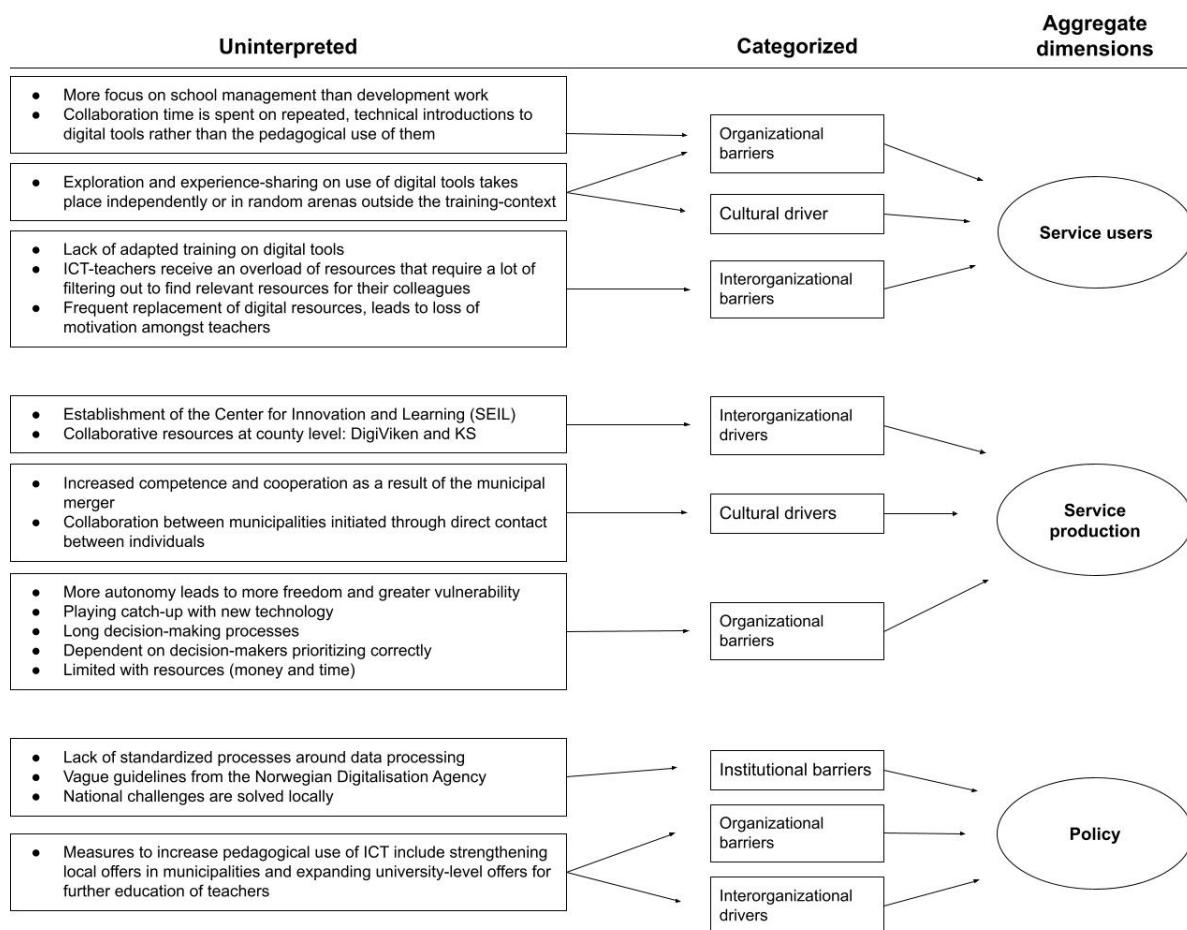


Figure 2. Visualization of data interpretation. Inspired and reproduced from Gioia et al., (2013).

3.3.1 Ensuring rigour

Conducting a study, you're given the privilege of interpretation, a responsibility that ought to be taken seriously. Ensuring that the analysis of the retrieved data happens in a transparent manner is referred to as 'ensuring rigour' in the literature, and Hay (2016) emphasizes the importance of a careful research design to make sure that qualitative research is done with sufficient rigour. To meet the requirements of a careful research design, I have provided a thorough review of my strategy for data collection, interpretation, and analysis, making use of Gioia's inductive approach for interpreting raw data material to theoretical assumptions to ensure a transparent process (Gioia et al., 2013). To prove the quality of my research design I will be putting it through the four tests found in Yin's (2018) book: construct validity, internal validity, external validity, and reliability.

3.3.2 Construct validity

Hay (2016) measure a study's validity by the extent of correlation between the data material and the following conclusions. If the study has examined what it was set out to examine, the followed procedures should lead to a precise observation of reality. To ensure validity, Yin (2018) provide two steps for the researcher: clearly define the study's goal and establish a logic chain of evidence and triangulate the data collection. Having provided a clear definition of the study's goal through my research question and the following delimitations, I have also included a model for the interpretation of data to ensure that the conclusions I draw from the evidence are clear and logical. The data-collection for this study has happened at three different point of times, through three different approaches: semi-structured interviews, observation, and document analysis. The first round of interviews was performed by another researcher, ensuring another level of validity as the data collections performed at three different point of times, by various approaches and various researchers still led to a corresponding and harmonized data material. Discussing the findings with a larger team of researchers ensured that the findings from my study correlated with the perceptions the other researchers had formed during their participation on the project.

Internal validity ensures causality between the researchers' argument and reasonings and the following conclusions, explained by Yin (2018) as how 'factor x' leads to 'event y'. To ensure the credibility of the conclusions drawn in this study, I have made sure to keep an open mind during the data collection and the following analysis, receptive of the possible

occurrence of rival explanations. Acknowledging the complexity of topics such as systems and processes consisting of human interactions, this study is intended as a contribution of plausible explanations to a phenomenon, rather than a final explanation with concluding remarks.

External validity ensures the transferability of a study, typically obtained through the generalization of theoretical claims (Yin, 2018). To ensure this, I have focused on clearly defining the case and presenting a transparent overview of my processes from data-collection to analysis and final conclusions. This way, other studies with similar characteristics as this case may find certain aspects of this study transferrable to their case.

Reliability ensures that the results from this study can be reproduced if the study was to be repeated (Hay, 2016). This requires a consistent and transparent process, through the continuous documentation of the researchers' procedures (Yin, 2018). A thorough explanation and documentation of my methods around data collection, data interpretation and analysis and the inclusion of relevant documents produced during this study ensures this.

4. Political context and case study

In this chapter's first section I will present findings from recent government publications indicating that lifelong learning, the digitalization of the school sector and municipalities' central role in innovation of the public sector are all topics of high relevance. I will consider these interconnected challenges as central contextual factors to my case study. Some of the policy documents' relevance reaches beyond that of a contextual factor as they proposed concrete measures to improve the offer for continuing education on the pedagogical use of ICT, which ultimately enabled the creation of the Learning Tracks.

The second section will present the participating actors behind "The Learning Tracks" initiative, the initiatives' objectives, and the research team's focus. After providing the overview I will go on to elaborate the main areas of The Learning Tracks initiative that I have chosen to focus on. This includes the implementation of second order changes in the digitalization of the school sector and the creation of a professional community for experience sharing amongst teachers.

4.1 Political context

In 2019, an expert committee was commissioned by the Ministry of Education and Research to carry out a study on the possibilities to regulate the area of basic education. The committee proposed a new Education Act which was to replace the current based on significant changes in society since it was implemented in 1998. The societal changes that were highlighted were within the areas of technological development, demography and globalization, public health, development trends in the labor market and changes in municipal and regional structure. Emphasizing the technological development that has taken place since 1998 the report points out that the current Education Act took effect the same year that the American tech company Google was founded. They go on to argue that ICT has a considerably larger role in education today, and that the technological development we have seen in education over the past decades needs to be followed by an equal increase in technological competences amongst teachers (NOU 2019:23). The proposal for a new Education Act has not yet become anything more than that, a proposal. It's been postponed to the end of 2022 due to the outbreak of the Covid-19 pandemic.

In 2017 the Ministry of Education and Research released a digitalization strategy for basic education. This document states that teachers' lack of digital competences is the main barrier for the pedagogical use of ICT in education. Presenting results from a survey done on this subject, they found that teachers themselves found the offer for continuing education on ICT insufficient, with 50 percent of teachers enrolled in an education program on this subject reporting that they received very little training on the use of ICT (The Ministry of Education and Research, 2017). In 2020 an action plan was released to evaluate the progress around the strategy of 2017 and set new goals and measures for the years to come (The Ministry of Education and Research, 2020). The report from 2017 and following action plan from 2020 presented some clear measures to meet these challenges, proposing a strengthening of the existing university-level offers for continuing education on the pedagogical use of ICT and the enabling of municipalities to drive local initiatives for enhancing digital competences amongst teachers.

In 2020 the Norwegian government released a new school reform named "Kunnskapsløftet" (The Norwegian Government, 2020). The reform elaborates on the core values based on the Education Act, and this section emphasizes digital competences and professional communities for continuous learning amongst teachers crucial to obtain a sustainable school

development. The focus on continuous learning for teachers is previously expressed in the national strategy “Kompetanse for kvalitet” that aims to increase knowledge sharing between colleagues and enable local, customized, initiatives for continuing education within the municipalities (The Ministry of Education and Research, 2015).

Over the last few years there's been initiatives to create a new municipal- and county structure in Norway. On the 8th of June 2017 the government decided to reduce the number of municipalities from 428 in 2017 to 356 in 2020, it also reduced the number of counties from 19 to 11. This decision was based on reasoning that local services are becoming increasingly complicated and demands for more specialized services might be challenging to meet for smaller municipalities with less resources. A survey done by KS in 2017 also show that larger municipalities had a greater innovation capacity due to access to more and better competences and resources. Following these structural changes were a de-centralization of power through state framework management with opportunities for local adaptations (Ministry of Local Government and Regional Development, 2017).

In 2020 the Ministry of Local Government and Modernization made a report presenting developments, status, need for change and government policy for the further work with innovation in the public sector. The report emphasizes the municipalities' central role in public innovation and expresses a desire for increased cross-sectoral cooperation and knowledge-sharing with a focus on value creation for society and citizens (Meld. St 30, 2020).

4.2 The Learning Tracks

The Learning Tracks initiative is an innovation project by Asker municipality that is set from 2020-2023. The project is conducted in collaboration with the University of Agder and a team of researchers from NIFU and the TIK-center, University of Oslo. The initiative focuses on the digitalization that has taken place in schools following the decision to distribute digital devices to all students, a so called 1:1 coverage. As of 2021 the decision to introduce 1:1 coverage in elementary schools had been made by over half of the municipalities in Norway. This transformation requires new approaches to teaching and classroom management and poses new challenges for school leaders and school owners. Arguing that the current work to meet mentioned challenges is fragmented and not very coordinated, the Learning Tracks initiative is a model for leadership and organization of pedagogical development related to

schools with a 1:1 coverage. The initiative has three objectives: Adapt and implement the model at different types of schools, disseminate knowledge about the model to school owners and other actors working on digitalization of primary and secondary education and provide new insight into pedagogical development work in schools with 1:1 coverage (Asker municipality, 2022).

The research performed by the participating research team is expected to help meet the last goal by answering the research question: *What inhibits and promotes pedagogical development work in schools with 1:1 coverage?*

In a report published by the research team in 2019, the challenges related to second order barriers are elaborated, stating that achieving pedagogical developments requires changes in cultures, attitudes, and motivation to adopt new technology in education (NIFU, 2019). This realization was part of what put the creation of a professional community for experience sharing amongst teachers on the agenda. By changing the culture and attitudes towards collaborating on development work related to pedagogical use of ICT, these professional communities can ensure continuous development even after the Learning Tracks initiative is finished.

5. Empirical findings

In this section I will present the empirical findings from the study. The first set of empirical findings are retrieved from semi-structured interviews and observations of the teachers, school leaders and school owners participating in The Learning Tracks. The second set of empirical findings are retrieved through a document analysis of relevant policy strategies and plans. I'll be separating the findings into the levels "service users", "service production" and "policy", elements derived from both Figure 1 and Figure 2 to provide a clear understanding of the systemic context that the findings occur in. To further separate the findings within these categories into drivers and barriers, I'll be drawing on Torfing's four context-bound elements that were used in the section 'Categorized' of Figure 2: cultural, institutional, interorganizational, and organizational.

5.1 Service users

The empirical findings from service users are retrieved from interviews and observations. 'Service users' includes teachers, ICT-teachers and school leaders of the schools that are

participating in The Learning Tracks. The findings that are categorized ‘organizational’ are barriers that occur within the school. The one’s categorized ‘interorganizational’ are barriers that occur in the interplay between school and municipality. The one’s categorized ‘cultural’ includes drivers within the culture of the school-staff.

5.1.1 Organizational barriers

Upon interviewing school leaders, ICT-teachers and teachers, one reoccurring theme concerning the constraining factors to the pedagogical development with digital tools was limited time. A relatively unison understanding of this issue amongst the three roles was that time set aside for collaboration and development work was too often eaten up by discussing issues revolving school management. When asked if collaboration time was spent on pedagogical development with digital tools, one teacher responded:

“If it is not controlled by the management, it rarely happens. Time is set aside for it, but we don’t always manage to keep up, we may need it to be more controlled. Most of us probably feel that little time has been set aside for collaboration, especially across grade-levels and subjects. Within the grade-levels it works well enough, but teachers of specific subjects are often left behind” (Informant 3, school)

Discussing other barriers for pedagogical development work during collaboration time, extensive focus on the technical functions of digital tools was mentioned by both teachers and ICT-teachers. The ICT-teachers are important participants in the trainings organized by the Learning Tracks. During time set aside by the school leaders, they’re expected to communicate the knowledge they gained from the courses out to the remaining staff. These sessions met constraining barriers as one ICT-teacher mentioned that technical issues regarding the functions of the digital tools ended up dominating the discussions, rather than the pedagogical use of them.

5.1.2 Interorganizational barriers

Technical issues dominating the development work was often the case because the teachers had very different starting points when it came to digital competences. The less competent teachers needed a more thorough introduction, and asked questions about the functions of the tools. The more competent teachers were more able to discuss pedagogical approaches. These variations in digital literacy amongst the teachers, posed a challenge when the courses from

the Learning Tracks were structured as a “one size fits all”, resulting in a barrier where the teachers experienced either a lack of motivation due to the courses being too easy, or too difficult.

Due to the Covid-19 pandemic, several providers of teaching resources made their sites available to everyone for a limited period of time. Having access to an extensive set of resources relevant to all levels, the teachers that found the Learning Tracks’ courses too difficult or too easy could access other digital resources on their level. However, one ICT-teacher discussed that the many different structures could be hard to navigate in, and so a lot of potentially useful resources didn’t reach the users. Functioning as a crucial intermediary between the service providers and the service users, one ICT-teacher explained how he attempted to filter out to provide personalized tips to relevant resources for his colleagues:

“There was no shortage on guidance. The challenge turned out to be how to navigate in all these resources, finding relevant tips etc. It was easier for me to navigate in these structures than for other teachers that didn’t have the same overview as me. I tried to tip them by sending them direct links to resources I thought would be relevant to them” (Informant 2, school)

Pointing out that this overload of resources took place during a testing phase where the municipality had not yet decided which resources to invest in yet, one ICT-teacher argued that the extended choice of resources had encouraged creativity and innovative approaches for some, but had also proved demotivating to others:

“There’s some frustration amongst the staff because we don’t know which resources Asker municipality decide upon from August, we’re in a testing phase where they encourage us to try out different resources. I try to encourage the teachers to check out what’s available, but most recently last week they told me that they didn’t want to try out the different resources in fear that they might decide on a different one in August after they’d spent all this time learning them, so that’s an attitude that’s present as well” (Informant 2, school).

5.1.3 Cultural driver and organizational barrier

When asked about which context the collaboration on pedagogical work around digital tools occurred, both teachers and ICT-teachers explained that apart from the time set aside by school management, this often happened ‘ad hoc’ in informal contexts such as during lunch

time or random encounters in the hallways. This has been categorized as a cultural driver because this positive attitude for knowledge-sharing could enhance collaboration and function as a driver for the work initiated by the Learning Tracks to establish a professional community for knowledge sharing within schools. It has also been categorized as an organizational barrier as the reason for why this knowledge-sharing is currently happening in informal context may be due to the lack of a formal context.

5.2 Service production

The empirical findings from service production are retrieved from interviews. ‘Service producers’ includes workers from the municipality, specifically within the field of school development. This includes workers from SEIL, who produces and delivers the service. The findings that are categorized ‘interorganizational’ are driving factors for establishing cross-sectoral organs for collaboration. The driving factors for joint learning amongst the staff are categorized ‘cultural’, whereas the findings categorized ‘organizational’ includes factors that constrains the production of service within the organization.

5.2.1 Interorganizational drivers

When asked to provide an overview of inter-municipal collaboration, one organization was mentioned as a central driver for this by several interviewees: The Norwegian Association of Local and Regional Authorities (KS). This organization arranges annual meetings and events for all Norwegian municipalities. They also function as an intermediary between local interests and policymakers. Another central resource for inter-municipal innovation that was mentioned is DigiViken, a partnership between the municipalities and Viken county that aims to enhance digital solutions for municipal service providers and citizens. Explaining how Asker municipality work around processes that needs to be communicated to higher levels, one interviewee said:

“We have met several challenges related to this (digitalization), and try to lift these issues to a national level through DigiViken and further up to KS, and also through other networks that some of us are advisors in” (Informant 6, municipality)

Another interorganizational driver mentioned was SEIL, a center that was established after the municipal merger and which aims to enhance collaboration between business, research, academia, public actors, and collaboration with other municipalities.

5.2.2 Cultural drivers

Other processes around inter-municipal collaboration mentioned was the direct contact between individuals situated in different municipalities, typically previous colleagues, or someone they'd met during the inter-municipal events organized by KS, DigiViken or SEIL. Explaining how the municipal merger had created a culture for collaboration and joint learning, one interviewee described how they collaborated to find next practice out of the best practices from each municipality:

“The municipal merger changed our processes, everyone wanted to do things their way, so we had to give some and take some. It’s a clear advantage that you’re more people; before, the smallest municipality only had one person working on digitalization, that was very vulnerable. Now we’re more people and able to specialize more in some areas. Me and two others in my department only focus on school and digitalization in school. We have been able to go much further into topics than other municipalities, such as with procedures around vulnerable children and privacy” (Informant 7, municipality)

5.2.3 Organizational barriers

When asked about internal processes and how they enable or constrain their work around innovation in their organization, one reoccurring theme was limited time and money. Another aspect was the long decision-making processes, and convincing important decision-makers to prioritize correctly. This was explained by one interviewee:

“Decision-making processes tend to take longer since it has to go through so many stages, so the time perspective is one thing, and of course the money... and the maturity of the organization. At school you are generally more concerned with bullying and what happens in the classroom, which makes people think "Is privacy so important right now?" You may not realize how complex it is. So, some complex processes take longer because you need people to understand how big and extensive it is and what resources are needed” (Informant 7, municipality)

5.3 Policy

The empirical findings from the policy-level are retrieved from interviews of workers from the municipality, and the document analysis on the digitalization strategy for basic education

and following action plan. The findings retrieved from interviews are categorized institutional as they describe logics that are prevalent throughout the entire system, and in this case, logics that have functioned as barriers to innovation on the municipal levels. The barriers categorized organizational are retrieved from the document analysis, reflecting organizational reservations within the Ministry of Education and Research to function as innovators not just enablers of innovation. The drivers categorized interorganizational are findings retrieved from the document analysis that involves the strengthening of municipal structure and cross-sectoral collaboration.

5.3.1 Institutional barriers

The municipal merger has already been mentioned in the context of interorganizational drivers through the establishment of SEIL and cultural drivers through the creation of a culture for joint learning. However, some barriers related to this event were also mentioned. One aspect was that the increased autonomy that followed the merger, to focus the decision-making to local authorities, had led to both more freedom and greater vulnerability. This vulnerability occurred due to the lack of guidance from above and was exemplified through the context of finding new programs for schools that meet the requirements for privacy policy.

“We can spend hours checking numbers to see if everything is done correctly; if the data processing is done in the right country, if things are exchanged and sold to third parties. I think that if we had a central approval scheme for this where the state said that "These four programs here are available and approved for use" then the municipalities could decide which one to use. That would be much easier than for us to go out ourselves and consult with all possible providers and find out if they have a data processing that is approved. This applies to 356 municipalities in Norway, who as of today have to do all these processes themselves” (Informant 6, municipality)

As argued by this interviewee, issues regarding privacy policy are a national challenge, who as of today is set to be solved locally. Although there are existing organs that are meant to assist on issues regarding privacy policy, such as the Norwegian Digitalisation Agency, the experience from workers at Asker municipality shows that this organization provide very vague guidelines, ultimately trusting the municipality to make their own, informed decisions. This can be problematic as different municipalities make different decisions regarding

privacy policy, leading to different opportunities for collaboration based on where you live, or worst case, that some municipalities allow for activities that violates GDPR-rules:

The GDPR perspective hinders the innovation perspective. We envision cooperation across municipalities, but there are barriers for this in the school context related to GDPR. We would like these things to be raised nationally so we are not alone in deciding "Should we allow our school documents to be shared with another municipality and vice versa?" We may end up deciding that it's not secure enough, but then the other municipality says that it is. Then our students can't interact with another municipality. Thereby, some students get different opportunities than others because there are different assessments of privacy consequences. (Informant 7, municipality)

The extended focus on privacy policy when introducing new technologies has slowed down the municipality's implementation-ability. This results in a situation where they're constantly "playing catch-up with new technology" (Informant 6, municipality).

5.3.2 Organizational barrier and interorganizational driver

Reflecting upon the lack of competences on the pedagogical use of ICT amongst teachers, The Ministry of Education and Research proposed two approaches for their measures. The first approach includes the extension of university-level offers on continuing education for teachers:

"There are many indications that newly graduated teachers today have not sufficiently acquired this (digital) competence through their basic education. With technological changes, more experienced teachers will also benefit from updating their skills. There is therefore a need to strengthen the teacher educations' ability to provide teachers and teacher students with the professional digital competence they need, both in basic education and through continuing education offers" (The Ministry of Education and Research, 2017)

The second approach includes strengthening local abilities to provide services for enhancing digital competences within municipalities:

Digitalization also places increased demands on competence in the municipalities, county municipalities and with the school management, to plan, assess and acquire infrastructure and equipment that supports the schools' pedagogical work, assess, and prioritize

competence development and lead digital development processes at the school. (The Ministry of Education and Research, 2017)

In 2020 an action report was released to evaluate the progress of these measures and set new goals for the coming years; however, the updated goals contained few novelties, building on the same measures from the strategy of 2017:

Ensure that continuing and continuing education offers are relevant to the teachers, that the offers are adapted to the technology-rich environment in the school and facilitate a good collaboration with providers (...) These offers must be developed in good cooperation with the environments at universities and colleges that are responsible for the offers (...) Through the decentralized scheme for local competence development, school owners can implement competence development measures based on local needs (The Ministry of Education and Research, 2020)

Despite the authorities' continuous choice to refrain from functioning as an innovator by proposing measures with innovative qualities, which was categorized as an organizational barrier, their function as innovation enablers by strengthening municipalities and encouraging cross-sectoral collaboration can be considered interorganizational drivers.

6. Analysis and discussion

In this chapter I will analyze the enabling and constraining factors to ensuring second order digital literacy in the Norwegian school system presented in chapter five through the theoretical framework presented in chapter two. The chapter is separated into four different sections. In the first section, I will draw on the empirical data from chapter five and the public documents from chapter four to analyze the political intentions and actual presence of second order changes in the Learning Tracks. In the second section, I will discuss how the empirical findings presented in chapter five can be understood in the context of co-creation, joint learning, balanced empowerment and metagovernance. In the third section, I will analyze the drivers and barriers from the empirical findings in the context of public governance regimes to identify what regimes are present in the processes around second order digital literacy in the Norwegian school system. Finally, based on the arguments posed in the previous sections, section four discusses how the current system matches the system described in the policy documents.

If all the strategies and policy reports on digital literacy in Norway presented in chapter four had worked out perfectly, there would be no constraining factors to digital literacy. However, empirical findings show that there are several constraining factors in the form of organizational, interorganizational and institutional barriers. Reviewing the impact of cultural factors, these became most apparent as drivers for innovation, arguing that the attitude amongst service- users and producers to innovate is overall positive. The fact that the various policy documents on driving public innovation and enhancing digital competences in our workforces exist, show us that the policymakers are eager to innovate too. This seems like a good starting point, and as will be argued in this chapter, the innovative ability in this system could potentially increase through a re-evaluation of delegated task between municipal level and policy-level, and the shift of focus from traditional university programs to more innovate, national solutions that resonates with the political intentions to drive radical innovation.

6.1 Two approaches to second-order digital literacy

This section will include a comparison of the goals set to be met by 2021 in the digital strategy for basic education 2017-2021 (The Ministry of Education and Research, 2017) to the empirical findings. The strategy presents two approaches to reach their goal for increased pedagogical competences on ICT amongst teachers. The first contains measures to strengthen existing offers for continuing education, the second involves the strengthening of municipalities to drive local efforts. Examining the goals formulated in this document can be helpful to analyze the coherence between the political intentions for increasing pedagogical competences on ICT amongst teachers, and current realities retrieved from recent interviews of teachers. By referring to goals formulated by the Ministry of Local Government and Regional Development (2019), I argue that the political intentions to drive radical innovation in the public sector are not reflected in the measures proposed in the strategy from 2017 and the following action report in 2020.

Presenting the status of digitalization in schools today, the strategy reported that although the technology was present in schools, they still found great variations in the use of this technology (The Ministry of Education and Research, 2017). Discussing the cause for this variation in use of technology in education, the lacking competences on the pedagogical use of ICT amongst teachers is highlighted as one of the main barriers. Similar issues were identified in the empirical data, where both teachers, school leaders and school owners reported struggles related to moving past the technical functions of digital tools to develop

competences on the pedagogical use of them as well. Explaining their goal for enhancing digital competences in schools, the digital strategy for basic education seeks to ensure that ‘teachers and school leaders should have high professional digital competences and good opportunities for continuing education of pedagogical use of ICT’ (The Ministry of Education and Research, 2017, p. 22). Applying Genlott and colleagues’ (2019) definition of second order changes to the concept ‘pedagogical use of ICT’, the shift of focus from technical functions to pedagogical use does qualify for the sort of innovative redefinition of procedures that characterizes second order changes.

To reach their goal for increasing the pedagogical use of ICT in education, the strategy formulated two approaches to achieve this change of focus: the first approach was to increase municipalities autonomy to create local offers for competence building, the Learning Tracks is an example of such a local offer that focuses on second order changes. The second approach was executed on the policy-level and further specified in the strategy’s presented measures: they would work to strengthen the existing institutions that offer teacher education and create new university-level courses for continuing education on the pedagogical use of ICT. As this document was written at the beginning of the strategy in 2017, the qualities of teachers described earlier were goals set to be reached through the implementation of abovementioned measures. Looking at the empirical data, we find that teachers participating in the data collection happening mid-2021 and early 2022 did express an increase in competences on digital tools. However, the competences described would typically include ‘first-order changes’ where analogue practices had been performed digitally, and there were made few reports on the pedagogical use of them.

Reviewing the intentions for innovation formulated in policy documents, one document reports that ‘Innovation in the public sector is one of the governments’ main strategies for solving the challenges that our society will meet in the coming years’ (Ministry of Local Government and Regional Development, 2019). The same document from 2019 also stated that the government would work to contribute to more radical, innovative work. The following year, an action plan was released. This action plan would evaluate the progress around the strategy of 2017 and set new goals and measures for the years to come. The plan concluded that they are to carry on with the continuous strengthening of existing offers, referring to the measures taken as “...still highly relevant”, a paradoxical legitimacy to continue the measures due to their inefficiency in solving the problem the first time. Surely,

considerable changes as those required to create second order changes will need time before they lead to noticeable changes. However, the governments' conviction that doing more of the same will lead to new results can be problematic for this goal, and it surely doesn't match their innovative intentions. Looking into the measures presented in the digital strategy for basic education and continued in the action plan of 2020, the presence of innovative efforts is questionable, or at least of a considerable incremental nature.

6.2 Collaborative innovation in second order changes to digital learning

This section will analyze the two approaches in relation to co-creation, joint learning, metagovernance and balanced empowerment. Discussing how the universities' financing system favors completed degrees, the lack of flexibility in terms of co-creation in this approach leads to the argument that government should consider more radical solutions rather than relying on existing institutions. Explaining how radical innovations need to be initiated by central government, it's further argued that attempts on metagovernance and balanced empowerment are inhibited by the lack of political and managerial directionality.

Looking at the two approaches for enabling second order changes for digital literacy in schools through a collaborative perspective on service production, some clear opposites become apparent. The university-level courses on pedagogical use of ICT go over a longer period of time and has a predetermined curriculum that allows for less flexibility in terms of co-creation as the production of service is finished by the time it's delivered. The lack of flexibility in this approach may provide difficulties in keeping the service relevant, both in regard to the lack of joint learning and the high efforts required to make changes to the curriculum. The local initiatives to enhance digital literacy amongst teachers have the potential to be flexible in terms of the production of service, time and place of the training, and the contents of the curriculum.

Elaborating on the lack of flexibility in university courses, a report from the Technology council (2020) argues that since their financing system is based on completed degrees the universities are reluctant to develop flexible, shorter courses that doesn't lead to a degree. Thus, relying on an institution that specializes and profits on extensive degrees to create flexible, single courses resembles more a strategy of playing safe through incremental changes than a genuine effort to find best practice.

Public institutions have great potential to lead radical innovation processes (Fuglsang and Sørensen 2011, Rønning 2021). Studies on types of innovations in the Norwegian public sector show that radical innovations are more often found in central government than in non-central government processes, and the authors reflect on the implications on this potential non-central dependence on central government institutions (Bugge and Siddiq 2021). Based on these findings, if radical innovations are to occur in public innovation, the central government should either lead this work themselves or enable the non-central institutions to do so. The measures to strengthen existing offers for continuing education on digital competences hardly qualify as a radical innovation. Previous arguments made on courage and innovation state that leaders in public sector need to be courageous and risk failure if radical innovation should take place (Chapman 2002, Bason 2018, Brown and Osborne 2013, Torfing 2019). Elaborating on the four leadership roles' responsibilities in relation to driving radical, public innovation, Bason (2018) emphasize that politicians should create 'joint visions that demands innovative activity'. Reviewing the digitalization strategy from 2017 and following action report from 2020, there are no obvious demands for innovative action.

Reviewing two more responsibilities for politicians, 'investing in innovation capacity' and 'expecting administrators to be professional innovators' are tasks that have been executed through the strengthening of local initiatives (Bason, 2018, p. 300). Increasing the autonomy of municipalities could potentially lead to more radical innovations, which happened to be amongst the arguments for the restructuring of municipalities in 2017 (Ministry of Local Government and Regional Development, 2017). However, empirical findings show that this increase in autonomy came with an overwhelming amount of responsibility that ultimately complicated and constrained innovative work (Informant 5 and 6). One informant also reported a fear in relation to assessing whether new programs for education were safe, referring to a case from 2020 where a Norwegian municipality received a massive fine due to misjudgments of an educational system's compliance with privacy policy (Informant 6). Not only has the government refrained from leading radical innovation by setting an example through courageous leadership, the lack of monitoring around privacy policy paired with penalties when mistakes occur has led to a fear of failure in relation to innovation in municipalities, a state of mind that undermines the potential of radical innovations.

One of the tasks that took a lot of time away from driving innovative work for schools in the municipality was tasks related to privacy policy, with one informant stating: "We can spend

hours checking numbers to see if everything is done correctly; if the data processing is done in the right country, if things are exchanged and sold to third parties” (Informant 6). The matter of privacy policy was mentioned in the strategy from 2017, stating that they would implement measures for better handling of information security and privacy in basic education and contribute to increased efforts to develop standards for learning technologies. The action report from 2020 suggested more concrete measures, stating that they would publish templates and examples for completing these and create general guidance on what requirements should be set for suppliers regarding privacy and information security. These measures were meant to ease the pressure on the municipalities, but they didn’t imply any re-delegation of responsibility on privacy policy, which was suggested by Informant 5 based on the argument that national issues should be solved on a national level. Empirical findings from spring 2022 show that one of the most time-consuming tasks for people working with digitalization in Asker municipality still were ensuring that new programs for schools met the requirements for privacy policy.

The municipal merger and increased autonomy to municipalities can be interpreted as a metagovernance-approach, leaving the government with the task to govern self-governed organizations (Torfing, 2019). The governments’ willingness to delegate responsibility to municipalities can be a driving factor for local innovation, but public managers still need to function as conveners, facilitators, and catalysts to support the innovating organizations (Torfing, 2019). This approach requires a fine balance between hands-off and hands-on governing, whereas feedbacks retrieved from empirical data suggest that the workers from Asker municipality have found the governments processes around privacy policy too ‘hands-off’.

The strategy of strengthening existing offers could be effective to enhance the digital competences to the workers graduating now, and to the individuals that are granted a spot in the continuing education programs. Educating a few individuals may be sufficient if these people are met by a teacher-staff with a culture for development through knowledge-sharing and an administration that enables this by setting aside time and resources for this to take place when they return to their workplace. However, empirical findings show that this culture has yet to be achieved in schools, and administrators are still struggling to determine how much time is sufficient for this work and making sure that this time is spent efficiently. Comparing this challenge to examples from local initiatives, the Learning Tracks share a

similar approach to the university courses where certain individuals attend the training, and the projects' ability to reach the entire staff depend on this persons' efforts to disseminate the knowledge. Empirical findings from the service provider level show that workers from the municipal level arranging the Learning Tracks meetings expressed concerns on whether the knowledge was further communicated by the attending teacher to the remaining staff. As such, a possible constraining factor to both approaches is the possibility that they may end up only increasing individual competences rather than the collective development they hoped would take place through knowledge-sharing.

The empirical findings mention several causes for why a culture for knowledge sharing on the pedagogical use of ICT has yet to be achieved in schools. Reviewing the constraining factors mentioned, limited time and considerable variation in digital competences amongst the staff are mentioned. Another prominent constraining factor is the lack of management in the time that is set aside to work on this. The central role of management in innovative work has already been expressed in both literature (Strokosch and Osborne 2020 and Torfing 2019), empirical findings, and policy documents (Ministry of Local Government and Regional Development, 2019). The managements' decision to take a step back during development time to provide flexibility for the teachers in these processes can be considered an attempt at empowering their staff. However, as the definition of balanced empowerment presented in chapter two specifies, managements' efforts to enable innovation needs to happen through a *dual* approach of empowerment and structure (Bugge and Siddiq, 2021). Considering one informant's statement on the lack of pedagogical focus in development time: "If it is not controlled by the management, it rarely happens. Time is set aside for it, but we don't always manage to keep up, we may need it to be more controlled" (Informant 3), it's fair to assume that the initiatives from management has lacked some level of control and structure.

Another attempt to empower teachers was the processes around choosing teaching materials. Empirical findings show how Asker municipality encouraged teachers to try out different materials before the municipality decided on one. This did result in creativity and experimentation amongst the more digitally competent teachers. However, the less digitally competent teachers found the process of continuously learning new systems and set-ups demotivating and overwhelming. One informant working as an ICT-teacher at a school in Asker municipality reported that some teachers refrained from experimenting "in fear that

they (Asker municipality) might decide on a different one in August after they'd (teachers) spent all this time learning them" (Informant 2). Speculating on the degree of user-involvement in the final decision of what systems to go with, this would be a crucial factor to determine whether this can be considered a genuine attempt at empowerment. Still, a reoccurring theme seems to be lack of structure and control paired with empowerment, leading to good intentions from management causing confusion and demotivation amongst the employees.

The strategy for digitalization in basic education addressed the extended need for political directionality, supporting the local initiatives. The report mentions measures that will be taken to achieve this, including the support of school owners' work with planning and implementation. The report also expresses the need to develop more technical standards and following up on established standards, facilitating the transfer and reuse of information between systems and changes of services. Drawing on the empirical data from spring 2022 on privacy policy and choice of teaching materials it's clear that these goals are far from reached and are "...still highly relevant" as well.

6.3 Public governance regimes within the Norwegian School System

So how can the processes around second order changes for the school system be understood and conceptualized in relation to public governance regimes? In the following chapter I will apply theory from TB, NPM and NG to processes described in empirical findings within the Norwegian School System. The last section will present a figure illustrating the empirical findings integrated into the analytical framework as presented in figure 1.

6.3.1 Traditional Bureaucracy

The continuous reliance on universities for continuing education can resemble an element from traditional bureaucracy of bringing old understandings of problems and solutions into the present (Rønning, 2021). Assuming that this anchoring in the past will lead to success as it involves the strengthening of established well-functioning institutions may prove right if the universities manage to move away from their degree-oriented focus. However, this would require extensive changes to the institutions' core structures such as the financing system. It may also undermine the simultaneous efforts to solve problems with innovative solutions. Another element prevalent in the Norwegian school system that originates from traditional

bureaucracy is the slow, bureaucratic processes within the municipal level that's reported from several workers in Asker municipality. One informant reported that "Decision-making processes tend to take longer since it has to go through so many stages, so the time perspective is one thing, and of course the money... So, some complex processes take longer because you need people to understand how big and extensive it is and what resources are needed" (Informant 7, municipality). This statement also mentions another organizational barrier resembling the hierarchical nature of traditional bureaucracy, describing the struggle of getting decision-makers to acknowledge innovate efforts as crucial for their operation, and prioritize accordingly.

Another empirical finding reported from the user-level was the processes around picking new educational resources for the municipality. One ICT-teacher described how the digitally competent teachers appreciated the possibility to try out different resources during the testing phase, whereas the less competent teachers found this process demotivating. The reason for this demotivation was explained, saying that they did not know what resources the municipality would pick in the end. This statement describes a situation where users report that they may have little influence on decision-making processes done at the municipal level. Whether user involvement was present in the final decision, this would only extend to the inclusion of the most competent teachers that had the capacity to experiment with different resources, excluding the less competent teachers that didn't have the capacity to learn several new resources within this time frame. Ultimately, this possible attempt for collaborative efforts ends up resembling traditional bureaucracy processes where service users and providers share little interaction, due to the failure to include all users, or at least representatives from all users, in the decision-process.

6.3.2 New Public Management

A central constraining element in NPM is that the lack of synchronization between service production and policy making may constrain the political ability to learn from daily practices and adjust accordingly. The policy-papers describing the political intentions for second order digital literacy in schools continue to describe collaborative initiatives and measures. Empirical findings show that this is not what's going on in schools, due to several organizational and interorganizational barriers that need to be considered in policy strategies in order for the political measures to succeed.

In 2019 NIFU released their end-report from a study performed at several of the same schools from Asker municipality that participate in the Learning Tracks today. In their report, they emphasized that digitalization had come a long way in terms of first-order changes, but still had a way to go in terms of second-order changes (NIFU, 2019). This report was published three years ago, and since then, the Learning Tracks have been initiated to enable these second order changes required to ensure continuous development within schools. However, empirical findings from spring 2022 still report that the digitalization efforts within the schools are limited to first-order changes, and little development time is spent on covering the pedagogical use of ICT. Having already discussed several possible organization factors to the Learning Tracks' processes to explain why digitalization hasn't taken place yet, the policy-documents noticeably reports that the measures that have been taken will continue. This may be a result in poor synchronization between service production and policy making.

Another core concept in New Public Management is creating services *for* users, as opposed to *with* users which is a central concept in collaborative innovation (Strokosch and Osborne 2020). Due to the limited capacity of The Learning Tracks, the lack of adapted training has left them with a service that's produced with key individuals, typically the digitally competent one's that are selected ICT-teachers and thus sent out to attend the courses arranged by the Learning Tracks. However, for the remaining staff that don't attend the courses and feel that the training may be above or beneath their level of competence, the perception amongst these teachers may be that the service production happened for them, instead of with them.

The report from the Technology Council (2020) states that the current climate for continuing education share characteristics with a marketization approach. They further argue that the high number of suppliers and offers creates a big and confusing market to navigate in for employers. Opening the market for suppliers can be a good way to provide diverse offers for the users, however, as exemplified in the previous empirical findings on choosing educational resources, too many offers can also have a counterproductive effect. Leaving the task to navigate in these resources to the employers may result in a lot of time spill in finding the right fit that could've been spent on development work within the organization.

6.3.3 Networked Governance

Due to elements from both TB and NPM, the Norwegian school system doesn't resemble a fully horizontal network, but it has elements from this as well. Elements of NG are particularly prevalent in policy documents where aspects such as co-creation, joint learning and user value are reoccurring. The close interactions between service producers and users in the Learning Tracks' courses for ICT-teachers is an example of attempts to realize co-creation policies. The Learning Tracks' focus on creating professional communities for learning and the policies for enhancing pedagogical use of ICT are also examples on efforts to create continuous innovative efforts, a key concept in NG (Torfing, 2019).

As previously discussed, the increased autonomy of municipalities (as stated in the policy strategies accounted for) corresponds with elements of metagovernance, and the attempts of school- owner and leader levels to increase teachers' autonomy in development time and decision-making can translate into attempts of balanced empowerment. Engaging a research team to follow up and report on the progress of the Learning Track initiative can also be interpreted as the inclusion of various actors and may contribute to secure a closer connection between service production and policy making, depending on the policy-makers uptake and application of this knowledge.

6.3.4 Drivers and barriers within public governance regimes

In figure 3 below, the empirical findings are integrated into the analytical framework as presented in figure 1. Identified elements from TB, NPM and NG functioning as main drivers and barriers for second order digital literacy amongst teachers in the Norwegian School System are highlighted in the color red.

Starting from the top, I have found that the policies formulated to enhance digital literacy amongst teachers have demanded little innovation but formulated clear agendas and implemented strategies. This includes the updating of old solutions by strengthening existing offers and providing license to innovate for municipalities through the increased autonomy that followed the municipal merger. Standardized bureaucratic processes were mentioned as innovation constrainers by workers from the municipality, reporting on slow processes that had to go through various stages before execution.

The continuous reliance on existing institutions can be interpreted as the strengthening of formal structures, whereas initiatives such as the Learning Tracks answers to the creation of innovative spaces. Attempts to empower staff have been made but lacked a simultaneous hands-on leadership. The municipalities have been encouraged to experiment, but findings from processes around privacy policy report that this was hampered by the risk of failure due to lack of national, standardized practices. Finally, we found elements of co-production within the Learning Tracks initiative, but this was limited to the attending teachers, reports from the remaining staff expressed that the service had not been useful to them as it did not meet their level of competences.

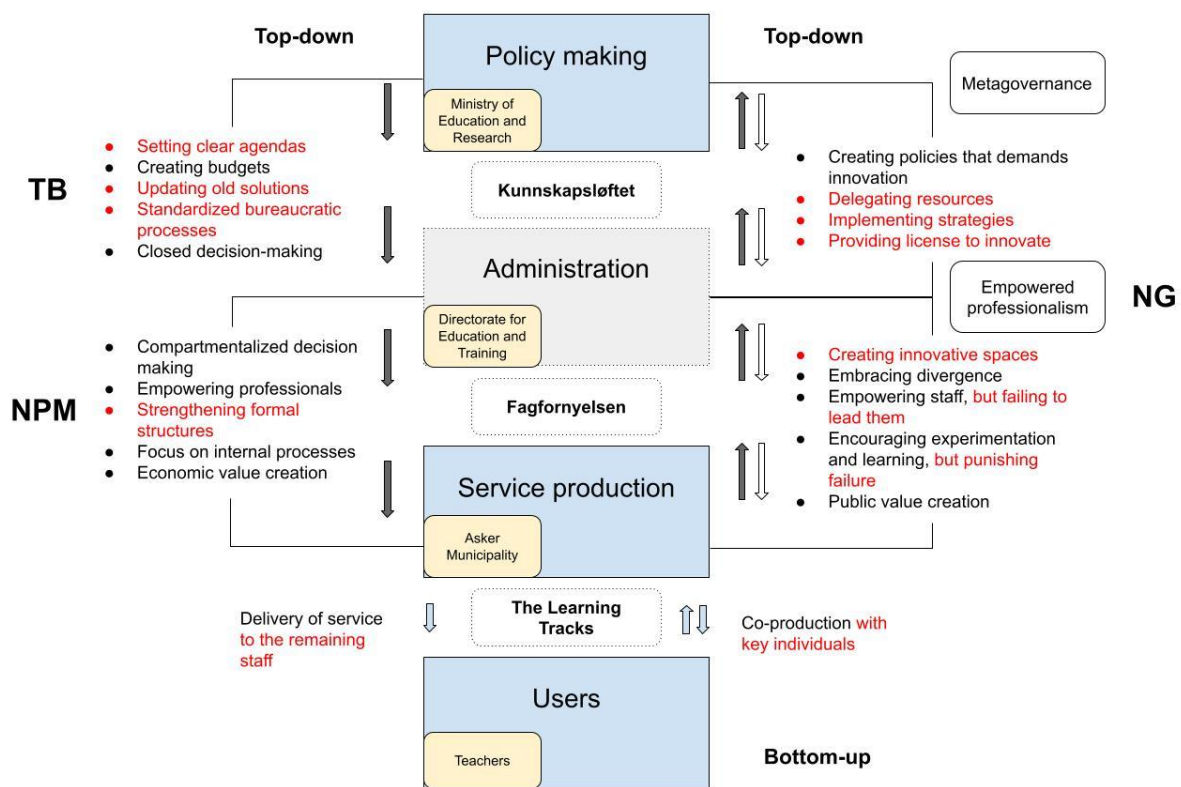


Figure 3. Visualization of elements from TB, NPM and NG functioning as main drivers and barriers for second order digital literacy amongst teachers in the Norwegian School System. Inspired and reproduced from Bugge and Skåholt (2013).

6.4 Moving towards initial policy intentions of digital literacy

This chapter will apply theory on collaborative innovation to discuss how elements from this approach can spur the innovative change required to enable second order digital literacy in

The Norwegian School System. By drawing on concrete examples from the empirical findings, elements from metagovernance and empowered professionalism will be proposed to help the Norwegian School System move towards the system described in policy documents.

Until now we have identified some gaps between the policy documents and current situation in the school sector. The elements causing this gap are described in the empirical findings as organizational, interorganizational and institutional barriers, and are part of what constrains second order digital literacy in the Norwegian school system. We have also identified some elements that enable second order digital literacy in the Norwegian school system. However, we find that these initiatives are hampered by the organizational barriers, inhibiting these measures from reaching their potential as enablers. The previous sections have shown how elements from both TB, NPM and NG occur within the Norwegian school system. An examination of innovative intentions in various policy documents speaks of a political intention to solve the challenges related to second-order barriers through collaborative efforts. Therefore, this section will discuss how the current system can move towards the system described in policy-papers by replacing elements from TB and NPM with NG approaches.

A reoccurring theme in the empirical findings is that attempts to enhance collaborative, public innovation has been approached by increasing the autonomy of actors in all levels of the system. The government arranged the municipal merger in hopes that this would provide the required autonomy for municipalities to drive innovation. The municipality included users in the decision-processes around new educational resources, and the school leaders arranged for employee-driven development time by taking a step back.

This is a good first step to create a horizontal network structure where actors within the system are equally included throughout the innovation processes. However, core concepts from theories such as metagovernance and balanced empowerment emphasize the importance of finding the right balance between hands-off and hands-on. Referring to previous mentioned informant perspectives, informants from both service user and service producer level report that the management has been too hands-off. Strong management is typically associated with a hierarchical rule, but findings from this study indicate that by introducing more elements from metagovernance and balanced empowerment, the Norwegian school system can move away from the hierarchical structures that characterize the system today.

Apart from management, another gap between policy intentions and the current situation is the emphasis on radical innovations. Empirical findings report that efforts to enable second order changes have been of incremental nature, regardless of the radical intentions formulated in the policy documents. Two proposals for enhancing more radical innovation could be: a reduction of responsibility related to privacy policy for the municipalities. This could possibly allow them to spend time previously set aside for this on innovative work instead. By moving some of this responsibility to national level, the fear of error in relation to evaluating new education systems may be reduced, and a risk-taking mindset may be re-introduced on the municipal level. This increase in capacity for the workers within municipalities could also possibly lead to the production of more personalized and comprehensive services. The other approach requires that the government dares to be bold and lead radical innovation processes. An example of this could be re-evaluating the focus on strengthening existing offers to consider entirely new solutions. The Technology Council proposed the creation of a national platform for continuing education in 2020 (Technology Council, 2020). By using technology such as algorithms to provide personalized training for everyone, this platform would be able to provide courses that resonate with each individuals' competence. It would free up time for employers who are currently navigating in endless resources, and it resonates with the intentions to provide radical, innovative solutions. The availability and low threshold of such a service would enable continuous development for individuals, and based on the elaborate choice of resources, the employer would get a staff with more diverse competences. This report shows that the government have received proposals for more radical approaches to the challenges related to continuing education. Now it's time for them to embrace the inclusion of various actors by implementing these ideas not just in their strategies and intentions, but into actual regulation and policy measures.

7. Conclusion

This thesis has focused on current offers for enhancing second order digital literacy amongst teachers. To answer the research question 'What enables and constrains second order digital literacy in the Norwegian school system?' I have retrieved empirical data from the three levels: service users, service producers and policy makers. By using thematic analysis to identify patterns and themes in my data material, I've identified some reoccurring drivers and barriers within this system. By applying theory from Torfing (2019) on four contexts barriers and drivers in collaborative innovation typically occur in, this thesis contributes to identify

what drivers and barriers that are present within this system, and what contexts they occur in. Applying theory on public governance paradigms to my empirical findings, I found that intentions formulated in policy documents typically consists of elements from NG, whereas recent empirical data retrieved from the service- user and producer level report of processes and procedures typically associated with TB and NPM (Hartley 2005, Bugge and Skåholt 2013). Thus, this thesis has contributed with empirical insights to the incoherence between political intentions and current capabilities within the Norwegian School System.

By comparing empirical findings with policy documents, I wanted to examine the coherence between the political intentions and the system's capacity to innovate. I found that several of the barriers could be interpreted as well-intended attempts on elements from metagovernance, balanced empowerment, and strengthening local authorities. The reason why these attempts ended up being perceived as barriers to service- users and producers could be due to an incoherence with policy-formulations and the system's capacity. Implementing policies intended for the NG paradigm described in policy papers may result in failure when the current system is characterized by elements from both TB and NPM.

Two central barriers stood out as important constraining factors on all three levels. The first constraining factor was the lack of hands-on management in innovative processes on policy- and school-leader level, exemplified through the municipal merger where tasks were delegated to municipalities without sufficient support from national hold, and school management's decision to let teachers lead their own development time. The second constraining factor identified were policy-makers reluctance to drive radical innovation, exemplified by their choice of meeting the growing problem of an outdated workforce with measures to strengthen existing offers for continuing education rather than opting for new approaches, any innovative approaches to this matter was delegated out to the municipalities. These attempts lacked some crucial factors to their approaches; managements role as conveners, facilitators, and catalysts to support the innovation processes, and leading by example.

Several enabling factors were also identified such as the consistent willingness to innovate throughout the system, a factor that was specifically prevalent in the positive attitudes amongst the informants and policy-documents stating intentions for considerable innovative activities. Another enabling factor was the increased interorganizational collaboration as a result of the municipal merger. However, I found that these drivers were unable to reach their

potential due to the managerial barriers previously mentioned. Thereby I conclude that by introducing more elements from hands-on management styles from theory on metagovernance and balanced empowerment, The Norwegian School System may enable several new and underlying drivers that are present in the system today to reach their full potential. This would provide the system with the collaborative qualities described in policy documents, which could ultimately enable it to drive second order changes for digital literacy.

This thesis was motivated by an identified gap within the literature on the education sector that lacked a holistic, systemic approach to examine teachers' pedagogical competences on ICT. My study responded to this call by applying theories on the governing and management of public sector processes within the three paradigms TB, NPM and NG, and retrieving data from both service- production and user level, as well as policy-level. The strengths of this thesis include the thorough research on the selected case providing valuable insights into key informants' perceptions, and the use of multiple methods for data collection providing a varied and complex understanding of the matter. Some weaknesses to my study were its limitation to only include three levels within this system: policy making, service producer and service user, as well as the short period of time. A suggestion for further research on the topic would be more extensive research on all levels within the system over a longer period of time.

References

- Agéllii Genlott, A., Grönlund, Å., and Viberg, O. (2019). Disseminating digital innovation in school – leading second-order educational change. *Education and Information Technologies*, 24(5), 3021–3039. <https://doi.org/10.1007/s10639-019-09908-0>
- Asker Municipality. (2022). Digital skoleutvikling i Asker. www.asker.kommune.no. Retrieved April 30, 2022, from <https://www.asker.kommune.no/om-asker-kommune/innovasjon-og-digitalisering/aktuelt-om-innovasjon/digital-skoleutvikling-i-asker/>
- Bason, C. (2018). Leading public sector innovation (second edition): Co-creating for a better society. *Bristol University Press*. <https://doi.org/10.2307/j.ctv1fxh1w.20>
- Brown, L., Osborne, S, P. (2013). Risk and Innovation. *Public Management Review*, 15:2, 186-208. DOI: [10.1080/14719037.2012.707681](https://doi.org/10.1080/14719037.2012.707681)
- Bugge, M. M., & Siddiq, F. (2021). Empowering professionalism in mission-oriented innovation. *Science and Public Policy*, 48(3), 423–437. <https://doi.org/10.1093/scipol/scab020>
- Bugge, M., Skålholt, A. (2013). Smart velferd: Styringsparadigmer for innovasjon i kommunene. In: Innovative kommuner (pp.53-70). *Cappelen Damm Akademisk*.
- Chapman, J. (2002). System Failure. Why governments must learn to think differently. London: *DEMOS*
- Fuglsang, L., & Sundbo, J. (2016). Innovation in public service systems. In Service Innovation: Novel Ways of Creating Value in Actor Systems. *Springer*. https://doi.org/10.1007/978-4-431-54922-2_10

- Fuglsang, L., Sørensen, F. (2011). The balance between bricolage and innovation: management dilemmas in sustainable public innovation. *The Service Industries Journal*, 31:4, 581-595. <https://doi.org/10.1080/02642069.2010.504302>
- Gioia, D., Corley, K., & Hamilton, A. (2013). Seeking Qualitative Rigor in Inductive Research. *Organizational Research Methods*, 16, 15–31. <https://doi.org/10.1177/1094428112452151>
- Hartley, J. (2005). Innovation in Governance and Public Services: Past and Present. *Public Money and Management* 25:27–34.
- Hay, I. (2016). *Qualitative research methods in human geography* (Fourth edition.). Oxford University Press.
- IEA. (2021). ICILS Teacher Panel reports on changes in digital learning during COVID-19. www.iea.nl. Retrieved April 30, 2022, from <https://www.iea.nl/news-events/news/icils-teacher-panel-2020-what-has-changed-education-during-covid-19-and-how-can>
- Kapucu, N., & Hu, Q. (2020). *Network Governance: Concepts, Theories, and Applications* (1st ed.). *Routledge*. <https://doi-org.ezproxy.uio.no/10.4324/9781351056540>
- KSU., The Research Council. (2021). Kartlegger forskning med levende kart: Universitetet i Stavanger. www.uis.no. Retrieved April 22, 2022, from <https://www.uis.no/nb/KSU-kartlegger-forskning-med-levende-kart>
- Mergel, I., Kattel, R., Lember, V., & McBride, K. (2018). Citizen-oriented digital transformation in the public sector. *Proceedings of the 19th Annual International Conference on Digital Government Research: Governance in the Data Age*. <https://doi.org/10.1145/3209281.3209294>
- Miles, M. B., Huberman, M. A., & Saldaña, J. (2019). *Qualitative data analysis: a methods sourcebook* (Fourth edition. ed.). Los Angeles: *SAGE*

- Ministry of Education and Research (2017). Framtid, fornyelse og digitalisering. regjeringen.no. <https://www.regjeringen.no/no/dokumenter/framtid-fornyelse-og-digitalisering/id2568347/>
- Ministry of Education and Research (2020). Handlingsplan for digitalisering i grunnsopplæringen. *regjeringen.no*.
<https://www.regjeringen.no/contentassets/44b8b3234a124bb28f0a5a22e2ac197a/handlingsplan-for-digitalisering-i-grunnsopplaringen-2020-2021.pdf>
- Ministry of Education and Research. (2015). Kompetanse for kvalitet: Strategi for videreutdanning for lærere og skoleledere frem mot 2025. *regjeringen.no*.
<https://www.regjeringen.no/no/dokumenter/kompetanse-for-kvalitet/id2439181/>
- Ministry of Education and Research. (2017). NOU 2019: 23: Ny opplæringslov.
<https://www.regjeringen.no/no/dokumenter/nou-2019-23/id2682434/>
- Ministry of Local Government and Regional Development. (2017). Nullpunktsmåling - Rapport om kommunesektoren i dag. Kommunal- og moderniseringsdepartementet.
<https://www.regjeringen.no/no/tema/kommuner-og-regioner/kommunedata/nullpunktsmaling/id2540086/>
- Ministry of Local Government and Regional Development. (2019). En innovativ offentlig sektor. Kultur, ledelse og kompetanse (2019-2020). Kommunal- og moderniseringsdepartementet. <https://www.regjeringen.no/en/dokumenter/meld.-st.-30-20192020/id2715113/>
- Mu, R., Wang, H. (2022). A systematic literature review of open innovation in the public sector: comparing barriers and governance strategies of digital and non-digital open innovation. *Public Management Review*, 24:4, 489-511.
<https://doi.org/10.1080/14719037.2020.1838787>

- Mulgan, G., & Albury, D. (2003). *Innovation in the Public Sector*. London: *Cabinet Office Strategy Unit*.
- OECD. (2018). *OECD Employment Outlook 2018*. *OECD Publishing*.
https://doi.org/10.1787/empl_outlook-2018-en
- Osborne, S. P., Cucciniello, M., Nasi, G., Strokosch, K. (2021). New development: Strategic user orientation in public services delivery—the missing link in the strategic trinity? *Public Money & Management*, 41:2, 172-175.
<https://doi.org/10.1080/09540962.2020.1758401>
- Osborne, S.P. (2020). *Public Service Logic: Creating Value for Public Service Users, Citizens, and Society Through Public Service Delivery* (1st ed.). *Routledge*. <https://doi-org.ezproxy.uio.no/10.4324/9781003009153>
- Rønning, R. (2021). *Innovasjon i offentlig sektor. Innover eller bli innover*. *Universitetsforlaget*. DOI: 10.18261/9788215046235-2021
- Steiner-Khamsi, G., Karseth, B., Baek, C. (2020). From science to politics: commissioned reports and their political translation into White Papers. *Journal of education policy*.
<https://doi.org/10.1080/02680939.2019.1656289>
- Strokosch, K., & Osborne, S. P. (2020). Co-experience, co-production and co-governance: an ecosystem approach to the analysis of value creation. *Policy & Politics*.
<https://doi.org/10.1332/030557320x15857337955214>
- Sundbo, J. (1996). The balancing of empowerment: A strategic resource based model of organizing innovation activities in service and low-tech firms. *Technovation Vol. 16 No. 8*.
DOI: 0166-4972(96)00029-6
- The Norwegian Government (2020). *Kunnskapsløftet – reformen i grunnskole og videregående opplæring*. *regjeringen.no*

https://www.regjeringen.no/globalassets/upload/kilde/ufd/prm/2005/0081/ddd/pdfv/256458-kunnskap_bokmaal_low.pdf

The Technology Council. (2020). En strømmetjeneste for læring: Et nytt målbilde for livslang læring i Norge. *Teknologirådet.no*. <https://teknologiradet.no/publication/en-strommetjeneste-for-laering-et-nytt-malbilde-for-livslang-laering-i-norge/>

Tømte, C, E., Wollscheid, S., Bugge, M., Vennerød-Diesen, F. (2019). Digital læring i askerskolen: Sluttrapport fra følgeforskning. *NIFU*.

Torring, J. (2016). Collaborative Innovation in the Public Sector. *Georgetown University Press*. <http://www.jstor.org/stable/j.ctt1h64pfm>

Yin, R. K. (2018). Case study research and applications: Design and methods (6. utgave.). SAGE.

Appendix A

Interview guide, translated from Norwegian to English.

INTERVIEW GUIDE

Service user level

How was your experience with the Learning Tracks?

Have you had any meetings initiated by management focusing on the pedagogical use of ICT?

- Are pedagogical approaches to ICT discussed alongside the technical functions of them?

Did you learn something new in these meetings?

Is there any knowledge-sharing between colleagues?

- How does this occur?

Has management taken any measures to develop a culture for knowledge-sharing around pedagogical use of ICT?

Is there any collaboration with teachers from other schools?

Do you think there's been set aside sufficient time for development work?

Service producer level

Workers from Asker municipality

Could you give an overview of daily tasks and who you collaborate with on an ordinary working day?

Have you noticed any changes in procedures as a result from the municipal merger?

Is there any intermunicipal collaboration?

- Who initiates this collaboration?

What processes inhibit and promote innovative work in your organization?

How's your municipality's capacity to innovate?

Do you feel like that you're able to influence decisions on changes to your organization?

Workers from SEIL

What is the purpose of the Learning Tracks?

What is the innovation in this project?

Who initiated the project?

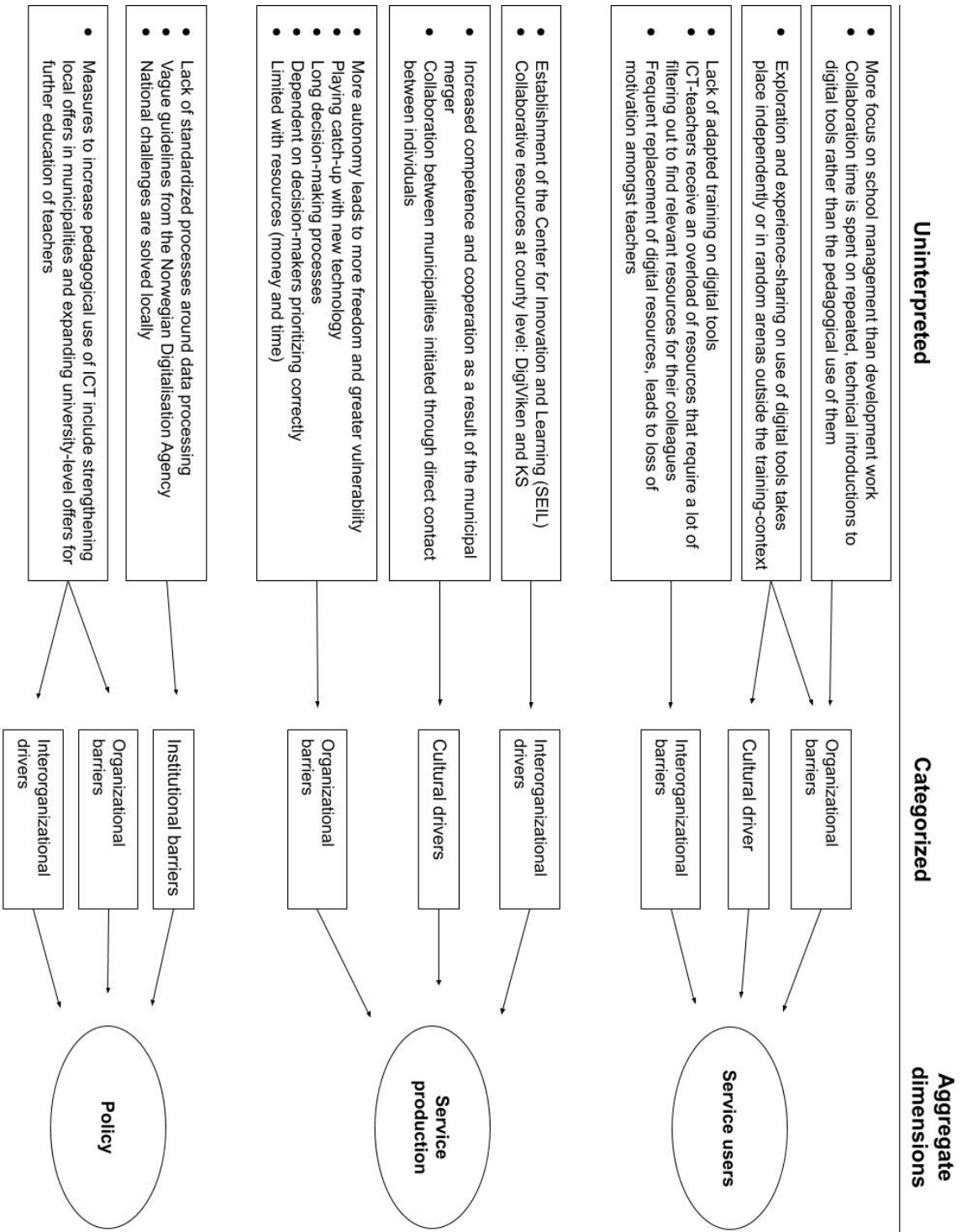
Can you walk me through the processes around the production of these courses?

How's the distribution of responsibilities between school owners and school leaders on this project?

What inhibits and promotes the distribution of these courses?

Appendix B

Data structure model, inspired and reproduced from Gioia et al., (2013).



Appendix C

Analytical framework model, inspired and reproduced from Bugge and Skåholt (2013).

