# Making Sense of Discursive Formations and Program Shifts in Large-Scale Digital Infrastructures

Egil Øvrelid
*University of Oslo*, egilov@ifi.uio.no

Bendik Bygstad
*University of Oslo*, bendikby@ifi.uio.no

Ole Hanseth
*University of Oslo*, oleha@ifi.uio.no

# Making Sense of Discursive Formations and Program Shifts in Large-Scale Digital Infrastructures

**Egil Øvrelid,[1] Bendik Bygstad,[2] Ole Hanseth[3]**

[1]Department of Informatics, University of Oslo, Norway, egilov@ifi.uio.no
[2]Department of Informatics, University of Oslo, Norway, bendikby@ifi.uio.no
[3]Department of Informatics, University of Oslo, Norway, oleha@ifi.uio.no

## Abstract

The current literature on discourse theory in IS offers powerful lenses for describing and explaining how organizations manage their encounters with new digital technologies. These contributions have mostly conveyed an actor-centric view of discourse as dominated by communication. Less attention has been paid to the systemic role of discourse, the understanding of program shifts, and the emergence of new programs in large-scale digital infrastructures. To investigate this issue, we ask: How does discourse influence the emergence of new programs in large-scale digital infrastructures? And how can policymakers and managers make sense of the public and professional discourse around large e-health infrastructures? Our in-depth case study investigated 18 years of the development of a regional e-health infrastructure in Norway. Drawing on Foucault (2002), we identified three important program shifts, each reflecting the interaction between digitalization trends promoted through macrodiscourses, and infrastructure conditions through microdiscourses. We found that program shifts happen when macro- and microdiscourses converge, leading to the emergence of discursive formations. We identified three processes through which this happens: connection, matching, and merging. In describing our second contribution, we discuss how policymakers and managers can use this framework to make sensible decisions.

**Keywords:** Discursive Formations, Discourse Convergence, Large-Scale Digital Infrastructures, E-Health Programs

## 1 Introduction

The French philosopher Michel Foucault's work is a milestone in research on discourse, particularly his book *Archaeology of Knowledge* (Foucault, 2002). Foucault defines discourse as a way of representing professional knowledge and analyzes discourse as a practice. In contrast to other contributions, he sees discourse as distinctly material in effect; it produces "practices that systematically form the objects of which they speak" (Foucault, 2002, p. 54). Importantly, discourse sometimes converges into discursive formations, i.e., a group of discourses that integrate different stakeholders' perspectives and align discourses and material issues in creating coalitions.

Discourse is a prominent topic in IS research; in particular, discourse is an important concept for describing, explaining, and understanding how organizations manage their encounter with new digital technologies (Barrett et al., 2013; Galliers, 2020;

Pollock & Williams, 2010; Sauer & Willcocks, 2007; Swanson & Ramiller, 1997; Wynn et al., 2003). While these contributions deal with discourse as power, discourse as consensus, and discourse as strategy, they do not build on Foucault's deeper understanding, and their contributions are limited by a strong focus on actors. In contrast, Foucault's systemic approach facilitates more holistic interpretations with stronger explanatory powers. In this article, we seek to explore this space in the context of shifts in large digital infrastructures; the focal object is not communication but a sociotechnical network, with technology serving as a key component. This context is important because it allows us to investigate the role of discourse—not in particular decision choices—but in substantial and strategic changes of large digital assemblages, such as financial systems and e-health infrastructures. These shifts require powerful discursive formations, and this article seeks to investigate how they emerge. In other words, we seek to understand why many discourses fade away before any consensus is reached, while a few trigger large-scale digital initiatives. Thus, our first research question is:

**RQ:** How does discourse influence the emergence of new programs in large-scale digital infrastructures?

Our empirical approach was a longitudinal 18-year case study of one region's participation in a national e-health infrastructure program in Norway, which underwent three such shifts. The background of our study is the e-health industry, which for 30 years has served as a context for large initiatives, with associated public and professional discourse. Many countries have initiated ambitious large-scale e-health programs aiming to provide better healthcare services, deliver existing healthcare services at lower per-patient costs, and serve more patients (OECD, 2018). Such e-health initiatives are expensive and often heavily politicized, due to leaders both overpromising dramatic social impacts and underestimating the rapid pace of change in technology standards and tools. While the public focus has often been on grand failures (Greenhalgh et al., 2010), the overall trend has been the slow growth of large interconnected solutions (Aanestad et al., 2017). However, this growth has not been consistent but rather characterized by dramatic shifts. Research has shown that the role of discourse in these shifts is important but policymakers and top managers struggle to make sense of it. Public discourse tends to set overly high expectations that are difficult to connect with professional discourse regarding digital infrastructure (Aanestad et al., 2017; Sauer & Willcocks, 2007). Thus, our second research question is:

**RQ:** how can policymakers and managers make sense of the public and professional discourse around large e-health infrastructures?

The paper is organized as follows. In Section 2, we review Foucault's discourse theory and our key concept of discursive formations. In Section 3, we discuss discourse studies in IS research. In Sections 4 and 5, we describe our research method, followed by a presentation of key findings from our 18-year longitudinal case study (2001-2019). In Section 6, we analyze and interpret the study findings in light of discourse theory.

In developing our contributions, we focus on how discourses converge into discursive formations (Foucault, 2002) by systematically examining both macro- and microlevel discourses. Our data analysis reveals a process based on three steps of convergence; connecting, matching, and merging. We explain program shifts not as actor driven but as system oriented. That is, we demonstrate how and why macro- and microdiscourses converge in a dynamic space of opportunities. In elaborating our second contribution, we discuss how managers can use this framework to make sensible decisions.

## 2 Foucault and Discourse Theory

### 2.1 Discourse and Knowledge

Philosopher and historian Michel Foucault considered epistemes that emerged in the early modern age as powerful formative epistemological *unities* that describe societal development and explain the emergence of professional disciplines. According to this view, the professional disciplines developed validity and perceived objectivity because they associated important discourses with societal development (Foucault, 2002).

Foucault's discourse theory denotes a historically contingent system that produces professional knowledge and meaning. It is distinctly material in effect and produces "practices that systematically form the objects of which they speak" (Foucault, 2002, p. 54). To see *discourse as practice* implies examining the social and collective use of discourse concerning knowledge production and the rules that govern how knowledge becomes socially accepted. Building on this, discursive practices refer to practices of discourses, meaning knowledge formations, not (primarily) linguistic practices or language use (Bacchi & Bonham, 2014). The focus is discursive practices of professional knowledge production in specific expert domains.

Foucault's archaeological method has three levels of discourse: statements, discourse, and discursive formations. *Statements* are the individual elements of discourse, words, signs, or numbers that do not necessarily make sense in and of themselves. Rather, they make sense only within a specific field of knowledge where they are expressed as part of a more comprehensive knowledge discourse. Statements are

thus both a function that reveals concrete and material aspects of knowledge in time and space but also an indication that larger structures and constellations exist (Foucault, 2002). *Discourse* is "constituted by a group of … statements … assigned to particular modalities of existence" (Foucault, 2002, p. 121). Discourse can thus be defined as "a group of statements which provide a language for talking about—i.e., representing—a particular kind of knowledge about a topic" (Dreyfus & Rabinow, 1983; Hall & Gieben, 1992, p. 291).

### 2.1.1 Macro- and Microdiscourses and Discourse Convergence

We aim to study professional discourses that strive to identify possible solutions to extensive problems in large-scale digital infrastructures collectively through discursive practices (Øvrelid & Bygstad, 2019). To structure our analysis, we distinguish between *macrodiscourses and microdiscourses*. The distinction is inherited from Canguilhem (Foucault, 2002) and is important for understanding that events may operate on different levels (Foucault, 2002).

In our framing, *macrodiscourses* refer to national overall managerial principles and perspectives that seek to change the entire system portfolio as a whole. Macrodiscourses take place via international and national media, industry conferences, and consulting reports (Sauer & Willcocks, 2007). *Microdiscourses* occur inside the boundaries of an organization or a program and tend to draw on the prior experiences and outcomes of ongoing programs that influence participants' outlooks or careers (Greenhalgh et al., 2012). While discourses at the macrolevel can address new strategic concepts or technologies, discourses on the microlevel are related to modules, systems, and data gained from work on the installed base (Aanestad et al., 2017). The macrolevel establishes high-level goals while the microlevel addresses basic necessities and the practicality of achieving local instances of macrogoals. In that sense, macrodiscourses are abstractions while microdiscourses describe concrete material outcomes at the local level. We see both macro- and microdiscourses as discursive practices that communicate and disperse expert knowledge (Foucault, 2002; Hall & Gieben, 1992).

Thus far, we know little about whether, when, and how these two levels of discourse interact and/or converge into a discursive formation that transforms strategic thinking and ultimately shifts the trajectory of a major program or trend. For instance, Foucault has been criticized for being more concerned with the content of a discursive formation than the contextual implications of its emergence (Elder-Vass, 2011; Rabinow, 1984). We refer to discourse convergence as the process by which macro- and microdiscourses come together through the sharing of language, concepts, and practices (Marshall, 2023).

## 2.2 Discourse Convergence and Discursive Formations

*Discourse convergence* occurs when macro- and microdiscourses are integrated and form coalitions (Marshall, 2023). Such coalitions have regularities; they emerge and persist because the participants have a common perception of reality (Foucault, 2002). In "The Birth of the Clinic" (Foucault, 1989), Foucault demonstrates that scientific disciplines such as medicine become more precise when the discourse is connected to something material. When the body is opened up, the medical gaze changes from a practice dominated by "the old myths of nervous pathology" and "a language of fantasy" (Foucault, 1989) to a practice dominated by a visible description and precise documentation (Foucault, 1989). Discourse convergence, thus, presupposes integration between agency and structure/materiality (Deetz, 1998; Elder-Vass, 2011; Radford, 2003).

However, it is less clear what it takes for discourse convergence to occur. We refer to coalitions that emerge through discourse convergence as discursive formations. Based on this insight, we define discursive formations as *a group of professional discourses that integrate different stakeholders' perspectives and align discourses and material issues in creating coalitions.*

A discursive formation is identified by analyzing four separate but interrelated elements within a discursive formation: *object, spokesperson, concepts, and strategy* (Foucault, 2002).

First, the object arises and is defined in a discursive field. Usually, the objects are linked directly to concrete scientific disciplines: e.g., doctors are concerned with biology, and scientists are concerned with mathematics. In his historical analysis, Foucault builds on this perspective but finds that concepts such as madness are discovered and constituted by several scientific practices surrounding the problem area (Schaanning, 2000). For example, mental illness and the management of people with severe mental illness relate to both medicine and the law. Furthermore, according to Foucault, the concept of madness changes in different historical eras. To understand the formation of the object, it is also important to illuminate how the object behaves in different historical periods (Arribas-Ayllon & Walkerdine, 2017). Modern psychiatry, law, and biology have a completely different relationship to mental illness than the relevant scientific disciplines had to "madness" in the 17th century.

Similarly, digital innovation (Nambisan et al., 2020) occurs when various discursive practices use digital technology to establish new strategies, new product and process innovations, and new forms of interaction both internally in an organization and externally towards the customer segment. Digital innovation is also an important object for scientific research. Digital

innovation can thus be seen as an object that unites different practical disciplines within the field of technology and contributes to establishing a discursive formation.

Professional discourses increase in strength when various experts interact in discursive practices. This makes the roles of *spokespersons* particularly relevant. Who is speaking and by what right and source of authority? From what institutional site and concerning which networks? In Foucault's work, these spokespersons may be doctors, judges, or other experts. In the field of e-health, professions include clinicians, politicians, IT architects, consultants, the media, and other experts (Sauer & Willcocks, 2007).

Further, professional knowledge often emerges through concept development or reuse and modification of existing concepts from other fields of knowledge. Consequently, the third way of identifying discursive formations is to inspect how *concepts* are developed and gain power through dispersion. Identifying the compilation of concepts within disciplines enables the identification of professional networks. The notion of platform ecosystems is an example of a term used in IS that derives metaphorically from other fields and is reused to strengthen the discourse and provide creative organizing visions (de Reuver et al., 2018). These metaphors have great rhetorical force because they imply a constellation of properties and relationships that do not have to be named to be grasped. They travel with the term.

The fourth element of discursive formation is the formation of *strategies*. A strategy is characterized by its ability to unify the object, the spokesperson's position, and concepts into a common system of formation. In Foucault's work, madness becomes a modern, institutionalized phenomenon observable by different methods and from different experts. Examples from information systems include macrodiscourses, like "business disruption" (the role of IT in advancing new business models) and "digital transformation" (the role of IT in creating a new organizational identity—Wessel et al., 2021). This requires a more coherent, unified, and managed strategy to prevail. We aim to use the insight from Foucault to identify the central processes needed for discourses to converge, and for a discursive formation to emerge. Table 1 defines the core concepts used in Section 2.

## 3  Prior Relevant IS Research

### 3.1  Challenges Associated with Large-Scale E-Health Infrastructures

A large-scale digital infrastructure is a sociotechnical interconnected network consisting of systems, actors, processes, and procedures (Hanseth & Lyytinen, 2010). Large-scale infrastructures in healthcare have emerged in recent years (Aanestad et al., 2017). A healthcare organization is itself a complex and conflict-ridden sociotechnical system of systems, burdened with complex disease trajectories, increasingly demanding patients, and rapidly emerging technological innovations. Some of these may have a disruptive impact on installed IT-enabled systems (Greenhalgh et al., 2010). Healthcare organizations are constantly confronting public pressure to control costs, combined with public pressure to adapt continually to emerging requirements. In this context, it is a challenge for leaders to ensure that the healthcare infrastructure continues to evolve in helpful ways (Bygstad & Hanseth, 2016). Prior studies have demonstrated that digital transformation projects encounter numerous challenges (Aanestad et al., 2017; Greenhalgh et al., 2010). Yet many tech vendors and many public authorities tout very ambitious e-health strategies, based on idealistic visions. For example, the World Health Organization (WHO, 2019) seeks to fight global poverty by improving lifecycle governance, registration, intervention, and follow-up services. The Organization for Economic and Community Development (OECD, 2018) sees digital transformation as a means for healthcare to deliver new treatment methods to better-informed patients via a digitally trained healthcare workforce supported by improved utilization of big data and better ways to harvest useful data and intelligent governance. This vision of a transformation strategy has, in turn, informed the e-health strategies of several countries, including Norway (Norwegian Ministry of Health, 2018).

Meanwhile, many prior studies have revealed a huge gap between the daunting challenges in creating and sustaining healthcare infrastructures and the visionary discourses that inform strategic action. In healthcare, large-scale digital infrastructures tend to be heterogeneous in terms of the multiplicity of tools, applications, and standards they support, as well as the multiple stakeholders, who introduce tension and complexity. In response to these pressures, some infrastructures may drift in unpredictable ways from the organizers' initial vision (Ciborra et al., 2000). Some drift is to be expected, in that, any large sociotechnical program must deal with emerging technologies, standards, and sociopolitical challenges. Thus, an infrastructure that is well-configured to align with the particular challenges at one point in time will inevitably need to change over time as the contexts of use governance and acceptance change. Sometimes a promising new technology (or cluster of technologies) causes an old program to be replaced by a new program. We refer to this change as a "program shift." A program shift might be experienced as traumatic by many participants or may barely be noticed. Sometimes there is an easy transition between two programs, and other times new technologies necessitate adjustments to organizations' and care teams' ways of operating.

**Table 1. Definitions of Foucauldian Concepts**

| Concept | Description |
|---|---|
| Statement | The individual elements of discourse; words, signs, or numbers that (only) make sense in a professional setting. |
| Discourse | A collection of discursive practices that represent professional or public knowledge about a topic |
| Discursive practice | Practices of maintaining and diffusing professional expert discourses |
| Macrodiscourses | Large-scale discourses (often strategic) conducted in international and national media, research, sector conferences, and consultant reports (Sauer & Willcocks, 2007) |
| Microdiscourses | Small-scale discourses that (often) remain inside the boundaries of health organizations and programs and tend to be based on experiences and outcomes of ongoing programs (Greenhalgh et al., 2012) |
| Discourse convergence | Integration between micro- and macrodiscourses (Marshall, 2023) |
| Discursive formations | A group of professional discourses that integrate different stakeholders' perspectives and align discourses and material issues in creating coalitions (Deetz, 1998; Elder-Vass, 2011) |

**Table 2. Three Research Streams on Discourse**

| Theory | Discourse as power | Discourse as consensus | Discourse as strategy |
|---|---|---|---|
| Key idea | Disciplinarian | Participation | Strategic change |
| Role of discourse | To promote a focal actor that imposes a dominant view and the reactions to this view within organizations | To demonstrate the necessity of multiple inclusion in the debate. This occurs through public workshops and hearings, debates in the media, and participatory design projects | Certain strategic goals are conceptualized and communicated to ensure focus on strategic requirements. |
| Focal point | Communication | Communication | Communication |
| Key papers | Swanson, 2002; Doolin, 2002 | Sauer & Willcocks, 2007; Swanson & Ramiller, 1997 | Barret et al., 2013; Bernardi et al., 2017 |

Program shifts can be inspected from multiple perspectives, such as strategic (Henfridsson & Bygstad, 2013), IT architecture (Bygstad & Øvrelid, 2020), or practice (Aanestad & Jensen, 2011) perspectives. In this paper, we investigate the role of discourse in program shifts in large-scale digital infrastructures. As noted in the introduction, the dynamics and significance of discourse in large, interconnected structures with many actors differ from that within the context of a single organization.

## 3.2 Discourse and Information

In existing IS research, discourse is an important concept for describing, explaining, and understanding how organizations manage their encounter with new digital technologies. Examples include the volume on organizational discourse edited by Grant et al. (2004), the Working Conference on Global and Organizational Discourse about Information Technology (Wynn et al., 2003), and the many papers published in top journals in the fields of IS and organizational sciences (Barrett et al., 2013; Galliers, 2020; Pollock & Williams, 2010; Sauer & Willcocks, 2007; Swanson & Ramiller, 1997). We organize the literature into three research streams: *discourse as power, discourse as consensus, and discourse as strategy* (see Table 2; also see Appendix A for a chronological list of the literature.)

**Discourse as power:** This stream takes a critical stance on power relations and their effect on organizational changes. A key idea is the disciplinary power of the discourse. Discourse analysis in this stream reveals the consequences when a focal actor exposes a dominant view. Regimes of truth are institutionalized infrastructures established to enable the production and circulation of certain truth claims (Introna, 2003) or strengthen the legitimacy of discourse (Harvey, 1998) to facilitate hierarchical control. Institutional infrastructures are also used to diffuse management narratives, buzzwords, fads, and trends and promote certain perspectives (Baskerville & Myers, 2009). However, the discourse as power stream is also concerned with how truth claims are perceived and enacted within organizations through counterdiscourses (Monod et al., 2003; Swanson, 2003; Westrup, 2003). Counterdiscourses emerge at the intersection between a dominant discourse and practice during the implementation of a technology or technological routines in an organization (Ellingsen & Monteiro, 2008; Gidlund, 2015; Oliver & Oliver, 2003; Paroutis & Heracleous, 2013; Rose & Kræmmergaard, 2003; Trusson et al., 2014). In this stream, the literature views discourse as a way to describe the rapid change in modern organizations (Edenius, 2003; Wastell, 2003) or to examine how discourse conditions the construction of reality and, hence, how discourse is within the control of

a certain group of actors (Doolin, 2002, 2004; Doolin et al., 2013; Ezzamel & Willmott, 2008; Hardy & Thomas, 2014, 2015; Klecun, 2016; Mantere & Vaara, 2008). This stream also includes studies examining how technocentric power excludes marginalized perspectives (Bentley et al., 2019; Davies & Mitchell, 1994) as well as studies focused on the role of discourse in the constitution of professional identity to align with dominant external discourses (Arribas-Ayllon & Walkerdine, 2017; Doolin, 2002; Knights, 1990; Knights & Vurdubakis, 1994). In sum, these studies address discourse as a means to establish or maintain power and control and discourse as a means of resistance and alignment to understand the mechanisms of professional and social relations during IT implementation in organizations.

**Discourse as consensus:** Sauer and Willcocks (2007) use the metaphor of Greek choruses to demonstrate the difficulties and importance of dealing with heterogeneous and vibrant discourses that take place within prestigious and large public sector projects. Klein and Schellhammer (2017) contend that public programs succeed insofar as they facilitate the participation of a critical mass of citizens and professionals and that these programs fail to achieve some or all of their goals when this discourse is limited. Consequently, we frame the second stream of research as *discourse as consensus.* The key idea in this stream is their participation, which may be ensured by defining rules for communicative action (Lyytinen & Hirschheim, 1988). Wikipedia is a successful IT structure achieved through rational discourse (Hansen et al., 2009). However, others note a consensus paradox since rational discourse sometimes leads to institutional conformity and stagnation (Friberg-Fernros & Schaffer, 2014). Foucault, on the other hand, posits that discourse is dynamic (Brooke, 2002). Consensus building through workshops and hearings ensures the participation of crucial stakeholders. Consensus discourse requires participation by diverse actors, both professionals and citizens (Constantinides, 2013). In their research on organizing vision, Swanson and Ramiller (1997), describe how IT discourse is aligned with public and organizational actors' understanding of how IT can improve their situation. Swanson and Ramillier theorize that achieving organizing visions depends on a flexible discourse; and that reciprocal transformations over time maintain the visions of the various stakeholders. Therefore, the discourse on IT is inclusive insofar as it facilitates collaboration and participation among actors (Ford & Ford, 1995).

**Discourse as strategy:** In the third stream of research, the key idea is that the role of discourse facilitates or impedes *strategic change*. Discourse concentrates on how strategic goals are conceptualized and communicated, and these goals inform strategic IT requirements. In this stream, critical studies examine how discourse affects digital strategies, and how digitalization structurally affects organizations (Hellberg & Johansson, 2017; Lystbäk et al., 2017). In the UK, public sector studies frame discourse as a way of analyzing and understanding stakeholder positions (Greenhalgh et al., 2012), including the preference for neoliberal strategies from the commercial sector (Currie & Guah, 2007; Hellberg & Johansson, 2017). Discourse in major policy at the supranational level (e.g. European Commission, 2013; OECD, 2018) and national levels (e.g., Norwegian Ministry of Health, 2018), foreground organizational and technological innovations that can transform a sector like healthcare. Studies on rhetorical strategies (Barrett et al., 2013; Bernardi et al., 2017) reveal how discourse conditions the implementation and diffusion of IT systems within healthcare institutions. Discourse can lead organizations to maintain the status quo. For Bernardi et al. (2017), discourses are central to the dominant frames, and they describe how policy actors draw on technology to construct frames and establish rhetorical strategies. For Barret et al. (2013, p. 205), discourse may turn into rhetoric for legitimating innovation: "IT diffusion from this perspective is related to the perceived effects of technology on issues such as politics, power, and autonomy, framed and interpreted through agents' rhetorical competence."

All three research streams elaborate successfully on the relationship between language, communication, and the role of powerful actors. For instance, Barret et al (Barrett et al., 2013) and Bernardi et al. (Bernardi et al., 2017) emphasize the role language plays in transforming an existing situation. We propose that three central elements in large-scale infrastructures are not sufficiently addressed by extant discourse theories.

First, existing theories see *communication* as a focal point, and other important issues or perspectives are seen as less important. This is evident both in how power is utilized, how consensus is obtained, and how strategic goals are communicated. Second, existing theories tend to be imprecise about technology capabilities, roles, and trends. Third, existing theories offer only limited descriptions of why discourse can cause change in large programs. Next, we review prior research investigating how discourse affects digital infrastructures.

## 3.3 Discourse in Digital Infrastructures

Prior studies have described how discourses affect IT processes and propel innovative change. Although the contextual challenges are evident in these discourses, their contributions are often derived from singular systems, rather than complex systems of systems like digital infrastructures (Aanestad et al., 2017; Hanseth & Lyytinen, 2010). Digital infrastructure has grown over the years and become increasingly attached to the organizational context. The deep anchoring in organizational context entails digital infrastructures

that are complex, path dependent, and resistant to change (Hanseth & Lyytinen, 2010). Change can emerge from diverse segments of the infrastructure and different stakeholders. The participation of multiple stakeholders means that a governance regime must address multiple perspectives from different sectors of the infrastructure (Bygstad & Hanseth, 2016; Klein & Schellhammer, 2017). These perspectives are often expressed through complex, heterogeneous, and, at times, contentious discourses (Øvrelid & Bygstad, 2019). Digital infrastructure projects (such as in e-health) often attempt to solve various societal challenges, such as serving vulnerable populations who carry unique economic burdens or improving healthcare-provider interactions (Hillestad et al., 2005). It is helpful to identify and understand the varied needs of government agencies, clinical professionals, and e-health suppliers to deliver and coordinate healthcare more effectively (Agarwal et al., 2010; Drucker, 2007). Furthermore, as healthcare providers go digital, multiple intersecting platforms are evolving to form a novel operational foundation for healthcare innovation (Grossmann et al., 2011).

These professional and technological discourses tend to establish dominant mindsets that, to some degree, control what can be said (Greenhalgh et al., 2012). In some cases, the dominant discourse leads to the uncritical importing of bold IT strategies from the private sector into public sector projects where the same conditions don't apply (Currie & Guah, 2007; Greenhalgh et al., 2010). However, at times, digital innovation in the private sector can serve as an adequate model for public sector innovation. Examples include digital platforms (de Reuver et al., 2018). In general, these strategies tend to omit the complexities of digital infrastructures, such as the existence of multiple legacy systems operating in isolation (Aanestad et al., 2017). This can be seen as a conflict between policy-level recommendations, and local concerns (Constantinides & Barrett, 2014). Weak contextual insight can sink a public sector strategy (Aanestad et al., 2017; Greenhalgh et al., 2010) and weaken the alignment between programs and the public interest (Klein & Schellhammer, 2017). While major reports (European Commission, 2013; OECD, 2018) have advocated for comprehensive top-down transformation, some researchers have recommended a bottom-up incremental evolution of e-health infrastructures (Aanestad et al. 2017). Consequently, framing discourse as an infrastructural phenomenon requires an examination of how multiple actors produce the object of discourse. While national or regional authorities may seek consensus, this is an elusive goal. The attempt to build consensus in these contexts involves a struggle between competing interests, and the outcome is sometimes completely different from the initial aims of the parties of the consensus.

To summarize, this paper aims to extend the IS research on discourse by developing a more holistic conceptualization and assessing it with a longitudinal case study of e-health. Our approach builds on two premises; first, we differentiate between discourse and discursive formations (Foucault, 2002), and second, we deal systematically with discourse on two levels, i.e., macro- and microlevels, before we describe how *discourses converge* (Marshall, 2023). We proceed with our method before we describe our findings. Then we analyze and discuss them.

## 4  Case and Method

### 4.1  Research Method

Our study is based on a comprehensive longitudinal multilevel case study (Greenhalgh et al., 2010; Pettigrew, 1986) that followed 18 years of e-health program development to investigate the interplay of discourse, programs, and e-health infrastructures in Norway. Our analysis is based on abduction (Sætre & Van de Ven, 2021), which is a form of generative reasoning that enables the reinspection of a known phenomenon to produce new hypotheses and theories when research evidence is not fully explained by existing knowledge (Sætre & Van de Ven, 2021; Timmermans & Tavory, 2012)

### 4.2  Data Collection

Norway is a nation with a population of 5.5 million people, offering a high standard of living and quality public health services. The sector is governed by the Ministry of Health and Care, while the Directorate of Health is an implementing agency and health advisory. Primary care is supplied by private GPs and municipal services.

E-health infrastructures are highly complex in terms of the clinical processes they support and the number of systems and applications (usually silo systems) in use. Research on e-health infrastructures in Norway has been underway since the 1980s (Ellingsen & Monteiro, 2003). The current set of studies, of which this paper is one segment, focuses on the period 2001-2019. We observed e-health infrastructure development at three levels: local, regional, and national. Our core knowledge came from participating as researchers in national, regional, and local projects during those years (see Table 3).

As researchers, we collected data at different times. The period from 2001-2006 was mostly covered by Researcher 3 and to a lesser extent Researcher 1. While 2006-2015 was mostly covered by Researchers 2 and 3, all researchers participated in collectinh data from 2016-2019 and in data analysis (see Appendix B).

**Table 3. Data Collection 2001-2019**

| Year | Activity | Level |
|---|---|---|
| 2001-2005 | 35 interviews in a local project | Local |
| 2002-2005 | 3 interviews with vendor and HP developers | Regional |
| 2004-2008 | Participation in ELIN project—5 interviews | National |
| 2005 | 2 Interviews with the director of the Ministry of Health | National |
| 2007 | 2 Interviews with managers of hospital partner | Regional |
| 2008 | Participation in National E-Health Conference | National |
| 2010 | 1 interview with a regional CIO | Regional |
| 2009-2010 | 10 interview clinical portal managers | Regional |
| 2010 | Interview with senior e-health directorate office | National |
| 2008-2014 | 10 interviews in the E-Prescription project | National |
| 2011 | 1 interview with the chief of administration | National |
| 2012 | 1 interview with a regional CIO | Regional |
| 2012 | 1 interview with a regional architect | Regional |
| 2011-2018 | 30 interviews with managers, project managers, and clinicians in the Digital Renewal program | Regional |
| 2015-2018 | Participation in 10 workshops | Regional |
| 2015 | Participation in national e-health conference | National |
| 2015 | Interview with program manager of e-health directorate | National |
| 2016 | Interview with a regional CIO | Regional |
| 2015-2017 | 11 Interviews with managers in the Medicloud innovation project | Regional |
| 2015-2018 | 25 interviews with participants of the Kalnes project | Regional |

We participated in discussions at workshops and seminars and analyzed around 50 documents on strategy, implementation, and architectural developments. Projects included the National Elin-k (2004-2008) and E-Prescription (2008-2015) projects, a large-scale regional portal project (2009-2011), the regional Digital Renewal program (2011-2018), and the activities of the innovation hub Medicloud (2016-2018). The goal of the Elin-k project was to standardize message exchange between actors in secondary and primary healthcare. The E-Prescription project sought to digitalize prescriptions and included IT vendors, project managers, and pharmacists. The regional portal project was a transformational initiative to implement a service-oriented architecture. During the Digital Renewal program, we also had access to managers, architects, and vendors, along with internal and strategic documents. We performed 30 interviews with clinicians, managers, and vendors. Our participation in the Medicloud project included 15 interviews, 11 workshops, and seminars. We also "shadowed" Medicloud's interaction with vendors at the National E-Health Conference in 2015.

As researchers, we participated at the local level in the HSE region. This was the portal project at Rikshospitalet (2001-2006) and the Kalnes innovation project (2016-2019). In the local portal project, we conducted 35 semi-structured interviews of an hour or more with 23 different employees and had formal access to managers, IT architects, project managers, and clinicians. For Kalnes we conducted 25 interviews with 12 different employees and analyzed more than 1000 pages of internal and external documents, including design and organizational development. The interviews were not recorded but notes were written

immediately after. We held a day-long seminar with a vendor and spent around 100 hours observing meetings, seminars, and clinicians in daily practice.

Our participation in projects helped us at the regional and national levels. At the *national level*, we interviewed top executives and IT managers at the Ministry of Health and the Directorate of Health. From these interviews, we were able to identify how national e-health strategists conceptualized and actively created IT strategies. We also analyzed the topics of the National E-Health Conference between 2001 and 2019 and identified the patterns of discourse. For instance, at the National Health IT Conference, while discourse on collaboration, teamwork, and interaction dominated throughout the period, discourse on architecture became frequent after 2010, and discourse on innovation after 2014.

At the *regional level,* which is our unit of analysis (see Figure 1) we investigated the development of the regional e-health infrastructure Health South-East from 2001 to 2019 through a sequence of programs. We interviewed IT architects, managers, and new entrants, such as vendors and proponents of innovative projects—in particular, innovation hubs. We transcribed the notes taken during interviews directly afterward. Follow-up interviews were conducted as needed.

In total, we held 140 interviews lasting between one and four hours. In addition, we analyzed more than 50 strategic documents, as well as bid and competition proposals and documents and presentations from e-health conferences. Examples are white papers from the Ministry of Health, the National ICT unit's description of a national service-oriented architecture (SOA), and the E-Prescription project plan and architectural plan

from the Directorate of Health. The Digital Renewal program was supported by status reports and IT architecture documents, as well as requirements specifications. For the Kalnes project, we had access to status reports, user requirement documents, and documents describing IT architectural design.

## 4.3 Data Analysis

Our approach was a multilevel analysis based on abduction (Sætre & Van de Ven, 2021). Our study was driven by ideas and hunches that were developed and used to reinterpret earlier empirical material. To do so, we constructed a new framework where we evaluated both older and newer empirical material. A central aspect of multilevel analysis is to understand and explain the interactions between different levels—in our case, the national, regional, and project levels. Our study was inspired by the work of Greenhalgh et al. (2010), in which top-down initiatives (macrolevel) were synchronized with bottom-up emergent experiences (microlevel). This relates to what Pettigrew (Pettigrew, 1986) calls inner and outer context: While the inner context refers to "the structure, corporate culture, and political context within the firm through which ideas for change have to proceed … the outer context refers to the economic, business, political, and social formation in which firms must operate" (p. 5).

We were particularly concerned with national and regional policies and how new technological innovations formed the discourse, as well as how earlier experiences were considered in these policies. At the organizational and project level (microlevel), we studied how policies and strategy documents conditioned the establishment of e-health programs and, eventually, the gradual change of the infrastructure caused by this. The data were analyzed in four steps (Table 4).

We conducted our analysis in conjunction with the data collection, moving back and forth between empirical data and theoretical conceptions (Table 4 and Appendix B add details about the process). The first step was a temporal analysis of all the material to identify important milestones in the evolution of the e-health infrastructure and the accompanying discourses. Through informant descriptions and documents, we learned how the infrastructure changed and how new programs were established to deal with infrastructural challenges. Separately, we followed the national and regional discourse on e-health strategies and important IT solutions and trends. The temporal analyses (developed through five iterations—Appendix B) led to a timeline in which we described the most important discourses and the emergent e-health programs.

In the second step, we identified a recurring pattern of discourses derived from international and national trends, strategies, and discourses on experiences within the existing infrastructure. We classified the discourses as macro- and microdiscourses and observed that these discourses interacted and formed the basis for the emergent e-health programs. One example of a macrodiscourse came from Helsenett ("health network"), a new network that facilitates coordination between multiple actors within the health sector. Helsenett created the foundation for new internet-oriented discourses such as *Health for Every Bit*, *Si@*, and *Te@mwork*, envisioning the removal of barriers to the free flow of information between health units. Another example is how HSE embraced service-oriented architecture (SOA), and "best of breed" initiatives, which refer to the optimization of each application area. Since discourse stood out as an important phenomenon in the evolution of the infrastructure, we saw that experiences from the existing infrastructure were just as important as fresh solutions.

In the third step, we performed a theoretical redescription by exploring different theoretical perspectives and explanations (see Appendix B). We elaborated on ideas and hunches regarding discourse as an infrastructural phenomenon. Then we created an analytical framework based on Foucault, to analyze the interaction and discourses. We observed that macro actors who passed on important digitalization trends and issues from a national or regional perspective continuously interacted with micro actors who were concerned with the condition of the infrastructure.

**Discourse convergence through connection, matching, and merging:** We found that there was a consistent debate between micro and macro actors about the system's overall condition and whether something could be done to improve performance if this was necessary. In given situations where the system had clear shortcomings, a closer dialogue between macro and micro actors happened. We thematize this as *connection* since there is a common recognition that something needs to be done. The search for possible solutions to the problem was initiated, and if solutions to the problem were found, these were evaluated. We refer to this as *matching*. Examples of matching are the requirement for layered modular architecture for all system suppliers who participated in bids in HSE from around 2007/2008. The bids were designed by both strategic and professional actors and led to competition between the system suppliers. There was an agreement between the actors that the winner of the bid should receive the offer. We refer to this as *merging* since solutions are demonstrated and decisions are taken. We found that these three processes integrated micro- and macrodiscourses and theorized this as *discourse convergence*. We observed that program shifts occurred when new solutions converged with experiences and technological components. This eventually led to new e-health program formations.

**Table 4. Data Analyses**

| Step | Description | Tasks | Activities | Output |
|------|-------------|-------|------------|--------|
| 1 | Establishing a chronology for the 2001-2019 period and identifying important events and issues | • Identify and describe key events and key entities on the three levels | Five iterations to identify key entities (see Appendix B) | Figure 1 |
| 2 | Identifying and mapping the most important discourses | • Describe the relationship between actors (including policy actors) and discourses on three levels | Approx 10 rounds of coding (see appendix B) | Section 5 |
| 3 | Theoretical redescription. Exploring different theoretical perspectives and explanations | • Abduction: Elaborate on ideas and hunches regarding a historical phenomenon (discourse as an infrastructural phenomenon)<br>• Create an analytical framework to evaluate hunches (Foucault's framework on discursive formations)<br>• Use the analytical framework to map discourse, programs, and infrastructures<br>• Identify the outcome of interacting discourses. | • Investigation of earlier research on discourse, and earlier empirical work on digital infrastructures. Identification of quotes and citations that emphasize and document empirical and theoretical suggestions.<br>• Creation of a model/framework based on Foucault demonstrating discourses and discourse convergence through three processes: connection, matching, and merging | Section 5, a process model, Figure 2, Section 6 |
| 4 | Theorizing shift patterns and the program formation process. Establishing a theory of discourse as an infrastructure phenomenon | • Theorize discourse convergence<br>• Theorize discursive formations as infrastructural phenomena | • Theorizing discourse convergence! Comparison between the existing discourse theory and discursive formations<br>• Discussing how managers and policymakers can use the framework to make sensible decisions | Comparison section (7.1); Implications for practice, section (7.2) |

We then conceptualized e-health programs as discursive formations. A discursive formation has four important elements: objects, spokespersons, concepts, and strategies. When discourses converge, strong alliances emerge. We carefully analyzed the content of the different trends, thereby providing a deeper understanding of the content of the discourses. We developed a process model describing the development from interacting discourses to the emergence of discursive formation through discourse convergence.

Finally, in the fourth step, we created a theory of discursive formations as an infrastructural phenomenon. We illustrated this through a model (figure 2) that describes how discourses converged through three processes and a discursive formation emerged. Then we compared it with earlier discourse theory. We found that it deviated in three specific ways: the role of discourse, the role of technology, and explanations of change. Our main contribution is illustrated in Figure 2 and summarized in Table 8. We proceed by describing and analyzing our findings before discussing the implications of our work.

# 5 Findings

In this section, we describe a timeline of the 18-year development and ongoing evolution of the regional e-health infrastructure and analyze the interactions between macrostrategies inspired by digitalization trends and microstrategies concerned with the condition of the digital infrastructure.

## 5.1 Case Study Context

Until 2001, all public hospitals in Norway were governed by 19 counties. On January 1, 2002, the central government took ownership and organized the hospitals into five regional health corporations (Health North, Mid, West, South, and East). In 2007, Health South and Health East merged into Health South-East (HSE). In total, there are currently 39 legal public hospital organizations. Before the reform in 2002, IT strategies and decisions were made by the individual hospitals. The main reason for the government takeover in 2002 was a lack of overall governance of the national health system. This led to problems such as the unsustainable use of

resources and poor financial management, different quality of health services depending on where the citizens lived, low level of competence development, and unclear divisions of overall responsibility (Herfindal, 2004; NOU 1999:15, 1999).

The reform was implemented to achieve more controlled management of the health system, including more controlled management of costs, better quality assurance of healthcare, and more efficient distribution of work between hospitals. At the same time, the intention was for the hospitals to remain autonomous as independent enterprises (Herfindal, 2004).

Figure 1 describes the timeline (2001-2019) and marks key events in the evolution of the e-health infrastructure at Health South-East. A core entity in the evolution is e-health programs. E-health programs are formalized structures that include strategies, practices, and routines, and technology to address core requirements. We investigated how program shifts occur and the emergence of new programs, distinguishing between two types of tendencies that affect program shifts and the emergence of new programs. The first is digitalization trends brought in by large strategic bodies such as Gartner and large government programs fueled by new technology addressing acknowledged political and societal challenges. The second is more practical, associated with the current infrastructural condition. These are experiences or challenges dealt with at the practice level (both local and regional) in working with the regional infrastructure. E-health programs are the

result of a convergence between actual needs and strategic or political ambitions.

The programs represent very large structures comprising several development programs involving high cost and effort over a number of years. When digitalization trends appear as implementable solutions to fragmented infrastructures, a convergence may occur. The convergence facilitates a shift and the emergence of a new program. Thus, shifts mark the collapse of the existing e-health program and the emergence of a new one through a newly reconfigured interplay between digitalization trends and communicated challenges from the existing infrastructure. We identified three large shifts over 18 years. Table 5 provides an overview of the e-health programs, the shortcomings they addressed, and the major trends.

## 5.2 National and Regional Strategies in E-Health Modernization: Local Programs (2001-2008)

The national reform had greater holistic ownership as its central aim (Herfindal, 2004). The main concern was creating a healthcare system with more integrated services that would facilitate communication across various health units. The hospitals still relied on paper records, and even though some processes had been digitalized, the paper records were often used in parallel (Christensen & Grimsmo, 2005). To enable electronic interaction and reduce the use of paper records, a more integrated infrastructure and more standardized communication were needed.
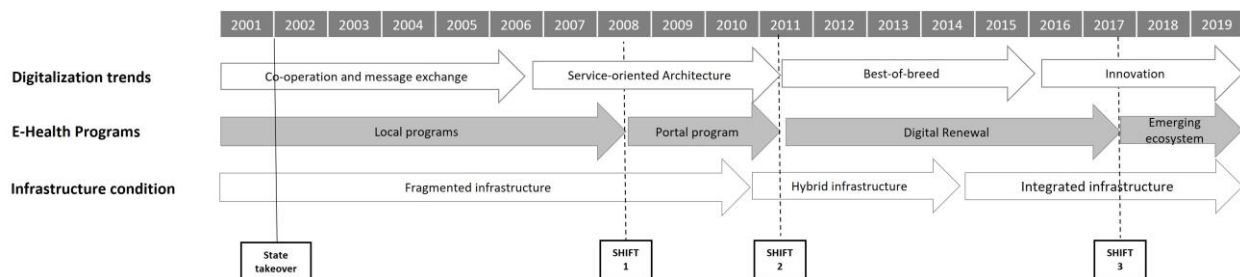


**Figure 1. Digitalization Trends and Infrastructure Condition Unified in E-Health Programs 2001-2019**

**Table 5. E-Health Programs, Addressed Shortcomings and Major Trends**

| E-health programs | Addressed shortcoming | Major trend |
|---|---|---|
| Local programs 2001-2008 | Fragmented care records | Digitalization |
| Portal project 2008-2011 | Fragmented infrastructure | Service orientation |
| Digital Renewal 2011-2017 | Hybrid infrastructure | Consolidation |
| Emerging ecosystems 2017-present | Lack of innovation | Innovation |

### 5.2.1 Improving the Infrastructure

The strategic roadmap from 2003 expresses the deep-rooted need for an improved infrastructure:

> *The development of a functioning infrastructure is a base for an offensive ICT development, so that public ICT systems within different sectors, different levels of administration, and different geographical areas can communicate. That is the core of the current strategy.*

The shortcomings of the existing infrastructure created several challenges:

> *(1) User guidance for information and electronic service offerings is too weakly developed/coordinated, (2) Data exchange and communication across agency and sector boundaries is a problem in many areas, (3) Security and trust around electronic transactions must be improved* (Arbeids- og administrasjonsdepartementet, 2003)

By the late 1990s, the internet had become a powerful infrastructure for healthcare. The internet enabled the potential for more interactivity between health units. The visionary 1997 report *Health for Every Bit* and policy documents like *Si@*, from 2001, and *Te@mwork*, from 2004, emphasized this form of digitalization.

> *By the end of 2002, there will be a recommended model for electronic patient records and information exchange internally in the nursing and care service, and between the nursing and care service and primary care physicians and hospitals externally.* (*Si@*, internal document, p. 23-24)

The idea of bringing healthcare in Norway into one electronic kingdom arose towards the end of the 1990s, but the official work started in 2004, when the regional health organizations joined and created Norsk Helsenett AS (Norwegian Health Network). This was meant to be:

> *1. A national health network that connects service providers through physical infrastructure and supportive shared services. 2 Over this network and other infrastructure, the service providers interact, among other things, by sending standardized electronic messages such as referrals and discharge letters, which are captured by electronic patient records and other end systems.* (*Si@*, p. 7)

According to the Directorate of Health, Helsenett was intended to enable a free and secure flow of information and electronic interaction.

### 5.2.2 Fragmented Care Records

The national authorities worked for a health system with more efficient digital interaction. Since the infrastructure was still fragmented, the clinicians and IT staff worked inefficiently. Historically, each hospital, and even each department, acquired and configured IT systems like patient records charts, medication, lab, and imaging from different vendors. The nonintegrated system portfolio symbolized the lack of a common infrastructure for communication and security. According to a nurse, a typical situation caused by fragmented systems is that patients

> *may have consultations with a doctor who knows nothing about them—despite the patient being in the healthcare system for a long time ... the patient has to tell his history again and again and again...the patients need to undergo unnecessary tests and examinations because previous results are unavailable, and they get contradictory information from health personnel about their condition and/or what is going to happen.* (Interview, 2004)

To improve the situation, clinicians required access to medical information produced by other units. Within each region, there was a need to exchange data, particularly between hospitals and primary care GPs, while at the national level, patient information needed to be communicated between regions.

All regions agreed to focus on standardizing the most important applications, to ensure that all hospitals had the same electronic patient record (EPR) systems, including radiology, lab, chart, and medication systems. All regions established a governance model based on Gartner's "y-model," (Regjeringen, 2014), which organized the IT activities and responsibilities into three roles: control and strategies (regional board and management), the customer (each hospital), and vendor (regional IT vendor). The strategy for standardizing applications was based on bidding processes in which the regional authority signed a "framework contract" of 5-10 years with one vendor for each application. Each hospital could decide when they needed new solutions, but those solutions had to fit within the contracted framework.

### 5.2.3 Convergence Through Digitalization and Cooperation

Elin-k is an example of a project established to address the intention of the reform, connected health services: The overall goal of the Elin-k project was to ensure the patient holistic processes in the health and care chain through electronic messages (Norsk Sykepleierforbund & KS, 2011).

Until the Elin-k project started in 2005, the development of electronic solutions to meet the nursing and care services' needs for electronic interaction was characterized by local projects. Elin-k called for jointly agreed national standards, and joint management for the development and testing of these. To enable digital interaction regardless of what EPR system clinicians used, activities to identify common requirements were initiated.

The Elin-k addressed *cooperation* in the health service. The goal was to streamline and ensure the quality of information transfer, free up more time for direct work with patients, and increase patient quality and safety (Norsk Sykepleierforbund & KS, 2011).

Although modest, it is reasonable to suggest that Elin-k connected and matched the overall interests of the managerial actors with the actors working on the infrastructure.

### 5.2.4 The Persistence of Local Programs

The national authorities implemented Gartner's y-model as an incentive to achieve consolidation. On the one hand, the y-model led to central authorities handling bidding rounds. Each hospital could choose whether they wanted to use the chosen solution.

Also, the regions were working hard to establish central IT units that could lead the development. In three of the regions, this work was quite successful, but the southernmost region was still separated into two units: Health South and Health East. Moreover, the twin regions served 60 % of the Norwegian population and were dispersed across a large geographical area. Only in 2007, when they merged into one region, was a central IT unit created.

Initiatives such as Elin-k contributed to improvements, but the reality at the ground level was still fragmentation. Thus, in the first period after the change of authority from the counties to the central government, the decentralized model had significant power. This model allowed local projects to build on their installed bases. The *local program* maintained an image of centralized authority and decentralized autonomy through *cooperation*. Unfortunately, low efficiency and a fragmented infrastructure led to increased dissatisfaction. Since the more profound problem of fragmentation was insufficiently addressed, the support for the *local programs* gradually diminished. The managerial and professional actors shared the view that the existing program had severe shortcomings, and a program shift occurred.

### 5.3 Shift 1: From Local Programs to the Portal Project

National reports supported the common understanding of fragmented infrastructure in the regions. The National

Audit Office report from 2007 shows that over 70% of hospitals either only ran paper records only or paper records and electronic at the same time. Only 19% of hospitals were operating fully electronically (Riksrevisjonen, 2008). Moreover, clinicians and other workers still complained that they had to log into several systems and register the same information several times.

Already in 2003, the Ministry of Health established the National ICT organization to improve the coordination of IT activities and solutions among the regional health authorities. Specifying a common IT architecture for all regions (based on SOA and standardizing archetypes for core data elements) was among the high-priority national activities. SOA was introduced in the software engineering community in the early 2000s and is an architectural style that focuses on discrete services implemented in smaller modules, instead of a monolithic design (Erl, 2005).

In 2004, National ICT created a requirement specification for a National IT architecture. This work resulted in a major report in 2008 that emphasized a SOA approach to e-health solutions. A national architecture based on a shared information model and service bus technology was recommended. A project manager described the new vision for e-health:

> *Simplified access to patient data means a superstructure in the form of a portal, which uniquely retrieves data from underlying clinical systems, such as patient records, laboratory systems, X-ray systems, and the like. When a user (for example a doctor) logs on to the system, the system knows who is logging in, what rights the user has to patient data, and what information the user (doctor) needs to deal with the patient in question.* (Interview, 2008)

In 2007, Health South, and Health East were merged into Health South-East, and a central IT unit was established. Furthermore, the two expert hospitals in Oslo, Rikshospitalet og Ullevål merged to form Oslo Universitetssykehus (OUS) and became the largest hospital in Europe with 24,000 employees.

Before the merge, the IT department at Rikshospitalet had developed a modularized portal solution based on SOA. In this context, a portal is an IT solution placed on top of several applications or services, giving its users a coherent interface for the underlying solutions.

The portal incorporated a new layer that bridged the silo applications by giving clinicians role-based access to various services. The solution required reengineering the existing systems, from user interfaces to services, and managing their accompanying complex security and privacy issues.

The international familiarity with SOA opened up an opportunity for global software companies to enter the

Norwegian health sector. In 2010, a New Zealand software company won a bid for a full solution, leading to high expectations in local and national e-health communities. A project manager explained:

> *The specification consisted of 300 requirements. Five suppliers responded to the tender [bid]. The international vendor was chosen in December 2009 on the basis that they had a far more comprehensive solution than the local vendor; they were an international supplier with installations in the Balearic Islands (Palma) and Canada. The local solution was "eerily unpopular," characterized by the fact that it was made for one customer, was unstable, and had several response problems.* (Interview, 2016)

### 5.3.1 Convergence Through Service-Orientation and Interoperability

Modularization and service orientation facilitate interoperability. Interoperability is an important concept in envisioning more agile organizational forms. Interoperability also conveys an image of efficient information flow:

> *A service-oriented architecture in the specialist healthcare service focuses on interaction and interoperability along several dimensions. Data and functionality are shared rather than duplicated in many systems. This involves the establishment and use of services within and across the organizations and the businesses in the health service and beyond.* (Official document, 2008)

SOA's architectural ambition of loosely coupled standardized modules inspired hopes of a *strong combination* of top-down governance and decentralized autonomy. But why would service-orientation and modularization be appealing from a user perspective? The idea of a modular architecture and role-based login fits well with users' desires for an integrated solution allowing them to easily access the information needed to choose and recombine modules (like portlets) from different underlying systems. The promises made by one portal solution vendor were quite transparent:

> *We can deliver "Basic versions of [workdesks] that can be modified locally ... customized versions can be supplied, for example, based on role, organization, task, subject, problem/diagnosis, and the like," while the "basic design elements and navigation [are] common to all."* (Nurse/project manager, 2009)

The local portal solution did not win the bid but was useful as a demonstration of the power of the SOA approach. The SOA architecture connected and matched the needs of management and professionals to reduce fragmentation.

### 5.3.2 The Portal Project Struggles

The portal project aimed to implement the SOA solution in less than 1 year. The implementation started in 2009 but was halted in 2011. However, the goals of the portal project proved overly optimistic. The infrastructure of the region was still fragmented and nonmodularized. To successfully leverage modularization a central organization of architectural decisions as well as a mature service layer where components are related through loose coupling, is required (Erl, 2005). A project manager said:

> *The project did not consider that there were several non-standardized processes. If you do not have standardized processes, choose an existing and consolidated system.* (Interview, 2016)

The modularization of the technical architecture and implementation of the portal project required extensive resources. Unfortunately, the vendor from New Zealand relied on an inexperienced subcontractor, and major problems emerged during implementation. A project manager explained:

> *The vendor struggled with the integration, and the company responsible for the implementation had little competence. It took too long for this to be acknowledged. The vendor then provided the necessary expertise, but it was too late. The main problem was related to 21 Java-based "Widgets" where both information and functionality were worse than in the existing solution. Several A-errors occurred on important test dates in the project.* (Interview, 2016)

The portal project contributed to some improvements. After the project was completed, the architecture was more robust and modularized, allowing modules such as x-ray images to be used independently of proprietary technology (project manager 2016).

However, after spending 20 million euros, the program ended in 2011. Its failure became part of the public and political debate. The media framed it as a national scandal. In an inquiry conducted by the Norwegian Parliament, the leader of the Control and Constitution Committee claimed that the project suffered from "mismanagement of the highest order," scandalizing the very term "portal" as well.

The parties' interests were connected and matched through the mutual understanding of the need for a consolidated and integrated infrastructure. The portal project crumbled, and a new program shift emerged.

## 5.4 Shift 2: From the Portal Project to the Digital Renewal Program

In August 2011, 9 years after the state takeover, the infrastructure was still fragmented. Clinicians still struggled to cope with multiple logins and redundant registration routines, and the IT staff still maintained multiple nonintegrated systems. An internal document visualized the fragmentation as a "fruit salad" (more than 1000 IT systems operating in partial or full isolation).

> *With today's ICT portfolio of applications and point-to-point integrations, Health South-East is unable to offer the necessary pace of change, sustainability, and scalability to adopt new and important functionality that supports the needs of the future. Information storage and end-user functionality are often designed in the same product and without open APIs, which has led to IT silos and technological complexity.* (Document, 2010)

The scandalization of the portal project led to the perception that a solid foundation had to be built. This triggered a new debate. We asked an HSE manager for his assessment of the situation:

> *The main problem is the fragmentation of solutions, which has a historical explanation. Each hospital, each clinic— and even each clinician—has had the freedom to choose any available solution, during the past 30 years. These choices have often been made arbitrarily, dependent on which vendors were knocking on the door, or other local conditions. The result is hundreds of different solutions, which cannot exchange data, because of the lack of standards, and cannot communicate, because of the lack of integration. Today, this is a hindrance to patient-oriented care and evidence-based medicine. It is also expensive. There is only one solution, which is an overall consolidation of shared systems, and standardization of data and processes. This requires the courage to establish top-down governance, an integrated architecture, and well-financed programs to implement the strategy.* (Interview, 2010)

By autumn 2011, the ideal SOA models were put to rest, with the e-health community debating the contrasting options of best-of-breed (use different applications and integrate them) and suite (choose one integrated solution, such as EPIC) strategies. EPIC viewed the Nordic countries as a new base for expanding the e-health strategies, and the Copenhagen and Helsinki Health Authorities decided to acquire EPIC.

### 5.4.1 Convergence Through Consolidation and Integration

The goal was to consolidate existing systems and clean up the mess caused by the nonintegrated solutions. National politicians, health authorities, and regional IT architects agreed on the consolidation of systems to reduce fragmentation. Digital Renewal was the name of HSE's program for renewing and standardizing work processes and IT, improving patient safety and quality, and ensuring efficient maintenance. The best-of-breed strategy ensured that existing systems and contracts would be reconfigured to enable consolidation. This implied that existing power bases would be maintained.

The Digital Renewal program had three central goals: reduce the number of systems, standardize remaining systems, and enable integration through standardized messages. The best-of-breed strategy implied choosing the most widely used EPR solution in Norway (DIPS) as the central application and *integrating* DIPS with other systems using a service bus middleware.

The program received funding in the amount of 1 billion euros and was launched in early 2012 to standardize the architecture for the 39 hospitals in the HSE region. A separate IT unit, the Integration Factory (specializing in Microsoft BizTalk), was established to integrate the numerous physical integrations between the EPR, and the clinical and administrative systems. For several years, technicians and architects had worked on a biz-talk integration engine, but it didn't fit the portal project. The integration engine was implemented in 2013-2014. A regional architect stated:

> *It was not the case that Biz-Talk suddenly appeared after the collapse of the portal project. On the contrary, the IT departments in Health South had worked with this technology for several years and knew it well. It was therefore relatively easy to establish the Integration Factory in 2014, and make integrations at two levels, a local ESB for each HF, and a regional ESB to link the HFs together.* (Interview, 2014)

With one exception, the other health regions ran similar projects. *Integration* became a dominant activity that connected the best-of-breed strategy with the integration engine to enable an *integrated architecture*. Again, the parties' interests connected on the shortcomings of the fragmented infrastructure and the need to move on.

### 5.4.2 Digital Renewal Struggles

The Digital Renewal program was the result of deep-rooted needs for an integrated infrastructure and a strategy that addressed these needs. The best-of-breed strategy sought to clean up the mess in the existing systems (rather than acquiring new ones) using an integration engine to consolidate them. The consolidation effort was appealing since the users were already familiar with the systems. The Digital Renewal program fulfilled some of its goals but was very expensive and new problems emerged. In 2015 a new discourse began to dominate.

## 5.5 Shift 3: From Digital Renewal to Emerging Ecosystem

Although the Digital Renewal program produced a powerful integration engine and strategies for consolidating care records, the results did not justify the spending. Most of the resources went to integration and consolidation and local innovation was significantly reduced. The central IT unit was caught up in large consolidation projects and focused less on local needs:

> *The central IT unit does not have the competency to support local needs…we needed to bypass central authorities when we established local innovation projects.* (Chief technology officer, 2016)

Clinicians complained about the lack of local innovation. This was viewed as especially unfortunate since a stream of innovations based on lightweight IT[1] (Bygstad, 2017), such as sensors, tablets, and mobile IT, had entered the medical field:

> *the EPR vendor tells us to wait until the next release. But this will take years. The new system vendor is much more active. Also, the system enables local innovation.* (Project manager, 2016)

In addition, innovative companies complained about difficulties in entering e-health infrastructure because of strict security requirements that favored large organizations.

The Kalnes innovation project emerged as a fresh candidate focusing on process innovation, and modular architecture. According to interviews with managers in 2016:

> *New Østfold Hospital will be the best in Europe for process innovation for four reasons. The work processes must be moved closer to the patient. We will use commercially available technology. The work processes will be simplified, and mobile technology will support them.*

> *Our goal was to become the first digital hospital in Norway, and the management team supported the strategy very well. This is very important, innovation requires new thinking, as well as a positive attitude… It is also important to remove old structures that create obstacles.*

The HSE authorities in the region realized that there was a need for change, with one stating:

> *The ICT investment in Health South-East will drive towards a greater proportion of lightweight ICT to be able to introduce ICT support faster, cheaper, and with lower risk and more adapted to the needs of the hospitals.* (Interview with regional manager, 2017)

This echoed an international discourse on platform ecosystems (Tiwana, 2013), where ecologies of large vendors and third-party innovators were becoming popular. Responding to calls for innovation, HSE established a new hub, Medicloud. Its mandate was to explore possible solutions that could connect heavyweight and lightweight IT. Medicloud was part of the IT Service Center and nurtured relationships with various clinicians and start-up IT companies. In 2015, several pilot projects were initiated both by public and private initiatives (Øvrelid & Bygstad, 2016). At the annual e-health conference, the shift in the discourse was evident. Medicloud held a separate event to attract lightweight innovations, and the large EPR vendors assured the public that they were open to offering APIs to app providers.

### 5.5.1 Convergence Through Innovation and Flexibility

At Kalnes, a layer of lightweight technology was successfully placed on top of the record systems, and the new configuration provided usable interfaces that could support several types of processes (Bygstad & Øvrelid, 2020). The combination of process and

---

[1] Bygstad (2017) used the concepts of heavyweight IT and lightweight IT to distinguish between the well-established knowledge regime of large systems, driven by a software engineering approach developing ever more sophisticated solutions through advanced integration (heavyweight IT), and the knowledge regime of mobile apps, sensors, and bring-your-own-device, also called consumerization and internet of things (lightweight IT). "The key aspect of lightweight IT is not only the cheaper and more available technology compared with heavyweight IT, but the fact that its deployment is frequently done by users or vendors, bypassing the IT departments" (Bygstad, 2017, p. 180).

knowledge technology had properties that were expected to promote regional scaling.

Clinicians at the new Kalnes hospital benefited from the new IT system, which enabled user innovation. The user innovation concept converged with a larger discourse on local innovation and decentralized governance:

> *An additional strength of Imatis is its visual power. We can use certain icons to emphasize particular aspects of the patient's conditions that need to carefully be taken into consideration. Examples are bleeding, pain, level of consciousness, or allergies. We can also use it to visualize the status of the patient's treatment and attach certain resources to it... I often use Imatis whiteboards when I need to have an overview. I can easily log in using my card, and immediately gain a full overview of the admitted as well as arriving and discharging patients.* (Nurse, 2017)

An HSE manager decided that the Digital Renewal program had fallen short and that decentralized governance models were needed to enable local innovation:

> *In the Digital Renewal program, there is a lot of central governance and little freedom. There is a need to clean up the infrastructure and create order. There is a lot to do but not much time. These challenges are forcing us to rethink. We [the central HSE unit] cannot own everything, command everything, and control everything. We need to rethink our strategies to facilitate more innovation.* (Interview, 2016)

The regional authorities established a more innovation-friendly program based on lessons learned from Kalnes. Through a more flexible and locally adaptive strategy, HSE was able to balance regional control and local innovation. This form of combined governance also mirrored an international discourse on platform architecture and decentralized innovation (Ross et al., 2019)**.**

In the next section, we discuss the results of the interaction between micro- and macrodiscourses, leading to *discourse convergence*. Then we describe how discursive formations emerge.

# 6  Interpreting Program Shifts Through a Discourse Lens

Foucault's archaeological method enables us to study the role of discourse on change and transformation processes in society (Foucault, 2002). We consider his theories particularly suitable for studying shifts in large e-health programs, in digital infrastructures. We identified three digital infrastructure phases (see Figure 2): a stable digital infrastructure, a digital infrastructure experiencing a program shift, and the resulting new digital infrastructure.

## 6.1  Phase 1: Stable Digital Infrastructure

An important premise of Foucault's method is that collaboration, communication, and action are discursive practices—*practices to maintain and diffuse professional expert discourses* (Bacchi & Bonham, 2014). Furthermore, discourse takes place at different levels. Governments, managers, and politicians may have other interests and challenges than architects, technicians, and workers. To address these differences of interests, we distinguish between macrodiscourse and microdiscourse.

*Macrodiscourses* are large-scale discourses (often strategic) conducted in international and national media, research, sector conferences, and consultant reports (Sauer & Willcocks, 2007). In our case, we view macrodiscourses as digitalization trends formulated by major players like chairmen, politicians, and large consulting companies. An example from our case is the extensive reliance on Internet technologies in Phase 1. The National Health Network served as a carrier of standardized messages as defined by the Elin-k project. Another example is the SOA discourse, directly leading to the establishment of a separate unit: National ICT. The National ICT had a rather central role in specifying the development and implementation of modular and layered architectures. A third example is how best-of-breed strategies focused on the optimization and reuse of available systems, aided by structured integration strategies, and how the lack of innovation in this best-of-breed discourse contributed to a growing discourse on innovation.

*Microdiscourses are more local*. They often remain within the boundaries of health organizations and programs and tend to be based on experiences and outcomes of ongoing programs (Greenhalgh et al., 2012). Microdiscourses are discursive practices that take place on a practical level and apply to the working conditions the infrastructure allows and what is needed to improve them. Examples from our case include the fragmented infrastructure that burdened clinicians with multiple logins and inefficient information retrieval in Phases 1 and 2. While Phase 3, dominated by the large Digital Renewal program, led to some improvement internally in the hospitals—aided by the large biz-talk integration engine, which enabled seamless information exchange, and the mapping of information to the needed format—it had major shortcomings. Its strictly disciplined centralization strategy reduced the ability of each hospital to innovate, contrary to some of the intentions underlying the reform in 2002.

In Phase 4, after the third shift, a combination of central control and local innovation, inspired by the emergence of ecosystem thinking, further improved the infrastructure. The combination of innovative app development aided by a more integrated infrastructure provided more local freedom.

## 6.2 Phase 2: Program Shifts in Digital Infrastructure

There is a continual interaction between micro- and macrodiscourses and we argue that change occurs when macrodiscourses and microdiscourses *converge* (Marshall, 2023). Convergence is triggered by an acknowledged shortcoming in the digital infrastructure and happens when a sufficient closeness between the two discourses materializes as overlapping interests. Concretely, *convergence* occurs when three processes are fulfilled: connecting, matching, and merging.

*Connecting* refers to the common recognition between micro- and macrodiscourses that the existing program is insufficient to solve the existing challenges. An example from our case is the presence of fragmented care records in Phase 1, which created a challenge both from a macroperspective, in that hospitals were not able to perform sufficiently across institutions, and from a microperspective, in that professional workers struggled with paper records and systems that required multiple logins. Despite some improvements, fragmentation persisted as a problem in Phase 2 and Phase 3. Consequently, it was quite easy to reach a consensus between the micro- and macrodiscourses regarding the challenges. In Phase 4, after the centralized Digital Renewal program, the challenge moved from fragmentation to a lack of innovation.

*Matching* happens when solutions to a problem exist, and evaluations of existing solutions are initiated. Examples from Phase 1 include the use of internet technology to distribute standardized messages. The Health Network, established in 2003, was seen as a channel to safely distribute these messages. While standardized messages developed by the Elin-k project seemed like a sufficient remedy at a certain point, they proved to be a weak foundation for a more consolidated infrastructure. The SOA discourse addressed this problem and provided a more deep-rooted solution—for instance, by establishing the National ICT unit to ensure layered modular architectures. The local portal solution also contributed by indicating the potential of a portal solution. If the SOA discourse seemed to be creating few improvements in the infrastructure, the best-of-breed macrodiscourse intervened with a much more centralized and consolidated view of system strategy

and development. The strictness of the Digital Renewal program led to the emergence of a new discourse on innovation. This discourse was harnessed by several national, regional, and local initiatives on innovation.

*Merging* occurs when decisions are made and implies a reconciliation between macro- and microdiscourses. Examples from our study include the convergence of the modular service-oriented architecture with user needs related to integrated access to all underlying systems. For instance, the solution from the New Zealand company featured user-friendly interfaces. Another example is the agreement that fragmented infrastructures would require more controlled management and more aggressive integration between the solutions. This was also strengthened by the existence of necessary IT systems—e.g., electronic patient records and integration technologies (like the BizTalk engine). The innovation discourse was considerably strengthened by the Kalnes innovation project, demonstrating the utility of combining user-oriented lightweight IT and regional/standardized heavyweight IT systems.

Figure 2 (a process model) illustrates the continual interaction between macro- and microdiscourses in a stable digital infrastructure. Substantial shortcomings in the existing programs trigger a more intense debate (connecting). When solutions exist, the two discourses interact to discuss the solutions (matching) before they finally agree on the suitability of an existing solution (merging). The *discourse convergence* produces a new discursive formation and a program shift. Table 6 defines the concepts.

## 6.3 Phase 3: New Digital Infrastructure

*We propose that a discursive formation emerges when macro- and microdiscourses converge*, creating a new digital infrastructure.

A discursive formation occurs when a group of discourses integrate different stakeholders' perspectives and align discourses and material issues in creating coalitions. We see large-scale e-health programs as discursive formations. A discursive formation consists of four elements: object, spokesperson, concepts, and strategies.

First, "a discursive formation exists if the statements in it refer to the same object." (Cousins & Hussain, 1984, p. 84). Thus, the *object* is the center of attention for the discourse. The object is central in the sense that it leads the discourse toward material possibilities clarified in the discourse.
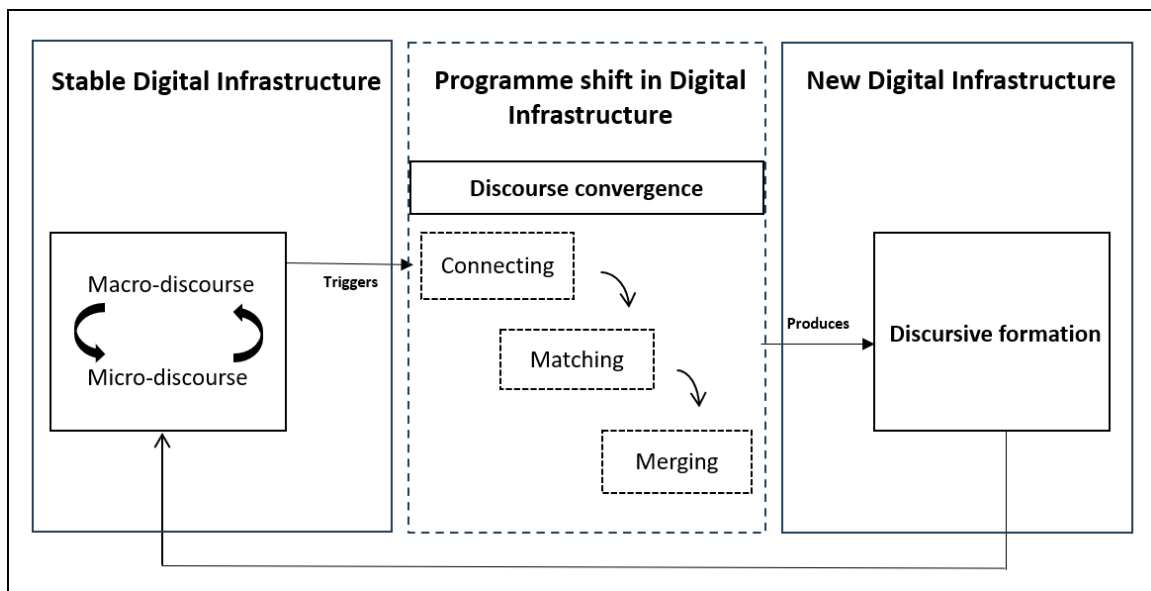
**Figure 2. Program Shifts in Large-Scale Digital Infrastructures**

**Table 6. Definition of Concepts**

| Concept | Definition |
|---|---|
| **Macrodiscourses** | Large-scale discourses occupied with digitalization trends that provide meaningful ways of solving strategic societal challenges |
| **Microdiscourses** | Discourses that often remain within the boundaries of health organizations and programs and tend to be based on experiences and outcomes of ongoing programs. |
| **Triggers** | The intensity of the debate increases when programs are struggling |
| **Discourse convergence (processes)** | The process by which macro- and microdiscourses are integrated.<br>*Connecting* refers to the compliance between the macrodiscourse views of digitalization and the microdiscourses that carry local requirements<br>*Matching* occurs when actors carrying macro- and microdiscourses collaborate in exploring and evaluating possible solutions<br>*Merging* occurs when decisions are taken, and implies a reconciliation between macro- and microdiscourses |
| **Produces** | Discourse convergence produces a new discursive formation leading to a program shift. |
| **Discursive formations** | A group of discourses that integrate different stakeholders' perspectives and align discourses and material issues in creating coalitions |
| **Program shifts** | The result of discourse convergence and the emergence of a discursive formation |

Examples from our case include digitalization, which was central to both the macro- and microdiscourse in Phase 1 and was dominated by paper records and inefficient digitalized solutions. Phase 2 was dominated by service orientation in layered and modular architectures. This was appealing for both the macro- and the microdiscourse—"macro" in that it promised an efficient and practical solution to the fragmentation by adding an architecture layer over the existing monolith systems and presented the underlying systems as providers of services, and "micro," as the systems integration reduced the number of logins and facilitated the configuration of information elements according to needs (a kind of use-recombination, see Henfridsson et al., 2018). Since the architecture was still fragmented, the next discursive

formation centered on consolidation and integration in a joint system portfolio. This united the macrodiscourse on the "best-of-breed" (optimize what we have) strategy and the microdiscourse on integrated infrastructure, since systems known to the users were acquired and integrated with other systems. A new discursive formation emerged when the Digital Renewal program became too strict and disallowed local innovation.

Professional discourses increase in strength when various experts interact in discursive practices and center on the same object. This makes the roles of *spokespersons* particularly relevant. In our case, national (like politicians) and regional authorities (CEOs) were increasingly central in the discourse around the object in every phase of the 20-year timeline.

**Table 7. E-Health Programs as Discursive Formations**

| Object | Spokespersons | Concepts | Strategies |
|---|---|---|---|
| Digitalization | National and regional authorities | Cooperation | Centralized strategy, decentralized autonomy, no IT strategy |
| Service orientation | National authorities, international agencies | Interoperability | Modular architecture, top-down governance |
| Consolidation | National and regional authorities | Integration | Integrated architecture, top-down governance |
| Innovation | Local managers and commodity suppliers | Flexibility | Decentralized governance |

This meant that the intention behind the reform—better national governance—was reflected in the actual solutions. We see a slight difference in Phase 3, where international companies intervened, as well as in Phase 4, where some of the centralized power in digital renewal returned to the hospital and innovation environments.

Third, a discursive formation exists if there is a constancy of concepts employed in the statements. Professional knowledge often emerges through concept development or the reuse and modification of existing concepts from other fields of knowledge. Consequently, the third way of identifying discursive formations is to inspect how concepts are developed and gain power through dispersion. In our case, we identified four central concepts for each discursive formation: cooperation, interoperability, integration, and flexibility. Cooperation in the case of messages, interoperability in the case of modular interaction, integration in the case of strict standardization, and flexibility to facilitate local innovation, are all appealing concepts for strengthening the objective of the discursive formation.

Finally, a discursive formation emerges if the statements support a common "theme" or institutional, administrative, or political pattern (Cousins & Hussain, 1984). A strategy is characterized by its ability to unify the object, the spokesperson's position, and concepts into a common system of formation (Foucault, 2002). In our case, the first phase was characterized by centralized strategy (the reform), and decentralized autonomy (the hospitals were still in charge). The SOA discourse and modular architecture became convenient after 7 years with few improvements. The discursive formation was dominated by top-down governance since the central authorities designed a uniform solution (portal project) to the challenges. The next discursive formation was dominated by an even stronger centralization strategy. The Digital Renewal program established an integration program with strong central management, both technically and financially. The last discursive formation emerged due to the increasing reaction to the strict centralization regime and was inspired by the new ecosystem discourse with decentralized freedom. Table 7 describes the content of the various discursive formations. Next, we discuss our findings and our contributions.

# 7 Discussion: Discourse Convergence and Program Shifts in Large-Scale Digital Infrastructures

Using Foucault's discourse theory (Foucault, 2002) we aim to provide a holistic view of discourses in large-scale digital infrastructures, building on our longitudinal case study. In this section we return to our research questions: (1) *How does discourse influence the emergence of new programs in large-scale digital infrastructures?* (2) *How can policymakers and managers make sense of the public and professional discourse around large e-health infrastructures?*

## 7.1 How Does Discourse Influence the Emergence of New Programs in Large-Scale Digital Infrastructures?

In earlier literature, the explanation for why shifts occur is omitted or explained as the result of individual actors' imposition of power (Doolin, 2002; Swanson, 2003) or powerful agents' ability to align divergent agendas through collective or rhetorical means (Barrett et al., 2013; Bernardi et al., 2017; Sauer & Willcocks, 2007; Swanson & Ramiller, 1997). Foucault has been criticized for avoiding the reasons why shifts occur; he is less focused on shifts than on structure and content (Rabinow, 1984). Although the focus on change is present (Barrett et al., 2013; Doolin et al., 2013), the discourse literature in IS also tends to be more concerned with the content of particular discourse streams than with explaining the reason why change occurs (Constantinides, 2013; Introna, 2003; Lystbäk et al., 2017).

Thus, our main contribution is a closer elucidation of shifts and why they occur. We distinguish between micro- and macrodiscourses and demonstrate how shifts occur when micro- and macrodiscourses converge. This distinction allows for a more fine-grained analysis. As shown in Section 6 and Figure 2, this happens through three processes. When the existing program experienced serious challenges, the debate became more intense. A *connection* between macro- and microdiscourses

occurred. A more hectic and unified debate on how to solve the challenge was initiated, and *matching* occurred when macro and micro actors collaborated to explore possible solutions. *Merging* occurred when decisions were made and reconciliation was obtained. Convergence is the result of these three processes.

We argue that our model of discourse convergence (Figure 2) is generalizable outside the e-health context. Specifically, we identify a recurring pattern for understanding program shifts through processes where the interaction becomes gradually more intense. Shifts mark the final collapse of the existing discursive formation and the emergence of a new one through a newly reconfigured interplay between macro- and microdiscourses. We find the same pattern in other contexts. Examples include Bernardi et al.'s (2017) focus on health reforms, and Barrett et al.'s (2013) focus on computer movements.

Further, Elder-Vass (2011) demonstrates the convergence between discourse and norms in public institutions, while Marshall (2023) provides an example of how public and local signs (discourse) converge to optimize messages to citizens about COVID-19 infection.

More generally, our study concerns macrodigitalization trends that challenge the status quo of incumbent digital infrastructures, ultimately enforcing a shift. These shifts sometimes radically alter the existing trajectory (Huang et al., 2017); other times, smaller issues converge with the existing base in less dramatic ways (Rolland et al., 2018). This framing is generalizable to the automobile (Svahn et al., 2017), finance, insurance, and electricity (Ross et al., 2019) industries as well as the retail sector (Yeow et al., 2018). It remains to be seen how discourse convergence should be understood in these industrial settings.

Based on our findings, we compare existing IS discourse theory with our theory in light of three topics: the focal object of discourse, the role of technology, and the causes for change (Table 8).

First, earlier theory on discourse in IS sees *communication* as the *focal object*. It arises either from power, where a focal actor imposes a dominant view (Doolin, 2002; Swanson, 2003) using discourse to communicate the intention to central actors (Klein & Schellhammer, 2017; Sauer & Willcocks, 2007) or as a means to reach strategic goals by communicating what it takes to accomplish them (Barrett et al., 2013; Bernardi et al., 2017). Earlier discourse theory framed communication as a key mechanism in social relations that both shapes individual and organizational identity and sheds light on strategies for opposing this imposition. This includes communication as a tool to integrate different stakeholders and manage tensions that arise when players with different interests converge. Communication is also important from an overall strategic perspective, not least when national authorities

preach a collective perspective through media proposals, policies, or other directives, to create order and control.

In contrast, the focal object of discursive formation is sociotechnical networks, including the installed base and the emergent IT discourse. Multiple intentions and challenges are broadcasted within these systems. Communication is crucial in these networks as well, but the focus is on the complex heterogeneous discourses among actors striving to solve a crucial challenge. There are still many actors and a need for coordination and agreement. However, these infrastructures use a collective approach rather than top-down communication to reach a consensus through coordinated action. Further, discursive formations include discourses that emerge in practical institutional settings (Foucault, 2002). This form of engagement allows us to observe how macrodiscourses from strategists converge with microdiscourses from practical work in the infrastructure to form the larger sociotechnical network. While existing discourse theory focuses on the ideological and rhetorical aspect of discourse and its role in persuading actors, discursive formations emphasize the partly planned and partly emergent integration between macro- and microdiscourses.

Second, the role of technology in discourse differs. In existing discourse theory, the role of technology is often secondary, socially constructed, and partly black-boxed (Constantinides, 2013). For instance, Barret et al. (2013) refer to diffusion as the process where particularly strong actors use rhetoric to gain power. This black-boxes the role of microdiscourse and the negotiations about what technology to produce. Also, existing discourse theory is often grounded in methodologies that emphasize the study of dialogues and narratives in texts (Barrett et al., 2013; Constantinides, 2013). This focus is important, but it tends to undermine the practical role of IT capabilities in organizational development. The focus of discursive formations, rather, is sociotechnical and action-oriented. Examples from our case include network technologies like the Internet inspiring the development of a health network that envisioned a soft transition after the reform. Moreover, while SOA promised an incremental development of services and no transformation of the underlying infrastructures, the best-of-breed strategies indicated a pragmatic but demanding orientation towards large-scale integration of multiple heavyweight systems. Lastly, the introduction of lightweight IT as a process technology to complement existing core systems demonstrates a turn towards ecosystem thinking. This shift towards ecosystems also highlights how the discursive formation is greatly expanded to include more actors and more technologies. The emergence of a collaborative ecosystem is dependent on a strong and shared discursive formation.

**Table 8. Comparison Between Existing Discourse Theory and Discursive Formations**

| Topic | Existing discourse theory | Our contribution (discursive formations) |
|---|---|---|
| Focal object and role of discourse | Communication through ideological and rhetorical discourses aiming to persuade actors. | Sociotechnical networks including installed base and emergent IT discourse. |
| Role of technology | The role of technology is secondary. Technology is socially constructed and partly black-boxed. | The role of technology is primary, as the relation between IT trends and digital infrastructure is sociotechnical. |
| Causes for change | Change is agent oriented, dominated by the perspectives of powerful agents. | Change is system oriented where macro- and microdiscourses converge and utilize the space of opportunities. |

Third, change in existing discourse theory emerges when powerful agents communicate through ideological and rhetorical propositions (Barrett et al., 2013; Bernardi et al., 2017). In some cases, the powerful agents are spokespersons for a community that seeks collective engagement. In these situations, consensus is important. In other cases, the agents are national strategists who create comprehensive policies for future development. While existing discourse theory is agent oriented, discursive formations are system oriented. Discursive formations enable macro- and microdiscourses to interact and *converge* within a space of opportunity. Change is a result of *discourse convergence* following multiple negotiations between professional actors at many levels in the digital infrastructure.

## 7.2 How Can Policymakers and Managers Make Sense of the Public and Professional Discourse Around Large E-Health Infrastructures?

For managers, policymakers, and other decision makers, the navigation between macro- and microdiscourses is demanding. However, there are several practical benefits of seeing program shifts in large-scale digital infrastructures as discursive formations. Policymakers, IT managers, and developers will all benefit from knowing that shifts require macrodiscourses (trends and technological paradigms) to meet microdiscourses (real ongoing experiences from the development of large-scale infrastructures). Examples of demanding assessment are: *Don't get caught up in emerging trends* (Baskerville & Myers, 2009). An example from our case is the internet inspiration in local programs (Phase 1) combined with limited changes in the infrastructure leading to a slow process. The SOA inspiration in the portal project (Phase 2), on the other hand, entailed a radical change process on a strategic level, without sufficient changes at the infrastructure level. This created organizational turbulence and the project finally collapsed. The subsequent program tried to remedy this by establishing a large-scale centralized

planning project called Digital Renewal (Phase 3). The causes for implementing the project were reasonable, but it led to limited innovation and reduced autonomy. In the first and the second programs, there was no lack of innovation, but it didn't scale. Also, the last program included innovation, but it scaled to a greater extent in a more collaborative ecosystem. Inspired by the recent trend of digital ecosystems, HSE authorities seem to have found a pragmatic trade-off between centralized and decentralized governance.

Further, shifts often *arise close to practice,* communicated through discursive practices (Bacchi & Bonham, 2014). An example is when architects or developers design modular solutions that facilitate the faster creation of digital services for clinical users with creative ideas. However, shifts can also be promoted through strategic and political strategies and reforms creating new conditions for macrodiscourses. As we saw in Phase 2, the SOA management discourse was particularly strong when it was aligned with a practice discourse on modularity and interoperability. The consolidation discourse was powerful when it was aligned with the integration discourse in Phase 3. Discourse on IT may facilitate collaboration between macro and micro actors (Ford & Ford, 1995)

However, while some conditions and trends require large investments others favor gradual adaptation. The macro-micro discourse is crucial for policymakers and politicians to sensibly choose the correct order of investment, aligning multiple stakeholders (Greenhalgh et al., 2012; Klein & Schellhammer, 2017). A fragmented infrastructure usually requires large investments, while an integrated architecture may motivate decentralized autonomy.

Also, since organizations are conservative, it is important to utilize macro-micro discourses to monitor technological trends and weigh different considerations. In Phase 1, after the reform, management was too distant and the strategy was too "liberal." This eventually led to important infrastructure problems being postponed. This, in turn, led to a more ambitious SOA regime. However, the

rhetorical SOA strategy was rushed (Barrett et al., 2013) and not sufficiently aligned with reality, which created space for a new discursive formation and a new dramatic shift. While theories and practices on platformization (Bygstad & Hanseth, 2018) through modular and layered architectures were important parts of the IT discourse, a reasonable utilization of insights on platformization requires deep knowledge and sobriety regarding the infrastructure condition.

Finally, Doolin (Doolin, 2004; Doolin et al., 2013) emphasizes the huge impact central actors have on strategy. We see that it is important to balance centralized regional control and local freedom. An example is large-scale long-term strategies governed by centralized actors—based more on architectural trends than on practical challenges. The Kalnes project resulted in a less dramatic but more efficient architectural solution since the Kalnes discourse was more aligned with recent developments in IT architecture (Bygstad & Øvrelid, 2020).

Summing up, the implications for practice are: First, decision-makers can use our insights on the convergence of macro- and microdiscourses to make more informed decisions, based on a realistic analysis of how, and to which degree, external trends and internal needs match. Second, practitioners can use our insights to argue for broad participation by IT personnel and user communities in strategic decisions, because their practical knowledge and experience are crucial for sound decisions in a demanding field.

## 7.3 Limitations and Further Research

Our study was conducted in the northern European context; however, we are confident that studies from other contexts involving the commercial health sector will be able to validate our framework, and possibly identify some shortcomings.

## 8 Conclusion

This paper proposes an alternative understanding of program shifts in large-scale digital infrastructures and emphasizes the relevance of closely investigating the role of discourse and discursive practices in these shifts. Building on Foucault and infrastructure research, we frame discourse as an infrastructural phenomenon in which micro- and macrodiscourses converge. Driving the convergence of macro- and microdiscourses, we identified three processes: connection, matching, and merging. We demonstrate how discourses in large-scale digital infrastructures can turn into discursive formations via their integrative capabilities. We also contribute by discussing how managers and policymakers can use our framework to make sensible decisions.

## Acknowledgments

# References

Aanestad, M., Grisot, M., Hanseth, O., & Vassilakopoulou, P. (Eds.). (2017). *Information infrastructures within European health care*. Springer.

Aanestad, M., & Jensen, T. B. (2011). Building nation-wide information infrastructures in healthcare through modular implementation strategies. *The Journal of Strategic Information Systems*, *20*(2), 161-176.

Agarwal, R., Gao, G. (Gordon), DesRoches, C., & Jha, A. K. (2010). Research Commentary—The Digital Transformation of Healthcare: Current Status and the Road Ahead. *Information Systems Research*, *21*(4), 796-809.

Arbeids- og administrasjonsdepartementet. (2003). *Strategi for IKT i offentlig sektor: Sentrale fokusområder for å fremme brukerrettede tjenester, effektivitet og forenkling på lokalt nivå 2003-2005* (p. 60). https://www.regjeringen.no/globalassets/upload/fad/vedlegg/ikt-politikk/strategi_for_ikt_i_offentlig_sektor.pdf

Arribas-Ayllon, M., & Walkerdine, V. (2017). Foucauldian discourse analysis. In C. Willig & W. S. Rogers (Eds.), *The SAGE handbook of qualitative research in psychology* (pp. 110-123). SAGE.

Bacchi, C., & Bonham, J. (2014). Reclaiming discursive practices as an analytic focus: Political implications. *Foucault Studies*, 179-192.

Barrett, M., Heracleous, L., & Walsham, G. (2013). A Rhetorical approach to IT diffusion: Reconceptualizing the ideology-framing relationship in computerization movements. *MIS Quarterly*, *37*(1), 201-220.

Baskerville, R. L., & Myers, M. D. (2009). Fashion waves in information systems research and practice. *MIS Quarterly*, *33*(4), 647-662.

Bentley, C. M., Chib, A., & Poveda, S. (2019). A critical narrative approach to openness: The impact of open development on structural transformation. *Information Systems Journal*, *29*(4), 787-810.

Bernardi, R., Constantinides, P., & Nandhakumar, J. (2017). Challenging dominant frames in policies for IS innovation in healthcare through rhetorical strategies. *Journal of the Association for Information Systems*, *18*(2).

Brooke, C. (2002). What does it mean to be "critical" in IS research? *Journal of Information Technology*, *17*(2), 49-57.

Bygstad, B. (2017). Generative Innovation: A comparison of lightweight and heavyweight IT. *Journal of Information Technology*, *32*(2), 180-193.

Bygstad, B., & Hanseth, O. (2016). Governing e-health infrastructures: Dealing with tensions. *Proceedings of the International Conference on Information Systems*.

Bygstad, B., & Hanseth, O. (2018). Transforming Digital Infrastructures through Platformization. *Proceedings of the European Conference of Information Systems*.

Bygstad, B., & Øvrelid, E. (2020). Architectural alignment of process innovation and digital infrastructure in a high-tech hospital. *European Journal of Information Systems*, *29*(3), 220-237.

Christensen, T., & Grimsmo, A. (2005). Development of functional requirements for electronic health communication: Preliminary results from the ELIN project. *Informatics in Primary Care*, *13*(3), 203-208.

Ciborra, C., et al. (2000). *From control to drift: The dynamics of corporate information infrastructures*. Cambridge University Press.

Constantinides, P. (2013). The communicative constitution of IT innovation. *Information and Organization*, *23*(4), 215-232.

Constantinides, P., & Barrett, M. (2014). Information infrastructure development and governance as collective action. *Information Systems Research*, *26*(1), 40-56.

Cousins, M., & Hussain, A. (1984). *Michel Foucault*. St. Martins Press.

Currie, W. L., & Guah, M. W. (2007). Conflicting institutional logics: A national programme for it in the organisational field of healthcare. *Journal of Information Technology*, *22*, 235-247.

Davies, L., & Mitchell, G. (1994). The dual nature of the impact of IT on organizational transformation. *Proceedings of the IFIP WG8.2 Working Conference on Information Technology and New Emergent Forms of Organizations* (pp. 243-261).

de Reuver, M., Sørensen, C., & Basole, R. C. (2018). The digital platform: A research agenda. *Journal of Information Technology*, *33*(2), 124-135.

Deetz, S. (1998). Discursive formations, strategized subordination and self-surveillance. In A. S. McKinley & K. P. Starkey (Eds.), *Foucault,*

*management and organization theory: From panoptic on to technologies of self* (pp. 151-172). SAGE.

Doolin, B. (2002). Enterprise discourse, professional identity and the organizational control of hospital clinicians. *Organization Studies*, *23*(3), 369-390.

Doolin, B. (2004). Power and resistance in the implementation of a medical management information system. *Information Systems Journal*, *14*(4), 343-362.

Doolin, B., Grant, D., & Thomas, R. (2013). Translating translation and change: Discourse-based approaches. *Journal of Change Management*, *13*(3), 251-265.

Dreyfus, H., & Rabinow, P. (1983). *Michel Foucault: Beyond structuralism and hermeneutics* (2nd ed.). University of Chicago Press.

Drucker, P. (2007). *Management challenges for the 21st century*. Routledge.

Edenius, M. (2003). Discourse on e-mail in use. *Proceedings of the IFIP TC8 / WG8.2 Working Conference on Global and Organizational Discourse about Information Technology* (pp. 73-89).

Elder-Vass, D. (2011). The causal power of discourse. *Journal for the Theory of Social Behaviour*, *41*(2), 143-160.

Ellingsen, G., & Monteiro, E. (2003). Big is beautiful: Electronic patient records in large Norwegian hospitals 1980s-2001. *Methods of Information in Medicine, 42*(4), 366-370.

Ellingsen, G., & Monteiro, E. (2008). The organizing vision of integrated health information systems. *Health Informatics Journal*, *14*(3), 223-236.

Erl, T. (2005). *Service-oriented architecture: Concepts, technology, and design*. Prentice Hall

European Commission. (2013). *Benchmarking deployment of eHealth among general practitioners (2013).* European Union.

Ezzamel, M., & Willmott, H. (2008). Strategy as Discourse in a Global Retailer: A Supplement to Rationalist and Interpretive Accounts. *Organization Studies*, *29*(2), 191-217.

Ford, J., & Ford, L. (1995). The role of conversations in producing intentional change in organizations. *Academy of Management Review*, *20*(3), 541-570.

Foucault, M. (1989). *The birth of the clinic*. Routledge.

Foucault, M. (2002). *Archaeology of knowledge* (2nd ed.). Routledge.

Friberg-Fernros, H., & Schaffer, J. K. (2014). The consensus paradox: Does deliberative agreement impede rational discourse? *Political Studies*, *62*(S1), 99-116.

Galliers, R. D. (2020). On confronting some of the common myths of information: Systems strategy discourse. In R. Mansell, C. Avgerou, D. Quah and R. Silverstone (Eds.), *Strategic Information Management* (5th ed., pp. 225-243). Routledge.

Gidlund, K. L. (2015). Three egoverments living happily ever after: Discursive tensions and conflicting epistemic cultures in the development of public e-services. *International Journal of Electronic Government Research*, *11*(3), 43-56.

Grant, D., Hardy, C., Oswick, C., & Putnam, L. L. (2004). Introduction: Organizational discourse: Exploring the field. In D. Grant, C. Hardy, C. Oswick, & L. L Putnam (Eds.), *The SAGE Handbook of Organizational Discourse* (pp. 1-37). SAGE.

Greenhalgh, T., Procter, R., Wherton, J., Sugarhood, P., & Shaw, S. (2012). The organising vision for telehealth and telecare: Discourse analysis. *BMJ Open*, *2*(4), e001574.

Greenhalgh, T., Stramer, K., Bratan, T., Byrne, E., Hinder, S., & Potts, H. (2010). *The devil's in the detail: Final report of the independent evaluation of the Summary Care Record and HealthSpace programmes.* London University College.

Grossmann, C., Powers, B., & McGinnis, J. M. (Eds.). (2011). *Digital infrastructure for the learning health system: The Foundation for continuous improvement in health and health care—Workshop series summary*. Institue of Medicine of the National Academies.

Hall, S., & Gieben, B. (1992). *Formations of modernity*. Blackwell.

Hansen, S., Berente, N., & Lyytinen, K. (2009). Wikipedia, critical social theory, and the possibility of rational discourse. *The Information Society*, *25*(1), 38-59.

Hanseth, O., & Lyytinen, K. (2010). Design theory for dynamic complexity in information infrastructures: The case of building internet. *Journal of Information Technology*, *25*, 1-19.

Hardy, C., & Thomas, R. (2014). Strategy, discourse and practice: The intensification of power.

*Journal of Management Studies*, *51*(2), 320-348.

Hardy, C., & Thomas, R. (2015). Discourse in a material world. *Journal of Management Studies*, *52*(5), 680-696.

Harvey, L. (1998). Visibility, silencing, and surveillance in an IT needs analysis project. *Proceedings of the IFIP WG8.2 & WG8.6 Joint Working Conference on Information Systems: Current Issues and Future Changes* (pp. 131-148).

Hellberg, S., & Johansson, P. (2017). eHealth strategies and platforms—The issue of health equity in Sweden. *Health Policy and Technology*, *6*(1), 26-32.

Henfridsson, O., & Bygstad, B. (2013). The generative mechanisms of digital infrastructure evolution, *37*(3), 907-931.

Henfridsson, O., Nandhakumar, J., Scarbrough, H., & Panourgias, N. (2018). Recombination in the open-ended value landscape of digital innovation. *Information and Organization*, *28*(2), 89-100.

Herfindal, S. (2004). *Veien frem til sykehusreformen: En studie av beslutningsprosessen bak lov om helseforetak* (Rapport 5-2004; Bergen: Rokkansenteret). Available at https://docplayer.me/7185635-Veien-frem-til-sykehusreformen.html

Hillestad, R., Bigelow, J., Bower, A., Girosi, F., Meili, R., Scoville, R., & Taylor, R. (2005). Can electronic medical record systems transform health care? Potential health benefits, savings, and costs. *Health Affairs*, *24*(5), 1103-1117.

Huang, J., Henfridsson, O., Liu, M. J., & Newell, S. (2017). Growing on steroids: Rapidly scaling the user base of digital ventures through digital innovaton. *MIS Quarterly*, *41*(1), 301-314.

Introna, L. D. (2003). Disciplining information systems: Truth and its regimes. *European Journal of Information Systems*, *12*(3), 235-240.

Klecun, E. (2016). Transforming healthcare: Policy discourses of IT and patient-centred care. *European Journal of Information Systems*, *25*(1), 64-76.

Klein, S., & Schellhammer, S. (2017). Medication infrastructure development in Germany. In M. Aanestad, M. Grisot, O. Hanseth, & P. Vassilakopoulou (Eds.), *Information infrastructures within European health care: Working with the installed base* (pp. 151-170). Springer.

Knights, D. (1990). Subjectivity, power and the labour process. In D. Knights & H. Willmott (Eds.), *Labour process theory* (pp. 297-335). Palgrave Macmillan.

Knights, D., & Vurdubakis, T. (1994). *Foucault, power, resistance and all that* (pp. 167-198). Routledge.

Lystbäk, C., Holmgren, J., & Friis, O. (2017). Strategy Discourse in public sector organizations: A qualitative focus group study. *International Public Management Review*, *18*(1), 21-44.

Lyytinen, K., & Hirschheim, R. (1988). Information systems as rational discourse: An application of Habermas's theory of communicative action. *Scandinavian Journal of Management*, *4*(1), 19-30.

Mantere, S., & Vaara, E. (2008). On the problem of participation in strategy: A critical discursive perspective. *Organization Science*, *19*(2), 341-358.

Marshall, S. (2023). Navigating COVID-19 linguistic landscapes in Vancouver's North Shore: Official signs, grassroots literacy artefacts, monolingualism, and discursive convergence. *International Journal of Multilingualism*, *20*(2), 189-213.

Monod, E., Truex, D., & Baskerville, R. (2003). The discourse of a large scale organizational transformation: The reengineering of IBM, 1989-1994. *Proceedings of the IFIP TC8 / WG8.2 Working Conference on Global and Organizational Discourse about Information Technology* (pp. 249-272).

Nambisan, S., Lyytinen, K., & Yoo, Y. (2020). *Handbook of digital innovation*. Edward Elgar.

Norwegian Ministry of Health. (2018). *Konseptvalgutredning. Nasjonal løsning for kommunal helse- og omsorgstjeneste*.

Norwegian Ministry of Health. (1999). *NOU 1999:15. Hvor nært skal det være?* https://www.regjeringen.no/no/dokumenter/nou-1999-15/id141741/

Norsk Sykepleierforbund & KS. (2011). *ELIN-k prosjektet—Sluttrapport* [Project-report]. https://omsorgsforskning.brage.unit.no/omsorgsforskning-xmlui/handle/11250/2487379?show=full&locale-attribute=en

OECD. (2018). *Health in the 21st century: Putting data to work for stronger health systems*. https://www.oecd.org/publications/health-in-the-21st-century-e3b23f8e-en.htm

Oliver, D., & Oliver, L. (2003). ERP adoption: Selling the system. *Proceedings of the IFIP TC8 / WG8.2 Working Conference on Global and Organizational Discourse about Information Technology* (pp. 507-523).

Øvrelid, E., & Bygstad, B. (2016). Extending e-health infrastructures with lightweight IT. In U. Lundh Snis (Ed.), *Nordic contributions in IS research* (pp. 43-56). Springer.

Øvrelid, E., & Bygstad, B. (2019). The role of discourse in transforming digital infrastructures. *Journal of Information Technology*, *34*(3), 221-242.

Paroutis, S., & Heracleous, L. (2013). Discourse revisited: Dimensions and employment of first-order strategy discourse during institutional adoption. *Strategic Management Journal*, *34*(8), 935-956.

Pettigrew, A. (1986). *The management of strategic change*. King Edward's Hospital Fund

Pollock, N., & Williams, R. (2010). The business of expectations: How promissory organizations shape technology and innovation. *Social Studies of Science*, *40*(4), 525-548.

Rabinow, P. (1984). *The Foucault Reader*. Pantheon

Radford, G. P. (2003). Trapped in our own discursive formations: Toward an archaeology of library and information science. *The Library Quarterly, 73*(1), 1-18.

Regjeringen. (2014). *Utredning av en innbygger en journal.* https://www.regjeringen.no/contentassets/355890dd2872413b838066702dcdad88/ikt_utford ringsbilde_helse_omsorgssektoren.pdf

Accessed March 2022. Riksrevisjonen. (2008). *Riksrevisjonens undersøkelse om IKT i sykehus og elektronisk samhandling i helsetjenesten* [Sak]. Kontroll- og konstitusjonskomiteen. https://www.stortinget.no/no/Saker-og-publikasjoner/Saker/Sak/?p=40113

Rolland, K. H., Mathiassen, L., & Rai, A. (2018). Managing digital platforms in user organizations: The interactions between digital options and digital debt. *Information Systems Research*, *29*(2), Article 2.

Rose, J., & Kræmmergaard, P. (2003). Dominant technological discourses in action: Paradigmatic shifts in sense making in the implementation of an ERP system. *Proceedings of the IFIP TC8 / WG8.2 Working Conference on Global and Organizational Discourse about Information Technology* (pp. 437-462).

Ross, J. W., Beath, C. M., & Mocker, M. (2019). *Designed for digital: How to architect your business for sustained success*. MIT Press.

Sætre, A. S., & Van de Ven, A. (2021). Generating theory by abduction. *Academy of Management Review*, *46*(4), 684-701.

Sauer, C., & Willcocks, L. (2007). Unreasonable expectations—NHS IT, Greek choruses and the games institutions play around mega-programmes. *Journal of Information Technology*, *22*(3), 195-201.

Schaanning, E. (2000). *Fortiden i våre hender—Foucault som vitenshåndtør. Bind 1 Teoretisk praksis*. Unipub.

Svahn, F., Mathiassen, L., & Lindgren, R. (2017). Embracing digital innovation in incumbent firms: How Volvo Cars managed competing concerns. *MIS Quarterly*, *41*(1), 239-253.

Swanson, E. B. (2003). Talking the IS innovation walk. *Proceedings of the IFIP TC8 / WG8.2 Working Conference on Global and Organizational Discourse about Information Technology* (pp. 15-31).

Swanson, E. B., & Ramiller, N. C. (1997). The organizing vision in information systems innovation. *Organization Science*, *8*(5), 458-474.

Timmermans, S., & Tavory, I. (2012). Theory construction in qualitative research: From grounded theory to abductive analysis. *Sociological Theory*, *30*(3), 167-186.

Tiwana, A. (2013). *Platform ecosystems: Aligning architecture, governance, and strategy*. Newnes.

Trusson, C. R., Doherty, N. F., & Hislop, D. (2014). Knowledge sharing using IT service management tools: Conflicting discourses and incompatible practices. *Information Systems Journal*, *24*(4), 347-371.

Wastell, D. G. (2003). Organizational discourse as a social defense: Taming the tiger of electronic government. *Proceedings of the IFIP TC8 / WG8.2 Working Conference on Global and Organizational Discourse about Information Technology* (pp. 179-195).

Wessel, L., Baiyere, A., Ologeanu-Taddei, R., Cha, J., & Blegind-Jensen, T. (2021). Unpacking the difference between digital transformation and IT-enabled organizational transformation. *Journal of the Association for Information Systems*, *22*(1), 109-129.

Westrup, C. (2003). Discourse, Management Fashions, and ERP Systems. *Proceedings of the IFIP TC8 / WG8.2 Working Conference on Global and Organizational Discourse about Information Technology* (pp. 401-418).

WHO. (2019). *WHO guideline recommendations on digital interventions for health system strengthening*. World Health Organization.

Wynn, E., Whitley, E., Myers, M., & Gross, J. (Eds.). (2003). *Global and organizational discourse about information technology.* Boston Kluwer Academic.

Yeow, A., Soh, C., & Hansen, R. (2018). Aligning with new digital strategy: A dynamic capabilities approach. *The Journal of Strategic Information Systems*, *27*(1), 43-58.

# Appendix A: Literature Categorized Chronologically

## Table A1. Discourse as Power

- Knights, D. (1990). Subjectivity, power and the labour process. In D. Knights & H. Willmott (Eds.), *Labour process theory, studies in the labour process* (pp. 297-335). Palgrave Macmillan.
- Davies, L., & Mitchell, G. (1994). The dual nature of the impact of IT on organizational transformation. In *Proceedings of the IFIP WG8.2 Working Conference on Information Technology and New Emergent Forms of Organizations* (pp. 243-261).
- Knights, D., & Vurdubakis, T. (1994). *Foucault, power, resistance and all that.* Routledge
- Harvey, L. (1998). Visibility, silencing, and surveillance in an IT needs analysis project. *Proceedings of the IFIP WG8.2 & WG8.6 Joint Working Conference on Information Systems: Current Issues and Future Changes* (pp. 131-148).
- Doolin, B. (2002). Enterprise discourse, professional identity and the organizational control of hospital clinicians. *Organization Studies*, *23*, 369-390.
- Edenius, M. (2003). Discourse on e-mail in use. *Proceedings of the IFIP TC8 / WG8.2 Working Conference on Global and Organizational Discourse about Information Technology* (pp. 73-89).
- Ellingsen, G., & Monteiro, E. (2003). Big is beautiful: electronic patient records in large Norwegian hospitals 1980s-2001. *Methods of Information in Medicine*, *42*(4), 366-370.
- Introna, L. D. (2003). Disciplining information systems: Truth and its regimes. *European Journal of Information Systems, 12*(3), 235-240.
- Monod, E., Truex, D., & Baskerville, R. (2003). The discourse of a large scale organizational transformation: The reengineering of IBM, 1989-1994. *Proceedings of the IFIP TC8 / WG8.2 Working Conference on Global and Organizational Discourse about Information Technology* (pp. 249-272).
- Oliver, D., & Oliver, L. (2003). ERP Adoption: Selling the system. *Proceedings of the IFIP TC8 / WG8.2 Working Conference on Global and Organizational Discourse about Information Technology* (pp. 507-523).
- Rose, J., & Kræmmergaard, P. (2003). Dominant technological discourses in action: Paradigmatic shifts in sense making in the implementation of an ERP system. *Proceedings of the IFIP TC8 / WG8.2 Working Conference on Global and Organizational Discourse about Information Technology* (pp. 437-462).
- Swanson, E. B. (2003). Talking the IS innovation walk. *Proceedings of the IFIP TC8 / WG8.2 Working Conference on Global and Organizational Discourse about Information Technology* (pp. 15-31).
- Wastell, D. G. (2003). Organizational discourse as a social defense: Taming the tiger of electronic government. *Proceedings of the IFIP TC8 / WG8.2 Working Conference on Global and Organizational Discourse about Information Technology* (pp. 179-195).
- Westrup, C. (2003). Discourse, management fashions, and ERP systems. *Proceedings of the IFIP TC8 / WG8.2 Working Conference on Global and Organizational Discourse about Information Technology* (pp. 401-418).
- Doolin, B. (2004). Power and resistance in the implementation of a medical management information system. *Information Systems Journal*, *14*(4), 343-362.
- Ezzamel, M., & Willmott, H. (2008). Strategy as discourse in a global retailer: A supplement to rationalist and interpretive accounts. *Organization Studies 29*(2), 191-217.
- Mantere, S. & Vaara, E. (2008). On the problem of participation in strategy: A critical discursive perspective. *Organization Science, 19*(2), 341-358.
- Baskerville, R. L., Myers, M. D. (2009). Fashion waves in information systems research and practice. *MIS Quarterly*, *33*(4)*, 647-662.
- Doolin, B., Grant, D., & Thomas, R. (2013). Translating translation and change: Discourse-based approaches. *Journal of Change Management, 13*(3), 251-265.
- Paroutis, S., & Heracleous, L. (2013). Discourse revisited: Dimensions and employment of first-order strategy discourse during institutional adoption. *Strategic Management Journal, 34*(8), 935-956.
- Hardy, C., & Thomas, R. (2014). Strategy, discourse and practice: The intensification of power. *Journal of Management Studies 51*(2), 320-348.
- Trusson, C. R., Doherty, N. F., & Hislop, D. (2014). Knowledge sharing using IT service management tools: conflicting discourses and incompatible practices. *Information Systems Journal, 24*(4), 347-371.
- Gidlund, K. L. (2015. Three egovernments living happily ever after: Discursive tensions and conflicting epistemic cultures in the development of public e-services. *International Journal of Electronic Government Research*, *11*(3), 43-56.

- Hardy, C. & Thomas, R. (2015). Discourse in a material world. *Journal of Management Studies, 52*(5), 680-696.
- Klecun, E. (2016). Transforming healthcare: policy discourses of IT and patient-centred care. *European Journal of Information Systems*, 25(1), 64-76.
- Arribas-Ayllon, M., & Walkerdine, V. (2017). Foucauldian discourse analysis. In C. Willig & W. S. Rogers (Eds.), *The SAGE handbook of qualitative research in psychology* (pp.110-123). SAGE.
- Bentley, C. M., Chib, A., & Poveda, S. (2019). A critical narrative approach to openness: The impact of open development on structural transformation. *Information Systems Journal, 29*(4), 787-810.

## Table A2. Discourse as Consensus

- Lyytinen, K. & Hirschheim, R. (1988). Information systems as rational discourse: an application of Habermas's theory of communicative action. *Scandinavian Journal of Management, 4*(1), 19-30.
- Ford, J. & Ford, L. (1995. The role of conversations in producing intentional change in organizations. *Academy of Management Review*, 20(3), 541-570.
- Swanson, E. B., & Ramiller, N. C. (1997). The organizing vision in information systems innovation. *Organization Science*, 8(5), 458-474.
- Brooke, C. (2002). What does it mean to be "critical" in IS research? *Journal of Information Technology, 17*(2), 49-57.
- Sauer, C., & Willcocks, L. (2007). Unreasonable expectations—NHS IT, Greek choruses and the games institutions play around mega-programmes. *Journal of Information Technology, 22*(3), 195-201.
- Hansen, S., Berente, N., & Lyytinen, K. (2009). Wikipedia, critical social theory, and the possibility of rational discourse. *The Information Society, 25*(1), 38-59.
- Friberg-Fernros, H., & Schaffer, J. K. (2014). The consensus paradox: Does deliberative agreement impede rational discourse? *Political Studies, 62*(s1), 99-116.
- Klein, S., & Schellhammer, S. (2017). Medication infrastructure development in Germany. In M. Aanestad, M. Grisot, O. Hanseth, & P. Vassilakopoulou (Eds.), *Information infrastructures within European health care: Working with the installed base, health informatics* (pp. 151-170). Springer.

## Table A3. Discourse as Strategy

- Currie, W. L., & Guah, M. W. (2007). Conflicting institutional logics: A national programme for IT in the organisational field of healthcare. *Journal of Information Technology*, 22, 235-247.
- Greenhalgh, T., Procter, R., Wherton, J., Sugarhood, P., & Shaw, S. (2012). The organising vision for telehealth and telecare: discourse analysis. *BMJ Open 2*(4), Article e001574.
- Barrett, M., Heracleous, L., & Walsham, G. (2013. A rhetorical approach to IT diffusion: Reconceptualizing the ideology-framing relationship in computerization movements. *MIS Quarterly, 37*(1), 201-220.
- European Commission (2013). *Networks content & technology. Benchmarking deployment of eHealth among general practitioners—final report.* European Union.
- Bernardi, R., Constantinides, P., & Nandhakumar, J. (2017). Challenging dominant frames in policies for IS innovation in healthcare through rhetorical strategies. *Journal of the Association for Information Systems, 18*. https://doi.org/10.17705/1jais.00451
- Hellberg, S., & Johansson, P. (2017). eHealth strategies and platforms—The issue of health equity in Sweden. *Health Policy and Technology*, 6(1), 26-32.
- Lystbäk, C., Holmgren, J., & Friis, O. (2017). Strategy Discourse in public sector organizations: A qualitative focus group study. *International Public Management Review, 18*(1), 21-44.
- OECD (2018). *Health in the 21st century: Putting data to work for stronger health systems.* https://www.oecd.org/publications/health-in-the-21st-century-e3b23f8e-en.htm.
- Norwegian Ministry of Health. (2018). *Konseptvalgutredning. Nasjonal løsning for kommunal helse- og omsorgstjeneste*.

# Appendix B: Explanation for Table 3, Steps 1-4

**Definitions:** Iterations are rounds of processing to identify key events and key entities based on the researcher's knowledge, empirical data, and new data.

**Coding** is used to describe the concrete empirical and theoretical use of concepts and how they are connected to data harvested from the research setting.

**Step 1:** Number of iterations to identify key events: 5. Participants: All three researchers.

**Artifact:** Textual description and Figure 1.

- Iteration 1: Main focus was on three key events, on one level: reform/state takeover (2002), digital renewal (2011), and end of digital renewal (2017).
- Iteration 2: A new key event: The portal project. (2008-2011). Concept labeling of the period after digital renewal as innovation.
- Iteration 3: Implementation of three levels: National discourse—e-health programs, regional infrastructure. Discourse is mainly operating at the macrolevel. Program shifts are identified as important indicators of change.
- Iteration 4: Discourses operated on all three levels and were labeled as macro- or microdiscourses.
- Iteration 5: Programs emerged when macro- and microdiscourses converged. Empirically, this happened when a prominent discourse addresseed concrete challenges in the infrastructure, and the infrastructure had building blocks or modules that could connect/adapt to the macrodiscourse. The last program was reconceptualized as an "emerging ecosystem".

**Step 2:** Rounds of coding, participants: all three researchers, Researcher 1 was the main responsible for creating the fundament for discussion.

- Iteration 1: Two rounds of coding.
  - First: Found a starting point for the timeline, identify earlier research, documents.
  - Second: Identified important events within the selected range.
- Iteration 2: Two rounds of coding.
  - First: Added new emerging events identified during reinvestigation of earlier empirical work.
  - Second: Conceptualized each period in accordance with the dominant concept used in each period. This was done both by using a spreadsheet to identify dominant national discourses and identifying the dominant discourses derived from empirical investigations.
- Iteration 3: Two rounds of coding
  - First: Differentiated between three levels, and suggest program shifts as crucial indicators of change: suggested by Researchers 1 and 2.
  - Second: Researcher 3 accepted this following discussion and added details regarding the first period.
- Iteration 4: Two rounds of coding
  - First: Discourses operated on all three levels and were labeled as macro- or microdiscourses: as suggested by Researchers 1 and 2. Researcher 1 proposed that discourses on the two levels were different and gave examples from documents, empirical work, and articles. Researchers 2 and 3 agreed and responded by giving further examples that documented the phenomena.
  - Second: Researcher 3 proposed that change happened when central actors were in strict decision-making mode. Researchers 1 and 2 proposed that "offensive discourses" may occur after change is initiated. Researcher 3 agreed after some discussion.
- Iteration 5: Two rounds of coding
  - First: Researchers 1 and 2 proposed that programs emerged when macro- and microdiscourses converged. R3 accepted this after discussion
  - Second: Researchers 2 and 3 suggested that the Foucauldian framework needed to be expanded and clarified in the empirical part of the paper.

**Step 3:** Abduction and evaluation of framework. Demonstration of the use of framework (precondition: discourse was established as a central tool to analyze e-health—Steps 1 and 2.). Participants: all three researchers.

- Iteration 1: The three researchers agreed that existing literature had shortcomings regarding the analyis of discourses in e-health. Several theories were debated, such as theories on platformization, assemblages, and ANT. All three researchers were familiar with digital infrastructure theory and suggested viewing discourses as an infrastructural phenomenon.
- Iteration 2: Researcher 1 suggested that Foucault's "discursive formation" could grasp discourse as an infrastructural phenomenon. Competing theories from Habermas were suggested. While Habermas emphasized the moral and political obligations in the use of discourse, Foucault was more occupied with the empirical complexity in which discourse participates to create and maintain professional knowledge. The framework was revised several times based on feedback from colleagues in seminars, and debates among the researchers.
- Iteration 3: Discursive formations were applied in a structural way to demonstrate how discourses converge and create new structural elements. Are programs discursive formations?
- Iteration 4: Several rounds of detailing followed and reviewers' feedback became important. Empirical data was used to demonstrate the validity of the framework.
- Iteration 5: Reviewers urged the authors to better distinguish between empirical findings and theoretical analyses. We "cleaned" Section 5 of theoretical concepts. Section 6 was introduced, where the discourse lens was applied to analyze the empirical data.

  Reviewers urged us to be more precise about the shift patterns. We consulted our data once again and revisited the drawing board. We found that there were gradual processes of interaction leading to discourse convergence. When programs experienced difficulties, the macro- and microdiscourses intensified. There was common agreement that improvements in the program were required. There was a *connection* between the parties. The search for and evaluation of solutions proceeded. We referred to this as *matching* since there was an exchange of arguments between the parties. When a solution was identified and agreed upon, the micro- and macrodiscourse agreed upon a new solution. We referred to this as *merging*. Connection, matching, and merging led to *discourse convergence* and a new discursive formation emerged. We illustrated these processes in a new Figure 2.

- Iteration 6: discursive formations were contextualized in digital infrastructures, through three phases. Figure 2 was modified, and Section 6 was updated.

**Step 4:** Theorizing shift patterns. All researchers

- Iteration 1: Compared theoretical framework with existing theory in IS. Several rounds of debate.
- Iteration 2: The discussion section was mostly theoretical: added empirical practical insight. Several rounds of adjustment and correction.
- Iteration 3: Improvement and clarifications regarding the contribution was required. The authors extended Section 7

## About the Authors

**Egil Øvrelid** is an associate professor of informatics at the Department of Informatics, University of Oslo. He has a PhD degree in information systems, a master's degree in informatics, and another in the history of ideas. His main interest is digital innovation in the health and financial sectors, and the relationship between digitalization, IS, and organizational change. He is also interested in IS research methods—in particular, the methodological implications of critical realism. His preferred empirical approach is longitudinal process research. He has publications in top journals like *Journal of Information Technology* and *European Journal of Information Systems*

**Bendik Bygstad** is a sociologist who is currently a professor in the Department of Informatics, University of Oslo, and an adjunct professor at the Norwegian School of Economics. His main research interests are digital innovation and the relationship between IS and organizational change. He is also interested in IS research methods—in particular, the methodological implications of critical realism. His preferred empirical approach is longitudinal process research, and he has published articles in *MIS Quarterly, Information Systems Journal, Journal of Information Technology, Information Systems Frontiers,* and *Information & Organization*.

**Ole Hanseth** is a professor in the Department of Informatics at the University of Oslo. His research focuses mainly on the processes of emergence and the evolution of digital platforms and infrastructures. His research has been published in journals such as *MIS Quarterly, Journal of the Association for Information Systems, European Journal of Information Systems, Journal of Information Technology, Computer Supported Cooperative Work,* and *Science, Technology, & Human Values*.