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The practices of data-based governance: German school supervision, professionalism and datafied structurations[1]

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Abstract

With the international rise of data-based education governance, Germany has equally seen an increasing prevalence of data in school governance. This includes the datafication of school supervision ('Schulaufsicht') which supports and simultaneously controls schools. The study explores how school supervisors' practices are (in-)formed by their datafied structurations (such as platforms, data overviews, etc.) and their professional self-perceptions. The article draws on qualitative interviews with ten school supervisors in four German states. The findings suggest that datafied structurations are widely used and influential (especially with regards to quality assurance meetings). At the same time, the supervisors continuously re-contextualize and qualify the datafied structuration. Furthermore, the interviewees highlight the importance of other knowledge sources and a trusting relationship between schools and school supervisors. In general, how datafied structurations influence supervisory practices depends highly on how supervisors perceive their profession.

1. Introduction

In Germany, the school system falls primarily under the supervision of the sixteen federal states. The state-level school supervision authority ('Schulaufsicht') is responsible for both ensuring educational quality and supporting the development of schools. Similar to many other countries around the world, the German school (supervision) system has seen an increasing prevalence of data-based (or 'evidence-based') rationales (Thiel et al., 2019; 'test-based accountability', Verger, Fontdevila & Parcerisa, 2019). This extensive implementation and usage of data infrastructures to inform decision-making is a form of 'datafication' (Hartong, 2018a). Particularly

over recent years, these data infrastructures – e.g., data dashboards to monitor school statistics or performance – have become increasingly optimized and refined. This includes the growing integration of platforms to make school monitoring data more easily accessible for governance purposes or by the wider public (Landri, 2018; Hartong, 2020; Gorur & Arnold, 2021; see also Decuypere, Grimaldi & Landri, 2021).

This growing reliance on data is affecting the practices of German school supervisors, which are the focus of this paper. However, in Germany, platforms are only one of several ways to present and structure data (Hartong, Förschler & Dabisch, 2021). School supervisors also rely on PDF data overviews, questionnaires, data tables and dashboards to get an impression of their schools. To capture this diversity, I choose the term 'datafied structurations,' i.e., (primarily) digital tools of ordering and visualizing school data. Conceptually, these datafied structurations are socio-technical combinations of material instruments and their underlying ideas and values ('assemblages', Kitchin & Dodge, 2014 or 'thinking infrastructures', Bowker et al., 2019).

While the adoption of such datafied structurations often reflects a desire to make decision-making more objective, data(-fied structurations) themselves are not neutral (see Williamson, 2016). Instead, they structure attention and powerfully shape what governing actors (such as school supervisors) get to see; in turn influencing which aspects of school reality they can act upon (Hardy & Lewis, 2018). For example, data dashboards focus users' attention in particular ways, prioritize certain (readings of) data and provoke particular forms of decision-making (Hartong, 2020).

While datafied structurations consequently hold a substantial amount of regulative power, research has shown that they do not simply determine decision-making practices, as people are not "passive subjects, disciplined ... in linear and unproblematic ways" (Kitchin & Dodge, 2014, p. 19). Rather, it is crucial to consider the multiple ways in which such structurations are continuously enacted by professionals (in this case school supervisors), and influence decision-making processes (Decuypere et al., 2021; Förschler, Hartong, Kramer, Meister-Scheytt & Junne, 2021).

Following this line of argumentation, this paper empirically investigates how datafied structurations become enacted in German school supervision practices and the role played by different professional self-perceptions, given the inherent tension between support and control in school supervision (Klein & Bremm, 2020). As I will show, datafied structurations are widely used and influential but, at the same time, ongoingly re-contextualized and qualified by supervisors. An analysis of the large variance in datafied structurations between states additionally highlights the impact of more managerial or supportive professional self-perceptions and differential perceptions of data-based supervision. By centering the practices of school supervisors

and not the datafied structurations, in my study, I adopt a somewhat different perspective than other studies that seek to understand the datafication or platformization of education from the viewpoint of specific technologies, their production or composition (e.g., 'MySchool', Gorur, 2013; 'Scuola in Chiaro', Landri, 2018; 'OneSchool', Clutterbuck, 2020; see also Hartong & Förschler, 2019; Perrotta, Gulson, Williamson & Witzenberger, 2021).

Critical data studies in education often emphasize an investigation of teachers or principals (e.g., Holloway & Brass, 2018; Lewis & Holloway, 2019; Perrotta et al., 2021), including their (potential) de-/re-professionalization (Brass & Holloway, 2021). By contrast, the impact of datafication on actors in state agencies has often remained out of scope (except for data practices in central offices in the US, see Park & Datnow, 2009; Coburn & Turner, 2012; Honig & Venkateswaran, 2012). This mirrors a general lack of research into the specific role of school supervisors in school governance in Germany (Lengen, 1988; Brüsemeister & Newiadomsky, 2008; for an exception, see Klein & Bremm, 2020) and seems particularly salient given the growing relevance of data dashboards and platforms (see Thiel et al., 2019; Hartong, 2020; Hartong, Breiter, Jarke & Förschler, 2020).

Methodologically, the study presented in this paper follows an explorative approach, based on interviews with ten German school supervisors. The school supervisors were located in four different German states and, given the large heterogeneity of datafication between the states (Hartong et al., 2020), are provided with notably different datafied structurations. The first goal of the study is to understand what these different structurations look like – that is, to understand how data infrastructures manifest empirically in different state contexts. Secondly, and most prominently, the study explores how datafied structurations and supervisors' professional self-perceptions (in-)form the realities of school supervision practice in Germany. The paper is thus mostly interested in how a variety of datafied structurations are integrated into the professional practices of school supervisors and their regulative consequences. The research questions explored in this paper are as follows:

1) How are datafied structurations enacted in school supervisors' professional practices? Specifically:
   a) What are more general effects of datafied structurations on professional practices?
   b) How do varying combinations of datafied structurations interact with professional self-perceptions and practice?

The remaining parts of this contribution are as follows: First, I focus on the global expansion and enactment of educational data and the impact of data on educational professions (section 2). Next, I provide an overview of the institutional structures of

school supervision in Germany, their inherent professional tensions and the shift towards increasingly data-based governance in Germany. After presenting the methods, in the fifth section, I present a short overview of the datafied structurations present in the supervisory contexts under study and key findings from interviews with school supervisors regarding the interaction between datafied structurations, supervisory practices and their professional self-perceptions. The contribution ends with a concluding discussion.

2. Framing the study: Critical perspectives on the datafication of educational professions

In hopes of improving education, countries around the world have increasingly turned to data to govern schools, with digital data being "touted as a potential panacea for many current educational challenges" (Selwyn, 2015, p. 67). In the wake of these changes, a range of research in critical data studies has started to investigate how such data increasingly matter for education governance (Williamson, 2016), including their effects on educational professions. As such studies show, data – or datafied structurations, as framed in this paper – require complex processes of valuation and relation-making, which are often invisible in the final product (Hartong & Förschler, 2019). Although such datafied structurations are often "promoted as an objective and data-led augmentation to the conventional school inspection by expert inspectors" (Williamson, 2016, p. 130), researchers highlight that such quantified representations of reality remove context (Piattoeva, 2021) and caution against an approach "where complex (and unsolvable) social problems associated with education can be seen as complex (but solvable) statistical problems" (Selwyn, 2015, p. 72).

Particularly in Anglo-Saxon school systems, which nowadays rely heavily on numerical data as markers of educational success and which are more open to 'high-stakes' accountability (i.e., linking (performance) data/large-scale assessments to consequences; Verger et al., 2019), research indicates a data-based *de-* or *re-*professionalization of the teaching profession (Ball, 2016). At the same time, scholars emphasize that datafication does not *directly* determine practice. Instead, such policy pressures are always *enacted* by actors on the ground (Landri, 2021). For example, focusing on individual teachers or schools, researchers observe varying responses from 'passive resistance,' 'cynical compliance' and 'muddling through' to 'begrudging acceptance' and alignment, as well as work-around practices, fabrications, data manipulation and other unintended effects (Thompson & Cook, 2014; Selwyn, Henderson & Chao, 2015; Landri, 2021). Another example of these ambivalences is the coexistence of contradictory logics of critique and acceptance of data (a 'double-

think' of data) in the minds of individual educators, for whom data is "worthless yet important, unnecessary yet indispensable, distracting but beneficial" (Hardy & Lewis, 2017, p. 682).

Focusing on school supervision, past studies on the enactment of data in US school districts show that superintendents and principals rely on a mix of experience, data and intuition, as well as on a trusting environment between schools and supervisory institutions so that data will be implemented meaningfully (Park & Datnow, 2009; Honig & Venkateswaran, 2012). However, in the intervening years, accountability and data pressures have expanded even more, highlighting the difficulty of maintaining such trust in a data- or test-based accountability environment (Sugrue & Mertkan, 2017; Datnow, Lockton & Weddle, 2020). As Holloway and Brass (2018) also highlight, over time, data-based accountability regimes have substantially altered teachers' professional self-perceptions, indicating "a shift in governmentality where objectification, quantification, and measurement are no longer treated as antithetical to teacher professionalism" (p. 380). Similarly, Lewis and Holloway (2019) show how data became part of teachers' professional self-perception and necessary to determining the 'truth' about their practices: "observation rubrics, for instance, became the consummate authority on teaching, which had the effect of marginalising the professional judgement of teachers themselves" (p. 46).

Even though in such cases data became the dominant framework through which to understand and assess teacher quality, this does not necessarily mean that data is always presented in sophisticated datafied structurations such as complex platforms or dashboards. As Selwyn (2022) highlights, in reality, the sophistication of the datafied structurations that 'data-driven' schools rely upon may not actually matter as much in the enactment. He shows how even "relative unsophisticated, pedestrian uses of data" can still lend "a veneer of precision and objectivity to otherwise woolly judgements and subjective decisions" and exert substantial influence on professional practices (ibid., p. 108).

Against the backdrop of research from mainly high-stakes systems with heavily institutionalized data usage, Germany is an interesting case with its traditionally 'low-stakes' approach, highlighting a larger resistance to school rankings and automated consequences attached to data (Verger et al., 2019; Dabisch, Hartong & Nikolai, 2021; Hartong et al., 2021). The following section provides an overview of school supervision in Germany and its professional tensions and highlights the increasing datafication of schooling and its consequences for school supervision.

3. School supervision and increasing datafication in Germany

In Germany, the 16 states are responsible for school supervision, namely the academic, legal and staff supervision of schools in their region ('Fach-, Rechts- und Dienstaufsicht', Avenarius, 2001). This includes monitoring the quality of teaching and education and the lawful operation of schools, as well as regularly supervising teachers, principals and other pedagogical personnel (see Eurydice, 2022). The form of school supervision authorities varies significantly between the 16 German states, from multi-level hierarchies in larger states to a compact school supervision team directly located in the Ministry of Education in city-states (for an overview, see Füssel, 2010).

This study focuses on the so-called 'lower' school supervision that engages directly with schools. These school supervisors at the lower end of the hierarchy are each responsible for supervising a set number of schools (in our sample mostly 10–20 schools per person). They are, on the one hand, the superiors of all school staff and, on the other hand, hierarchically subordinate to the central supervision authority and accountable to the Ministry of Education (Dedering, 2021). Consequently, supervisors have to adhere to political and educational regulations (including those on data usage) and facilitate and control the implementation of education reforms.

Traditionally, lower school supervisors have been experienced teachers, mostly former principals who, after becoming supervisors, then regularly inspected teachers (Hopf, Nevermann & Richter, 1980; Lengen, 1988). Unlike in other countries where supervisors receive special administrative or managing training and oftentimes do not have any work experience in schools (e.g., see Hartong, 2018b, for the US), German school supervisors have been trained mostly on-the-job, their professionality largely being built on their long-term experience as teachers and principals (Bessoth, 1974). As late as the 1950s, school supervisors were often without official offices and were characterized as 'pedagogical decathletes' (i.e., all-rounders, ibid.; Schwab, 1979; Wieth, 2020). Since then, an increasing formalization (or 'bureaucratization') of school supervision has taken place. This included the establishment of local bureaus and regulations, supervision laws and increased paperwork and, starting in the 1970s, an increasing shift of responsibility from supervisors to principals – a development which, however, did not substantially alter the approach to school supervision overall (Hopf et al., 1980; Wieth, 2020).

Still today, school supervision is situated within a ministerial hierarchy and combines the roles of pedagogue, advisor and bureaucrat (Hopf et al., 1980; Kroupka et al., 2019; Wieth, 2020). The simultaneity of these differing roles generates a continuous tension in the school supervision profession. This tension between controlling, administrative logics on the one hand, and advisory, supportive logics on the

other has provoked numerous debates throughout the decades (Poschardt, 1978; Schwab, 1979; Hopf et al., 1980; Lengen, 1988; Dedering, 2021). Historically, studies on school supervisors' self-perception highlight that supervisors view themselves primarily as pedagogues (Bessoth, 1974; Poschardt, 1978; Schwab, 1979). However, there is also a long tradition of criticizing schools (and school supervision) for being overly bureaucratic and in conflict with the pedagogical freedom of teachers (Becker, 1954; Rosenbusch, 1994; Herrmann, 2020).

Since the diversion of responsibility for teacher supervision to principals (starting in the 1970s and accelerating in the 1990s), school supervisors increasingly focus on principals and, then only more indirectly, on their schools (Bessoth, 1974, pp. 48 ff.; Rürup & Heinrich, 2007). As a consequence, some scholars have called for managerial professionalization of school supervisors along the lines of US superintendents (Bessoth, 1974; see Schwab, 1979 for a critique). However, since then, only a few German states have implemented institutionalized and, hence, more standardized professional training for supervisors (see e.g., LISUM, 2018; Tulowitzki, 2019). Consequently, the actual practices of school supervision are still highly dependent on individual supervisors' experiences and their perception of the profession with its inherent tensions between pedagogical, advisory, administrative, supportive, and managerial logics (Bessoth, 1974; Hopf et al., 1980; Gruschka, 2010).

From the late 1990s onwards, the German states further increased individual schools' responsibilities and datafied representations of schools' outputs. While the states vary substantially regarding the design of their data-based governance instruments, there are also commonalities. Partly as a critique of traditional school supervision, many states introduced regular external school inspections ('Schulinspektion,' not to be confused with school supervisors), whereby new intermediary agencies inspect entire schools and write inspection reports (Maritzen, 2008; Heinrich, 2015).

Additionally, the states created new agencies to advise schools and provide teachers with further education courses. After the German PISA results in 2000 surprised negatively ('PISA-Schock'), the states introduced standardized performance testing for all pupils (literacy and numeracy in grade 3 and 8, known as 'VERA') and some states also founded 'quality institutes' to analyze this performance data (Hartong & Förschler, 2019; Diedrich, 2020) and develop data instruments for internal school evaluation (Thiel et al., 2019). With the aim of digitalizing school administration, the states also introduced and continuously expand school administration systems (Hartong et al., 2020). While all these new data infrastructures did not fundamentally change the basic processes of school supervision themselves, their introduction still meaningfully changed the environment of school supervision. Furthermore, with the increasing push towards a datafied (re-)professionalization of teacher training and

school supervision (LISUM, 2018), (performance) data have been gaining traction as means of influencing education professions.

In the wake of this development, schools and school supervision authorities have increasingly been asked to integrate these new data infrastructures into their practices (Thiel et al., 2019). School supervision authorities are provided with reports on varying data types by the Ministry or their 'quality institute.' However, research suggests a lower prevalence of (performance) data-based accountability in German schools, out of line with reformers' hopes (Ramsteck, Muslic, Graf, Maier & Kuper, 2015; Muslic, 2017). Still, teachers report undesirable outcomes of accountability reforms such as 'teaching to the test,' 'cheating' and 'cream skimming' (Jäger, Maag Merki, Oerke & Holmeier, 2012; Thiel, Schweizer & Bellmann, 2017).

To facilitate the take-up of data by schools and school supervision authorities, most states introduced regular (data-based) *quality assurance* or *target agreement meetings* between schools and the lower school supervision, again with the aim of both supporting and controlling schools (Kroupka et al., 2019; Herrmann, 2020). Often, such target agreements are not focused on performance data and in most cases, no sanctions are attached (Muslic, 2017, Kroupka et al., 2019; but see the 'Bonusprogramm' in Berlin, Baur, 2016). The meetings are often institutionalized in the context of external school inspection reports but are also used in place of school inspections (Tarkian, Lankes & Thiel, 2019; Tarkian, Maritzen, Eckert & Thiel, 2019). However, so far, little is known about the actual practice of such meetings, underlining the need for explorative studies on school supervision.

Concluding the previous two sections, we can see that data infrastructures and datafied structurations have expanded substantially with, at least in the international context, clear regulative effects on education professions. However, such effects are not straightforward, are always locally enacted and might vary from governance context to governance context. Consequently, there is a need for explorative studies that consider the ways in which professionals enact data (here: datafied structurations) (Hartong & Förschler, 2019; Decuypere et al., 2021). This holds especially true with regards to the effects of datafication on the professional practices and self-perceptions of school supervisors, a profession with a long tradition of integrating contradictory logics.

4. Methodological approach

The study presented in this paper is part of DATAFIED (www.datafied.de), a large-scale research project combining subprojects on the expanding role of data infrastructures and practices in and around German schools, ranging from classroom interactions, software and administrative studies to governance (see Bock et al., 2023).[2]

The project accounted for inter-German heterogeneity by focusing on two city states and two larger (more rural) states, one of which used to be part of the German Democratic Republic (East-Germany). In the subproject on school supervisors and principals on which this study is based, we first reviewed publicly available documents for each state, as well as research literature, sketching out and mapping the formal procedures and structures of school supervision (and specifically 'data based' school supervision). Following that stage, we conducted 25 extensive interview conversations with school principals, supervisors and state quality or support agencies between 2019 and 2021.

For the purpose of this explorative study on supervisors' professional self-perception, I focus on eight semi-structured, in-depth interviews with ten school supervisors in these four German states as well as the aforementioned documents related to descriptions of school supervision. The interviews ranged between 45 and 120 minutes and focused on the school supervisors' practices and the perceptions of their different fields of activity. The partially structured qualitative interviews centered school supervisors' professional practices and how they engaged with the datafied structurations present in their respective supervisory contexts. Despite our structuring questions, in the interviews, we responded to the school supervisors' own sense-making of data-based school supervision. This openness allowed us to exploratively follow the perspectives of our interviewees regarding their very different professional practices.

For the analysis, I used a qualitative content analysis approach (Kuckartz, 2010), analyzing the transcribed interviews theoretically informed by critical data studies. In the states where school supervisors provided us with examples of their datafied structurations, I used these to complement the descriptions of the structurations in the interview transcripts. First, I analyzed the datafied structurations based on the provided material, public documents and the descriptions given by supervisors and principals in our interviews. After a case-by-case content analysis of the interview transcripts, I systematized the findings and focused on the instances where school supervisors referred to data practices and datafied structurations, to exploratively investigate the interactions of datafied structurations, professional practices and self-perceptions. This perspective, centering school supervisors' practices, allowed me to explore the regulative effects of datafied structurations despite the large variety of datafied structurations.

5. Findings: Interactions between datafied structurations and professional self-perceptions in school supervisors' decision-making

5.1 General effects of datafied structurations on the professional practices of school supervisors

In this section, I investigate the more general effects of the use of data and datafied structurations on the professional practices of school supervisors. The aforementioned expansion of datafication is also reflected in the interviews: all supervisors use data(-fied structurations) frequently to get an overview of the schools under their responsibility. In recent years, both opportunities and the obligation to work with data have expanded substantially and, consequently, so have data-related practices.

Having examined the datafied structurations that the school supervisors in the four states are provided with, I distinguish six different types of datafied structurations: (central) digital platforms, dashboards for single (administrative) data, PDF data overviews, PDF questionnaires, data tables and single data sheets. However, as shown in Table 1, which datafied structurations are actually provided to the school supervisors varies substantially across the four states.

Table 1: Prevalence of different datafied structurations in the four federal states under research

State 1	State 2	State 3	State 4
central digital platform, dashboard for single (administrative) data, PDF data overviews, data tables, single data sheets	dashboards for single (administrative) data, PDF data overviews, PDF questionnaires, data tables, single data sheets	digital platforms, dashboard for single (administrative) data, (PDF data overviews), data tables, single data sheets	digital platforms, data tables, single data sheets

While all states use digital platforms for certain administrative tasks, such as teacher planning, budgeting or data transfer between schools and the Ministry (e.g., school administration systems), only State 1 provides a *central* digital platform that combines most school supervision tasks into one structuration. The other states mainly rely on PDF data overviews or single data sheets as datafied structurations, but also a small number of automatically updated dashboards for single administrative data.

Throughout the interviews, it becomes apparent that school supervisors make particular use of datafied structurations to support regular *quality assurance meetings* with school principals. All school supervisors use their respective datafied structura-

tions as a basis for these meetings to get an overview of the school's situation before meeting with principals.

> So, all the things are represented graphically. And that's a real help, because otherwise you'd have to search for all the data yourself.
>
> For our [quality assurance meeting], we have the [PDF data overview]. This is a very compact, very condensed summary of 'all data at a glance,' so to say. I definitely find that extremely helpful.
>
> First of all, we look at the school's data. And for me, there are a lot of indicators of school quality.

One common data practice of all school supervisors is to ask schools to explain the data and to find out why the data are the way they are. Here, the supervisors especially focus on data that were marked as "striking" in the datafied structurations.

> There are regular topics for the [quality assurance meeting] that are based on this body of data. And as a school supervisor, you go into that conversation, you ask about data that is striking, and you hear how the school interprets that data.
>
> If there was a very serious drop [..] For example, the Maths Abitur [university entrance diploma] is always two grades below the state average. Then you really have to investigate and ask the principal: 'What's going on here?'

Here, the school supervisors acknowledge that school principals might have different interpretations of the data and deeper knowledge of the underlying reasons than they do. However, this practice of asking for an oral account to accompany the data account can simultaneously enhance understanding and increase pressure on the school.

As established in the framing of this study, datafied structurations come with inherent valuations that are not necessarily visible in the final product (Hartong, 2020). By using datafied structuration to decide which data (not) to investigate, the supervisors implicitly accept these built-in valuations. For example, a data overview will present or highlight certain data (e.g., exam results in Maths or cancelled classes) and not other data (e.g., exam results in Geography or absentee students), which in turn (in-)forms which parts of schooling can be acted upon (Hardy & Lewis, 2018). Another way in which these valuations affect supervisors' practices is rooted in the benchmarks that the structurations provide. Most datafied structurations compare the school's data to the state average for the school type. Another state additionally uses a second benchmark drawing on 'comparator' schools (schools with a similar socio-economic composition) for comparison.

> How do we [referring to the school] manage our resources? It's done well. So, I'll write a one-liner, something like: Teacher substitution budget used very responsibly, clearly below state average.

> In the [PDF data overview], of course, there is always a comparison with the 'comparator schools.' So, that means there is always at least one benchmark.

As we can see, these choices that were made in the production of datafied structurations still shape school supervisors' decisions about which data points they investigate and which data points they ignore. However, other supervisors reject these built-in valuations provided by the structuration, warning that they sometimes compare 'apples and oranges:'

> I also check whether apples and oranges are being compared, which is sometimes the case with standardised methods, right? Like if you make comparisons on a state average and don't look at the baseline situation [...] it's a milkmaid's calculation [idiom for naïve fallacy].

The majority of the interviewees have a very differentiated approach to data: Their perspective on data defies simple categories such as 'data-critic' or 'data-fan.' While they clearly make use of the data provided, the interviews also indicate a reflexive engagement with the datafied structurations. The supervisors put data into perspective, add contextual knowledge and qualify the data they use (or do not use) – even in the states that are more strongly data-orientated. Some supervisors criticize their datafied structurations more implicitly, for example by ignoring data that does not fit with their assessment of the situation. Other supervisors more explicitly criticize data in their correctness or usefulness.

Here, the supervisors do not consider the datafied structurations to be the ultimate authority on the 'truth' about schools (in contrast to teachers in Lewis & Holloway, 2018, for example). Instead, like superintendents in the US emphasizing the need for a mix of experience, data and intuition (Honig & Venkateswaran, 2012), school supervisors emphasize that there is more to know about schools than what is visible in the datafied structurations:

> But, of course, it's never the data basis alone. That's very clear. It's the knowledge of the school supervisor of the school […] And it's also always the school itself.

> I'm not, how to put it, an uncritical data-believer, I want to see it with my own eyes […] And there the first thing is to look at the school, to introduce myself to the principal, to the teachers, to the school community.

Throughout the interviews, supervisors consistently emphasize that relying on datafied structurations alone is not sufficient and stress their extensive contextual knowledge, which mainly stems from their direct contact with schools. This contact takes the form of (sometimes daily) calls with principals, e-mails and regular school visits (with varying reasons). All supervisors emphasize that supporting schools on a daily basis is very important.

Additionally, the supervisors organize a range of non-data-focused meetings with all principals they are responsible for ('Schulleiterdienstbesprechung') and in some cases also educational trips, coffee meetings or (in one case) even one-to-one coaching sessions for a struggling principal. These practices of deliberately adding context are notable, especially given the aforementioned tendency of quantified data to remove such context (Piattoeva, 2021). It is these less formalized, refined, everyday interactions with schools to which many school supervisors attribute the most importance for their decision-making, as the following quotes illustrate:

> If you really want to figure something out, then the data won't help you.
>
> I think if you have a trusting relationship with the school, the principal will just tell you where the shoe pinches. And if you don't, he won't tell you anyway.
>
> It's all to do with observation, but not just with data. Instead, conversations are very important, so is feedback, completely different kinds of feedback.
>
> Especially when something unusual happens, I'll first learn it from the school principals, if it's really dramatic. And the statistics don't look as dramatic as the reality sometimes does.

In sum, on a more general level this section reveals that school supervisors have incorporated the provided datafied structurations into their practices, especially with regards to quality assurance meetings. The supervisors use datafied structurations as a starting point to let schools explain the data, at the same time accepting the built-in valuations, but also emphasizing that there is more to schools than the measurable. Moreover, the supervisors regularly qualify the explanatory power of data, actively add their own contextual knowledge and maintain a certain degree of skepticism towards data infrastructures.

5.2 Interactions between varying datafied structurations and supervisors' professional practices and self-perceptions

After exploring more general effects of data usage in school supervision, this section will explore the differences between datafied structurations and how they interact with practices and self-perceptions. To analyze the different configurations of the datafied structurations and the degree to which they are processed and refined, I develop a systematization with three dimensions, in which the structurations vary from one another: centrality, visualization and modifiability/automation. High *centrality* means that many different data and functions are centralized or combined in one structuration. An example for high centrality would be a data overview that brings together various different data types, like performance data, sociodemographic data and administrative data. *Visualization* refers to the degree to which a structuration highlights certain data; processing data visually, for example, through color-coded tables, graphs or bar charts as opposed to less visualized black numbers in a table on

a white background. Finally, the last property distinguishes how *modifiable* the structurations are by the supervisors and whether data is *automatically* added, analyzed and changed; e.g., coming from a central data base.

In Figure 1, the differences in the configuration of the structurations provided by the respective states are visualized. As we can see from Figure 1, there are two states with higher and two states with lower degrees of centrality, visualization and automation in their datafied structurations. When contrasting the practices of school supervisors in the respective states, the findings in fact indicate substantial differences between those states. An intuitive assumption would be that supervisors provided with the most centralized, visualized and automated datafied structurations in State 1 would experience the strongest regulation of their practices and vice versa.

Figure 1: Differences between the states' datafied structurations according to degree of centrality, visualization and modifiability/automation

State/Properties	State 1	State 2	State 3	State 4
Centrality	high	medium	low	low
Visualization	high	high	medium	low
Modifiability/Automation	high	medium/high	medium	low

However, contrary to this assumption, professional practices are most streamlined around data in *State 2*, where school supervisors mostly rely on PDF questionnaires that schools fill out and PDF overviews on schools' data (see Table 1). Here, the supervisors are aware that the data overviews provide a focus only on selected data. However, the focus provided by the structurations are explicitly seen as positive, an orientation in the vast amount of data available, which helps save time.

> I rather see it as an aid to get a quick overview and quickly see if everything is within the normal range. Or if there are really, let's say, deviations. The material and the data are processed so well that you can get a really quick overview.

The State 2 supervisors thus accept the datafied structurations and integrate the view into their perception of good supervision that improving performance test scores improves schools. In this case, both supervisors' professionalism and their datafied structurations are aligned towards what Verger et al. (2019) call test-based accountability. The supervisors here adopt more a managerial approach to their role, every year focusing on a different set of performance data.

> This year, we said, we're looking very specifically at primary school [performance data] in year three. [...] So, we've asked schools to take more measures to strengthen the competencies in this area. And at some point, it has to be reflected in the results.

Much like in the high-stakes context of the US (Brass & Holloway, 2021), this re-professionalization of school staff around performance seems to bear fruit, since the supervisors report that schools are trying to improve their performance data themselves. Here, we can see that even PDF overviews and questionnaires can be very influential, when aligned with the professional self-perceptions of school supervisors. This is very much in line with Selwyn (2022), who found that even seemingly unsophisticated data usages can still shape practices in a determinative manner.

In contrast, in *State 1*, with its highly centralized digital platform and PDF data overviews (see Table 1), the supervisors emphasize supporting schools and principals as an integral part of their supervisory practice. They describe themselves as supportive actors who are in tension with the more controlling, managerial logics of the platform (and the Ministry of Education). The supervisors explicitly warn that accountability pressures lead to an erosion of trust and what Landri (2021) calls 'fabrications,' where schools are fabricating an image for the supervisors, following all the rules and returning good numbers, without actual improvement ('Potemkin villages').

> You've got to listen in the first place, right? Otherwise, the other party will shut down and you won't get any school development; instead, you'll only get Potemkin villages – people then pretend.

Instead, the supervisors highlight the importance of a trusting environment, hearing the schools' perspective and supporting schools while giving them enough time to solve their problems. The supervisors criticize their platform and feel under pressure, for example by an increasing number of ministerial surveys sent to schools through the platform, which they cannot influence. At the same time, the supervisors use the platform and the focus provided by the PDF overview. Using data to learn about the school is clearly a part of their perception of good supervision. However, while the focus of PDF overviews (and thus their inherent valuations) is accepted, their use of the platform can be described as 'begrudging acceptance' (Selwyn et al., 2015).

> It's actually all very formalized now. It's clear what we have to do, what data we have to take, what data has to be analyzed, what has to be reported. Everything is pretty much bundled together into one package. It's this so-called 'controlling' that people always want here.

The reporting functionalities integrated into the platform are even actively circumvented by the supervisors. For example, one supervisor deliberately takes her notes outside of the designated forms in the platform and discusses them with the principals before inserting them. Thus, the supervisors in State 1 use the provided datafied structurations, but, in contrast to State 2, do not perceive their role to be managerial, instead aiming to provide an environment of trust and support without too much pressure on the schools.

In *States 3 and 4*, on the other hand, the supervisors mainly rely on datafied structurations in the form of data tables, single data sheets or less comprehensive data reports; the platforms are only used for few (mainly administrative) tasks (see Table 1). Consequently, it is the school supervisors themselves (rather than a datafied structuration) who assemble the different data that build the shared basis of the quality assurance meetings.[3] Thus, the professional (data) practices more strongly depend on individual supervisors' professional perceptions of good school supervisory practice, allowing for substantial intra-state differences.

In *State 3*, the supervisors follow two different approaches to the utilization of data and its importance for school supervision, illustrating how strongly school supervisors' professional perception of good supervision and the role of data in it influences and shapes school supervision practices. The first supervisor in State 3, who places an emphasis on supporting schools, describes how she largely relies on talking to schools and parents to find out if she needs to support schools or intervene in a different way. The performance data is less scrutinized and mostly used by the schools themselves.

> So first and foremost, it still works really 'retro' via direct communication. This means that the schools normally get in touch with me when they need support. [...] With regards to data, we only get the schools' [performance data] automatically.

The second supervisor in State 3, while valuing phone calls and personal visits to schools, at the same time places an emphasis on managing schools through performance tests, thus also embracing a more managerial approach. She was able to convince her schools to implement additional performance testing and even combines performance data with target agreements, attaching consequences to test results. Due to the low formalization of datafied structurations, she too is able to put her perception of good supervision as involving performance data into practice. Here, much like the supervisors in State 2, she follows the global trend of test-based accountability (Verger et al., 2019). However, in this case, since the state has not included this test-based accountability into its datafied structurations, both supervisors have more freedom to implement their own professional self-perception into their practice. In the absence of datafied structurations implementing test-based accountability, the supervisory practices are much more dependent on individual approaches to supervision than in the former states.

The school supervisors in *State 4*, who only use data tables and single data sheets, explicitly reject the type of data-based supervision that focusses only on specific extracts of data and highly visualized, 'processed' datafied structurations. As a result, the state's approach to data-based supervision varies distinctly from the approach in State 2 (and, to an extent, in State 1). As one supervisor stresses, it is important that schools and supervisors view 'non-edited' data (tables).

> I look at the data, you look at the data. You might detect something different from what I see. This means: if I have processed the data in advance in a way, so that it supports my conclusions and makes them more plausible, then, the process isn't open anymore.

Here, she directly opposes visualized data overviews as they would lead principals and supervisors in a certain direction and consequently prevent an open conversation on their different perspectives on the data. The supervisor thus criticizes certain datafied structurations for containing substantial valuation (see Hartong & Förschler, 2019) and hopes to avoid such interference by only using data tables. The practices of the second State 4 supervisor also stand in distinct contrast to States 1 and 2, as she uses *all* available data, deliberately *not* focusing on any specific data. This represents an approach to data-based supervision that rejects the focus (= valuation) that comes with data overviews, in this case because it would mean overlooking certain aspects of schooling.

> I actually use all of them [the data], because that gives the full picture. In one school, they might very well do good work content-wise and yet the educational stuff might fall short. Or the other way around.

She decided which data sources she would use when her state started to conduct data-based supervision. However, she constantly updates the list of data because she regularly has new ideas as to which data could be useful, for example to find out if a hunch she has is correct. She reports that due to her long experience and deep knowledge of the context, her gut instinct is quite reliable.

> Most of the time it fits with my gut instinct, because I have quite a close contact to the schools and because, maybe it's also because I know a tremendous amount of people and I know the structures here well, because I was a principal here myself [...] so I know the connections.

Concluding this section, the interaction between different datafied structurations and supervisory practices is highly dependent on how supervisors perceive their profession. In State 2, where the supervisors' perception of their profession and the datafied structurations are aligned, structurations had a strong influence on practice. However, in State 1 where they were in conflict, the supervisors opposed the more controlling notions of the platform. In the two states with less centralized datafied structurations, differing perceptions of good data-based supervision were able to influence practices even more directly. Interestingly, in State 4, this led to a specific form of data-based supervision that does not focus on specific data, but rather uses all available data.

6. Conclusion

This contribution has explored the enactment of datafied structurations by the profession of school supervisors. Drawing on interviews with ten school supervisors in four German states, the analysis explores (section 5.1) more general influences of datafied structuration on supervisory practices, but (section 5.2) also accounts for the high variance in these structurations and professional self-perceptions of supervisors.

Across the states, 'data-based' governance has become a large part of contemporary school supervision. For this purpose, supervisors use different datafied structurations, especially for regular *quality assurance meetings* with schools. Additional to the datafied structurations, supervisors' perception of their profession influences substantially how data-based supervision is practiced. While supervisors use most datafied structurations they are provided with, most supervisors also engage critically with the underlying data, qualifying, ignoring, and (re-)contextualizing data as they see fit, implicitly or explicitly criticizing the reductive nature of quantified data (see Piattoeva, 2021).

In agreement with research on policy enactment, the paper highlights how data and accountability policies are always locally enacted by education professionals (see e.g., Ball, 2016; Landri, 2021). Consequently, the interviews demonstrate large differences between how datafied structurations are influencing the practices of data-based governance in the four states as well as differences between supervisors' approaches to 'data-based supervision.'

As argued extensively elsewhere, using data to (in-)form the (supervisory) gaze shapes and structures what can be perceived as schooling and thus acted upon by the supervisors (see Hardy & Lewis, 2018). However, as this study shows, the relationship between datafied structurations and supervisory practice is not straightforward. First, in the state with the centralized, visualized and automated digital platform, the school supervisors had a decidedly critical stance toward the built-in approaches to data-based governance. Second, while some supervisors embrace the focus (and thus valuation) by the visualized and centralized data overview as (part of) their supervisory gaze, other supervisors emphasize the importance of *not* focusing on specific data and consider all data as a means to get the whole picture. Both aspects highlight the importance of professional self-perception for supervisory practice.

The interviews also reveal that the supervisors integrate rather supportive and rather controlling aspects of school supervision. However, the supervisors put different emphasis on the different aspects, especially the embrace of managerial approaches and test-based accountability differs substantially. The article highlights that professional understandings of good supervision are a key part of enacting datafied

structurations, pointing to the importance of such explorative studies that center the practices of data use by education professionals.

As the analysis further shows, even datafied structurations in the form of PDFs can be very influential when the built-in perceptions of good school supervision align with school supervisors' perception. This highlights the importance of widening the view of critical platform studies (Decuypere et al., 2021) to incorporate seemingly simple PDF data overviews and questionnaires (see also Selwyn, 2022). With regards to the research on German school supervision, there is a need for historical studies that explore the development of the profession of school supervision in hindsight, moving beyond simplistic and normative dichotomies (e.g., of bureaucrats versus pedagogues).

Although (lower) school supervisors have always been hierarchically subordinated to the Ministry of Education (Dedering, 2021), this study adds to the conception of hierarchy by pointing to new forms of hierarchical influence that emerge through datafied structurations. Crucially, while historically, school supervisors might have been able to interpret or discuss demands from higher up in the hierarchy, today, supervisors themselves feel under pressure and are not always able to shield their schools, e.g., from ministerial surveys. This reflects a general development of German school governance towards tighter control through (performance) data (Hartong et al., 2021). With the 'Bonusprogramm' in Berlin, there is already an example of attaching high stakes to target agreements, with resources being dependent on success (Baur, 2016). Future research on supervisors and hierarchical control could benefit from taking these new forms of hierarchical influence through centralized datafied structurations into account.

It is worth noting that until a few years ago, superintendents in the US, like their German counterparts, relied on a mix of experience, data and intuition in a trusting environment, but now test-based accountability is seen to have undermined this very trust (Park & Datnow, 2009; Honig & Venkateswaran, 2012; Datnow et al., 2020). Against the backdrop of this development and the increasing prevalence of test-based accountability approaches in Germany, it is advisable to examine existing alternative methods of supervision like those presented in this study more closely and also to incorporate them into supervisory trainings. Future research could investigate more trust-based forms of supervision as alternative modes of governance, fleshing out the ways in which supervisors create and maintain such trusting relationships with schools. A promising example of such an alternative approach is Hardy's (2021) concept of 'authentic accountabilities,' which could be adapted for the (still) low-stakes environment of Germany.

Due to its explorative nature and its focus on individual supervisors, the present study has only limited explanatory power. Without interviews with principals or

participant observation, this study cannot investigate if supervisors' perceptions of themselves as supportive are reflected by principals. While differences were found between states, because of the small number of school supervisors interviewed in each state, one must be wary of overly deterministic explanations of these differences. In general, it is important to caution against claims of datafied structuration causally influencing supervisors' practice or professional self-perceptions, given their co-constitutive relationship.

In conclusion, school supervisors in this study rely on a mix of datafied structurations, contextual knowledge, professional experience and direct communication in a trusting environment. Although the increasing datafication of school supervision puts new pressures on supervisors and schools, most supervisors are (still) able to put their differing perceptions of good supervision into practice.

Notes

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2. The project was funded by the German Federal Department of Education and Research (BMBF), project number 01JD1803D.
3. However, this assemblage of data tables is obviously shaped by the possibilities that the respective state school administration provides.

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