

Exploring the Transformative Impact of Technology on School Leadership. Affordances, Practices, Implications

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ABSTRACT

In the context of digital transformation processes in schools, the introduction of technology is often discussed in terms of the individualization and optimization of teaching, learning and school management. However, it is often neglected that technologies are preconfigured and provide socio-material offers that invite certain actions and thus subtly shift forms of practice. Since the everyday life and actions of school leaders are also significantly influenced by digitalization-related transformation processes, they also have to refer to technologies and the associated affordances in their everyday actions. However, what these affordances are and how they influence the actions of school leaders remains unclear in previous research. Against this background, the present paper focuses on the following question: How do school leaders integrate technology into their daily practice and how does technology influence the practices of school leaders? Based on the results of an empirical-qualitative study using expert interviews and shadowing, the article presents empirical examples of technology-related affordances in the everyday lives of school leaders. Associated actions of school leaders in dealing with technology as well as subtle shifts in the dynamics between school leaders and other actors are shown. The article concludes with a discussion of implications for school practice, future research, and the professionalization of school leaders.

Introduction

In the context of digitalization-related transformation processes in schools, the introduction of technology is often discussed in terms of individualization and optimization of teaching and learning (e.g. Antonietti et al., 2023; Knox et al., 2019; Schrum & Levin, 2016; Selwyn, 2020). However, it is not only the use of technology for teaching and learning that needs to be discussed; aspects of school management are also increasingly coming into focus, as the everyday life and actions of school leaders are also significantly influenced by digitization-related transformation processes (Krein, 2024a, 2024b). It is therefore not surprising that school leaders around the world are increasingly using technology to manage schools, for example for data-based decision-making (e.g. Schildkamp et al., 2019). But if we look at previous research on the use of technology in schools and explicitly by school leaders, it quickly becomes clear that a shortened understanding of technology often prevails. Technologies and digital media are merely discussed as tools or, to a certain extent, as a supplement to everyday life. The debate to date has therefore mostly been characterized by a technological determinism (Krein, 2023). However, such an understanding fails to recognize that digitalization is a fundamental social transformation process. Contemporary societies are permeated by digital technologies that significantly shape

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our perception of the world and our actions and are themselves subject to continuous change (Allert et al., 2017; Stalder, 2016). If mediality is therefore understood not only as a technological supplement, but as “a central structural condition of symbolicity and thus a central anthropological moment” (Jörissen, 2014, p. 511; translation by the author), which is fundamentally interwoven into pedagogical processes, socio-material offerings also come into focus (on sociomateriality, see e.g.: Orlikowski & Scott, 2008). These invite certain actions, which subtly shift forms of practice (Jornitz & Macgilchrist, 2021; Zillien, 2019). This is because “new technologies rarely simply lead to the more efficient execution of older practices; rather, they change existing behaviors or even require completely new ones” (Zillien, 2009, p. 6, translation by the author). Such relational possibilities for action of technologies can be described as *affordances*. “The term affordance goes back to the American perceptual psychologist James J. Gibson (1977) and can be defined as the propositional character of an object” (Zillien, 2009, p. 3; translation by the author). Affordances are not inherent properties of objects, but rather arise through the interaction between humans and their perceptions and abilities as well as materiality, i.e. the technology and its characteristics (Fayard & Weeks, 2014; Gaver, 1991). The reciprocity implied here is of great importance: although the perception of affordances depends on the abilities of the perceiving individuals and the social and cultural context, affordances are nevertheless considered invariant (Zillien, 2009). This means that the affordances of an object exist independently of the interpretation or perception of an individual. At the same time, however, they have a subjective character, since they refer to the possibilities of action of an actor, which underlines the reciprocity of artifact and perceiver and takes their complementarity into account (Zillien, 2009). Against this background and since technologies are also always prefigured and therefore never neutral (Jarke & Breiter, 2021), from a research perspective, the questions of how technology shapes our actions and how these daily actions in turn influence technologies come to the fore (Zillien, 2009).

For school leadership research, not only technical affordances are relevant when investigating affordances and their effects on the actions of actors, but also social and educational affordances (Kirschner et al., 2004), which can have a major influence on everyday school life. Initial research in this field has dealt with affordances in the context of leadership styles and qualities from the perspective of leadership and leadership development (Margolin, 2013). However, studies that explicitly address the affordances of technologies in the everyday life and actions of school leaders have not yet been conducted, which should be emphasized as a desideratum in view of the key function of school leaders in the context of digitalization (e.g. Håkansson Lindqvist & Pettersson, 2019). Especially in view of the diverse range of tasks of school leaders in a digitalized world and the associated challenges but also potentials, it can be assumed that various technologies are used by school leaders, which are accompanied by corresponding affordances. School leaders have to deal with these affordances, which also raises questions about the professionalization of school leaders in terms of using technology. To be able to recognize and reflect on affordances, it is first necessary to define and describe them. This means clarifying how the reciprocity of people and materiality outlined above is shaped in school leadership practice. Against this background, the article addresses this desideratum and focuses on the following question: How do school leaders integrate technology into their daily practice and how does technology influence the practice of school leaders?

The aim is to explore the transformative impact of technologies on school leadership and therefore to reveal technology-related affordances in the everyday life of school leaders, to describe them using empirical examples in the respective situations, considering actor constellations, and ultimately to derive implications for future research, school leadership practice and the professionalization of school leaders. To this end, the present study draws on the concept of affordances, which “provides a useful way of thinking about how practice is structured by the social and physical construction of technology and the material environment” (Fayard & Weeks, 2014, p. 236). When the concept of affordances is applied to the analysis of media use and impact, the focus is not only on the user and not exclusively on the technological artifact but establishes a link between the two and allows the reciprocal conditions and enabling relationships to be analyzed (Zillien, 2009). In contrast to usability research in the context of affordances, the focus is therefore not on the user-friendliness of

technologies (for this understanding of the affordance concept, see e.g. Norman, 1988), but is shifted from purely technical features to the resulting relational possibilities for action. To empirically capture this connection between humans and technology and the associated relational possibilities for action, a multi-stage qualitative study was conducted, which is explained in the following.

Methodological Approach

To answer the research question, the results of an empirical-qualitative research project are presented (Krein, 2024a). This research project comprised two sub-studies: First, (1) expert interviews were conducted with school leaders in Germany, followed by (2) an ethnographic study using shadowing. Both sub-studies are briefly outlined below (for a detailed description of the studies, see Krein, 2024a), before the data analysis is described.

Study 1 | Expert Interviews

Within the first study, seven semi-structured, guideline-based expert interviews (Bogner et al., 2014; Meuser & Nagel, 2009) were conducted with school leaders ($n = 1$ woman) in Germany. Expert interviews are a common method of qualitative social research that focuses on experts and their specific knowledge (Bogner et al., 2014). Experts are not only abstract functionaries of certain power structures, but also “concrete social actors with specific logics of action and professions” (Bogner et al., 2014, p. 4; translation by the author). School leaders from secondary schools in Germany were selected as experts for this study. The school leaders interviewed had between four to 25 years of professional experience in school leadership ($M = 10.28$ years). The interviews were conducted in spring 2020 immediately after the first pandemic-related school closures in Germany and served as an initial exploration of the everyday life of school leaders in the context of digitalization. The interviews therefore focused on the following topics: (1) digitalization in the daily work of school leaders, (2) understanding and attitudes of school leaders toward digitalization, (3) support and training needs of school leaders regarding digitalization, (4) school development (needs) and (5) data generation and use by school leaders (Krein, 2024a). The duration of the interviews varied between 25 and 60 minutes, with an average length of around 35 minutes. Immediately after the interviews were conducted, additional interview notes were prepared in the form of a postscript, in which the respective framework conditions and special features were recorded. Following Bogner et al. (2014), the expert interviews were recorded in mp3 format (purely auditory) and then transcribed manually using MAXQDA (version 20.2.2).

Study 2 | Shadowing

For the second study, an ethnographic approach using shadowing was chosen. Shadowing can be understood as a multi-method complex whose central core element is a participant observation (Krein, 2024a). In this study, observation was supplemented by collecting rich contextual information as well as episodic and anecdotal information and conducting weekly reflection interviews with the participating school leaders (Krein, 2024a). Shadowing was chosen as a method because it makes it possible to examine actions in situ and in actu and thus to interpret patterns of action and possible challenges in their respective contexts (Krein, 2024a). The shadowing was carried out in various phases: First, there was (1) extensive preparation, during which permissions were obtained and the subsequent observations were prepared. This was followed by (2) the implementation of the participant observation itself. Passive participant observation was chosen as the core element of the form of observation, in which an open, unsystematic form of observation was aimed for. Following the image of a shadow, there should be as little interaction with the school leader as possible, but at the same time a permanent, unobtrusive presence of the shadow – and thus participation in the daily work of the school leader. As part of this second phase, two school leaders from secondary schools in Germany were each accompanied in their daily work for three weeks in

spring 2021. Although only two school leaders could be accompanied as primary shadowees in this study, it was still possible to observe some of the work of the school leadership teams on site. In this way, a large amount of data was also collected from the other thirteen members of the school management teams. Where necessary, ethnographic field interviews were also conducted in form of “friendly conversations.” These and personal comments were recorded, condensed and extensively processed together with the field notes following the field phase. The school was defined as both an analog and a digital observation space, whereby methods of virtual ethnography or so-called netnography were used. Netnography can be understood as a form of ethnographic research adapted to the internet, which also focuses on (participant) observation in a natural, in this case digital, setting (Kozinets et al., 2018). This field phase was followed by various types of (3) debriefing: For example, daily reflections were written by the researcher and the field notes were summarized immediately after leaving the school. In addition, weekly reflection meetings were held with the participating school leaders to clarify any ambiguities during the observation and to discuss possible adjustments to the methodological approach.

Data Analysis

To localize and describe the respective affordances as a constitutive element of digital technologies situationally in the entanglement with the actions of school leaders, a multi-method approach was chosen. From the perspective of an ethnographic affordance analysis (Bareither, 2023), different methodological procedures were productively integrated, which make it possible to “recognize the relational practice demands and limitations a technology offers during the research process more clearly, to record them in the data collection, to code them in the data analysis and finally to describe them densely in the ethnographic text” (Bareither, 2023, p. 18, translation by the author). To this end, the data collected in the expert interviews was first analyzed using content structuring qualitative content analysis (Kuckartz, 2018). Categories were formed both a priori and inductively. This was followed by a phenomenological analysis (Brinkmann, 2015) of the data collected during the shadowing. The results of both analyses were then triangulated.

The results of these analyses are presented below. Here, the various affordances and the associated school leadership actions are described descriptively and explained in more detail using empirical examples. Special consideration is given to possible changes in actions and the effects of affordances on dynamics between school leaders and other actors. This should make it possible to better understand the interrelationship between digital technologies, school leaders, their incorporated knowledge and the practices carried out through the combination of these elements (Bareither, 2023).

Results

The analyses identified various affordances of technologies in the everyday lives of school leaders that are highly relevant to school leadership due to their impact on practices and actors in social contexts. Since three of these affordances were explicitly identified as being particularly present in school leaders’ everyday activities, the following presentation focuses on these three affordances. To present the individual affordances in a comprehensible way, specific situations are described in which these affordances became visible, and it is explained how the actions of school leaders have adapted to the corresponding affordances of the technologies, or which new actions have emerged. Finally, the effects of the practices made possible by the corresponding technologies on social interaction and dynamics between different actors are explained.

Affordances of Parallel Working

The first affordance, which was visible in many places in the data material, could be localized in the use of communication technologies, e.g. messenger systems, which school leaders integrate into their daily routine at various points. The affordance mentioned here allows school leaders to carry out activities

in parallel – usually alongside digital communication – or to continue them on the side. This can be illustrated most clearly using the example of e-mails as a “defined standard communication medium” (01S5SL_16), for which various situations were recorded in the everyday lives of the school leaders observed:

The shadowee opens his e-mail program and begins to read incoming e-mails. Meanwhile, the door to his office is open the whole time, so that a conversation between the janitor and a secretary in the adjoining office can be heard loudly. While the shadowee reads an e-mail, he calls for the janitor without looking away from the screen and asks him when the construction work for the planned sports facility next to the green classroom will take place and how long it is expected to last. He needed this information to be able to give feedback at the appropriate point. The janitor then approaches the open door and describes various stages of the work, which he estimates will take three weeks. However, the sports facility should be completed before the Easter vacations. “All right,” replies the shadowee, while his eyes are still fixed on the screen and the next e-mail that he opened (...). (S2vSL_1)

(...) The Shadowee opens his mail program and the school messenger, which is always open on the side, and reads two incoming e-mails. As he reads an e-mail, he exhales heavily and says that he could “get really upset again now,” shifts a little to the left and points to the incoming e-mail for me. I nod to show him that I’ve already read the e-mail. It’s a request from a teacher asking if she could cancel lessons in the coming week due to a heavy workload. [...] Turning to me, the shadowee says that the teacher is very dependent and that such requests take up a lot of his working time. He then begins to formulate an answer when there is a knock at the door and the secretary enters and says goodbye, as she is now closing time. The Shadowee - still looking at the e-mail and typing - thanks her for the information before the secretary smiles slightly at me and leaves the office again. (S2vSL_2)

As can be seen from the situations described, the shadowee remains focused on his main activity (processing e-mails) and integrates the conversation with the janitor or saying goodbye to the secretary into his work process. The e-mail program he uses enables him to carry out several actions simultaneously and thus efficiently due to the indirect, correctable and flexible form of communication. This also makes it possible to handle formal and informal interactions quickly and incidentally, as different streams of information can be received simultaneously. In the actions of the school leaders, it became clear that these possibilities are not only perceived by the school leaders, but that changes in practice or effects on everyday situations could also be identified. For example, e-mails – as described above – are (further) processed during informal talks or during formal meetings. In the context of such talks and meetings, it was also observed on several occasions that these were interrupted, or their start was delayed until the relevant technology was set up. A more detailed analysis of what the school leaders used the device for in the respective situation revealed the actions described above. Although notes were (occasionally) taken or calendars opened, in almost all situations e-mail programs were also opened and incoming e-mails were at least read, even if they were not relevant to the situation at hand. It should be noted, however, that actual simultaneous action in such meetings could only be observed to a limited extent. Rather, the school leaders were distracted or interrupted by incoming e-mails, which usually interrupted the “actual” action during the meeting. In this context, with regard to the dynamics of the actors involved, it should be noted that the seemingly continuous use of the e-mail program and messenger by school leaders promotes constant interaction with colleagues and administrative staff on the one hand by enabling an immediate response to incoming messages and rapid communication and decision-making. On the other hand, this integration of e-mail processing and communication also creates an apparent personal distance between the actors involved when, for example, situational communication was interrupted and at the same time it became clear that the attention of the school leader as a counterpart and conversation partner was divided or even non-existent. For example, the school leaders observed repeatedly turned their eyes away from the other person or did not look at them at all, but instead looked at their screens and were obviously reading and typing e-mails. Another example is the secretary smiling at the researcher instead of the school leader when saying goodbye, which suggests that she assumes that the school leader would not notice a smile in this situation. Constant accessibility and interaction with school leaders can therefore not only contribute to a dynamic and communicative working environment. It can also have a negative

impact on the dynamics between actors, concerns do not receive full attention because e-mails become, in a sense, independent entities in interactions. In summary, it can therefore be stated that the connection between communication technologies and school leaders can open relational opportunities for action, in the context of which the parallel implementation of digital communication is promoted in various situations. If school leaders follow this affirmative action, an ambivalent picture can be drawn: On the one hand, this can lead to an increase in productivity and increased exchange, but at the same time it can also influence the interaction with stakeholders and the communication culture in general. A change in communication practices could also be observed in connection with other affordances, as the following explanations show.

Affordances of Low-Threshold and Unbounded Communication

In the context of communication technologies, further affordances and associated practices enabled by technologies became visible: Due to their omnipresence in the everyday lives of school leaders and the use of messenger systems, it became clear that technologies enable low-threshold forms of communication that are independent of time and place, which are perceived by school leaders themselves, but also by other actors in their daily work¹:

[...] He writes something down before hesitantly looking up from his notebook; his back is now a little hunched compared to before. For a moment, neither he nor the Shadowee say anything. An unexpected pause, I think. Compared to the previous agenda items, there now seems to be a topic that makes the member of the school leadership team uncomfortable. Finally, he takes a deep breath and asks if classes have to be canceled on May 14 because it is a holiday, or if there is a possibility of holding a parents' evening. He believes that there is a need for communication on the part of parents, because "If I add up the time, the amount of time spent talking to parents has increased exponentially," he explains. Thanks to the possibilities offered by messenger, they are much more accessible as teachers and school leaders than they used to be, and parents are taking advantage of this. "I have communication with parents every evening until 11 p.m." (02S5SL_7)

The shadowee enters the office where I'm waiting for him and puts his cell phone on the counter in front of me while he says: "just so I don't have to listen to the whole thing alone on the way home." I realize that the WhatsApp chat with the parent representative is open and the last message displayed is a two-minute voice message from her. I remember that the Shadowee had already talked to other people in the school about this parent representative sending long voice messages, some of which lasted four minutes. The Shadowee presses play so that we can both hear the voice message. While the message is playing, I can see in the Whatsapp chat history that several voice messages have been received, to which the Shadowee has always replied in writing and usually briefly. [...] After the voice message has ended, the shadowee explains to me that this is the "normal" communication with this person. "It's not for nothing people say that if you talk to [name of person] on the phone, your day is over." (S2vSL_1)

As the examples presented here show, the practices of other actors, such as parents, made possible by technology also have a major influence on the everyday life and actions of school leaders. Where previously a fixed consultation hour in the form of an appointment at the school or even participation in a meeting with parent representatives required a mutual presence, the format of communication via messenger as described here offers a low-threshold and direct form of communication. In terms of a possible shift in practices, it can be noted that the shadowee uses WhatsApp in the examples presented to respond efficiently to long messages, but especially to longer conversations by responding in short, written form. In a face-to-face conversation, such a response behavior would be rather unlikely. The format of the voice message also seems to invite users to share the message and thus the conversation with others or to behave in the opposite way by only listening to voice messages after a considerable delay, which is impossible to do in a face-to-face conversation. Messenger thus affords the possibility of changing forms and modes of communication within a medium depending on the intention of the school leader in the respective communication. At this point, a clear change in communication and its forms can be observed in comparison to "classic" communication, which takes place in person and directly. It is also clear from the previous examples that messenger-mediated communication also takes place largely independently of limited spaces (school buildings) and times

(e.g. office hours). For example, school leaders report messages that reach them late in the evening or at the weekend, or their own communication that takes place well after working hours:

Parking my car in the teachers' parking lot at around 07:10, I spot the Shadowee's car and immediately make my way to his office. Once there, the Shadowee greets me as he is preparing the coffee machine. He still has his jacket on and the screens on his desk are switched off, which - together with the preparation of his espresso - leads me to conclude that he has probably just arrived and is going about his morning routine. While I put my things down, he prepares two espressos for us (he no longer asks if I want one; the second espresso seems to have become part of the morning routine), stands by the open window and starts to tell me about his weekend. On Sunday morning, he was sitting comfortably at the table when a message "came in" on the school leader's WhatsApp group. He had received the information that the father of one of the school's pupils had died and what action would now be taken by the formal school leader. "You're having a nice Sunday morning and then something like this happens," he says, looking out of the window. He looks exhausted, I think, even though it's only Monday at 7:15 am. (02S2vSL_11)

He sits down at his desk and turns to me. He tells me that he did some more work yesterday evening "from about 9 or 10 pm." First, he filled in a list and sent it off, then he read the "minister's big pamphlet," highlighted important passages and then sent it to the teachers. I remember a letter from the Rhineland-Palatinate Education Minister that he received by e-mail yesterday and make sure he is referring to it, which he confirms. He then received a call from a school leader at another local school, which he did not answer at first. However, "later" he called back and advised her regarding her "cry for help." Finally, he sent a letter from the chairman of the school board requesting further distribution to various parties. (02S5SL_10)

"We're used to coordinating certain things more quickly now, because things have to happen much faster. And of course, in many cases this is now done digitally. For example, we have already organized two conferences digitally. Somewhere late in the evening at home, rather than after a day of lessons as usual. And that was extremely productive. It was more productive than sitting down for another two hours after the eighth lesson. Instead, we all went home first and then said, okay, we'll have another conference for an hour or two after 6 pm." (01S2vSL_45)

As can be seen from the excerpts, the accompanied school leaders use software to communicate from various (also private) end devices. This enables them to always carry (not only) work-related e-mails and text messages with them, whether on their smartphone, tablet or laptop. This omnipresence also creates opportunities to view incoming messages "in between" or "later" and to process them in the evening or at the weekend. In particular, the school leader's Whatsapp group mentioned in the first example enables information to be disseminated quickly within the school leadership team, which means that the shadowee also receives important information at the weekend but must also respond accordingly. The affordances, which invite low-threshold and unlimited communication, thus enable flexible and direct interaction, as seemingly constant accessibility is created, but also lead to a dissolution of working hours and a blurring of work and leisure time. The dilemma outlined here is also named by a school leader about communication with parents: "On the one hand, constant availability for parents (I: mhm), who then perhaps take advantage of this beyond limits, we don't want that. On the other hand, simple communication with parents, that would also be very, very helpful" (01S7vSL_28).

Affordances of Controlling

In addition to the affordances just presented, which were identified in the context of communication technologies, affordances of administrative technologies became apparent that require school leaders to act in a controlling manner. These were mainly new types of action, which were opened primarily by the introduction of new technologies in schools and the associated opportunities. It should first be noted that it became clear during the analysis that many of these technologies or tools are perceived by the school leaders as "simply a lot of very great tools to better deal with the amount of data you have to deal with on a daily basis" (01S5SL_28). These same "great tools" also afford various (new) actions:

"And to be able to document the lessons in all situations, I can't use paper books. And then it's about time, and with the digital class register, everything is connected again so that parents can also look up what was covered in

which lesson. It's better control for us as school leaders or the level leaders, class leaders, so as a student you can no longer escape it." (01S5SL_20)

"And our ultimate goal is that all parents register so that we can distribute letters to parents, information and so on in a very efficient way. And that we get feedback that it has been received. (I: mhm). So, a confirmed delivery of data." (01S7vSL_34)

The Shadowee opens a new e-mail, this time from a teacher. I can read that the teacher is complaining about the fact that he has to teach every afternoon and is asking for the timetable to be adjusted. The shadowee turns to me and exhales audibly. He tells me that this is another example of the unprofessionalism of some teachers. On the one hand, the tone with which the e-mail was formulated is inappropriate. Secondly, the content is incorrect and based on a lie. The shadowee had in mind that this teacher did not have to teach every afternoon. "But we can just look." He then turns back to the screen, picks up his cell phone and opens the software used to create and manage the timetable. Meanwhile, he says that it is "really great because I can now simply look up the timetables of every teacher." [...] He opens the timetable of the teacher involved and holds his smartphone out to me so that I can see the timetable in full. I see that the timetable only includes one lesson in the afternoon. (S2vSL_5)

As can be seen here, the administration software offers school leaders the opportunity to document processes and information and to track their progress. At the same time, the data records stored there can be used as a control instrument, for example to check the receipt of documents or the truthfulness of statements. This provides new options for school leaders: by introducing new technologies, processes can be digitalized and thus made more controllable. In this way, it is possible to track what teachers are doing in their lessons in real time and communication with external stakeholders can also be safeguarded by using the technology for example to request confirmation that information material has been read. School leaders thereby achieve empowerment, as they have full access to data, unlike the other actors involved. As the above example suggests, such controlling behavior could also have consequences, e.g. by preventing negotiation processes from happening in the first place if data sets are used to legitimize actions. The management and use of digital data thus presents itself as an instrument of power that can be used to promote different actions, depending on the technology:

When I enter the school building through the entrance at the teachers' parking lot at around 07:20 at the start of the second shadowing week, the corridor is already bustling with activity. I see several teachers hurrying between the teachers' room, the meeting room where the coronavirus tests are kept and the secretary's office. The door to the shadowee's office is locked, so I knock, but get no answer. I conclude that he hasn't arrived yet, stop in the corridor and watch the hustle. Some of the passing teachers smile at me, but I am not greeted or spoken to. When the Shadowee enters the corridor at around 07:35, he walks straight to his office, greets me and unlocks the door, whereupon we both enter the office. The Shadowee takes off his jacket, greets the secretaries and then sits down on his office chair. Like last week, I sit down on a chair behind him. He turns to me to tell me about his weekend. One evening he was bored, so he experimented with importing and exporting student data in edoo.sys and discovered that edoo.sys can generate various masks that prepare student data in such a way that it can be transferred to other systems with little effort. In doing so, he gained "extremely exciting insights." He reports that he entered the students' data anonymously into Google in relation to their place of residence and was then able to see not only the exact place of residence, but even individual houses. With all the possibilities offered by these data masks, "you are torn between data protection aspects and gaining knowledge." (02S5SL_6)

As this example shows, not only does the range of tasks of school leaders require the processing and use of data of various kinds, but school leaders are also required by technologies to carry out certain data processing, including the transfer of data between technologies. In this context, school leaders are empowered as the persons who have comprehensive access to all data (in) the school, as they decide on the input, processing and transfer of data. Although all school leaders in the expert interviews pointed out the high relevance of data protection and their sensitivity to it, the previous example clearly shows that school leaders face ethical and data protection boundaries as a result of technology-afforded action. This also has an impact on the dynamics between school leaders and other stakeholders. Disclosing such data practices, as described by the shadowee himself, could affect the trust and perception of the actors involved in terms of data protection and data security regarding the interaction and dynamics between school leaders and students. Overall, these control options influence the

dynamics between the actors involved by defining power structures and responsibilities without actually being visible to all those involved. In fact, it remains questionable to what extent teachers, parents, pupils and other stakeholders are aware of what data can be accessed and processed by school leaders.

In summary, it can be stated that various technology-related affordances could be identified in the everyday lives of school leaders that lead to changes in practice and dynamics between actors. In addition to communication technologies, administrative software also emerged as a relevant technology that brings power structures into focus. The results presented here offer several starting points and implications for existing research, the actions of school leaders and their professionalization in dealing with technologies and their affordances, which are now addressed and discussed in the concluding chapter.

Discussion

The results of the analyses offer various examples of technology-related affordances in the daily work of school leaders, in the context of which both adapted behavior of school leaders could be observed as well as the effects on the dynamics between different actors could be uncovered. It became clear that technology is not just a tool, but an essential component of school leader practice, that provides comprehensive “environment[s] of affordances” (Madianou & Miller, 2012, p. 170) and thereby significantly shapes the actions and interactions of school leaders. The results showed that the interplay of technology and school leadership leads to behavior that moves along a continuum between blurring boundaries and the associated burden and relief as well as enabling control efforts and actions. Finally, these results are now discussed, firstly by highlighting references to existing research. On the other hand, implications for the professionalization of school leaders and future research are addressed.

From Affordances that Offer Relief . . .

As illustrated in the findings, technologies offer a variety of affordances in everyday school leadership that facilitate or optimize actions. In this context, the intensive use of digital communication technologies should be emphasized, which enables school leaders to communicate with internal and external school stakeholders in a low-threshold and flexible manner. Similarly, school leaders use technology to manage multiple tasks simultaneously. Given that there is already empirical evidence that the everyday life of school leaders is highly heterogeneous and characterized by interruptions (cf. e.g. Krein, 2024a; Thomas & Ayres, 1998), the opportunities opened up by technology to be able to complete the extensive tasks of school leaders partly simultaneously or despite interruptions can certainly be perceived as a relief. However, the possibility of overcoming such interruptions by continuing to work simultaneously also means that technologies enable new forms of (non-)dealing with interruptions, which can also be reflected in a change in the interaction between the actors involved. This includes, for example, a change in the form of communication when glances are averted or not even turned toward someone. However, in view of the increased stress experienced by school leaders due to the many demands placed on them (see for various countries: Arnold et al., 2023; Burke et al., 2022; Dadaczynski et al., 2021), this form of parallel working should also be discussed critically. Both the performance of simultaneous actions and the described constant accessibility and availability (expected by others) can lead to increased stress for school leaders in their daily work, which brings questions about the health of school leaders and coping aspects of such stress into focus (cf. for exemplary work on the health (promotion) of school leaders: (Beusaert et al., 2023; Dadaczynski & Paulus, 2016; Kelly, 2023). These consequences of school leadership actions afforded by technology can be seen as highlights for various challenges that became visible in the data material alongside the (apparent) relief.

...through Changing Dynamics and Power Relations...

As the results show, the affordances and related actions of school leaders described also led to changes in the dynamics between school leaders and other stakeholders and their power relationships. For example, fast and informal communication via digital platforms promotes a new dynamic in interaction, which can lead to an increased flow of information and improved collaboration. At the same time, the technologies used enable actions such as postponing responses or informally sharing content and information, which raise questions about communication culture and ethical aspects. The seemingly constant accessibility of school leaders poses a particular challenge in the context of these changing dynamics: For other stakeholders, such as parents, this could be accompanied by a corresponding expectation to be able to reach the school leader at any time and to receive timely feedback from them. Such external expectations in turn change the dynamics between the actors involved and could have a negative impact on the cooperation between school and family (for parental involvement and possible barriers, see e.g. Hornby & Blackwell, 2018). Likewise, controlling behavior, as was also evident in the analyses, suggests a change in the dynamics of actors. If school leaders can use digital data to control processes, invalidate statements or simply track where teachers are at all times (according to timetables), this creates a new power relationship. The results thus also tie in with existing work in the field of surveillance studies (see, for example, for the school context: Andrejevic & Selwyn, 2022). However, in the context of power relations, the use of technology also brings other actors into focus in addition to school leaders who are not visible in the actual daily work of school leaders and in their interaction with others: For example, the findings point to the significant role of software developers, who also gain agency by shaping the relevant technologies, subtly controlling understandings of phenomena and actors as well as possibilities for action (see also, for example, Ideland, 2020; Krein & Schiefner-Rohs, 2024; Macgilchrist, 2024). This is because the pre-structuring of technology means that school leaders are not only users but are also guided in their actions by the specifications and functions of the technologies. This power of technology developers underlines the importance of design decisions and how they influence school leaders' practice (see also on power relations and educational technology discourse: Macgilchrist, 2017).

...to Implications for the Professionalization of School Leaders and Future Research

The results underline the need for the professionalization and further training of school leaders in the use of digital technologies. It is important that school leaders not only acquire the technical skills to be able to use new technologies adequately in their everyday work and for school leadership. It is also important to develop strategies to overcome the challenges associated with the use of technology and to be able to reflect on the consequences of affordances. In this context, however, the affordances described above can not only represent the content of professionalization programs, but can also be used didactically and thus provide a valuable starting point: With regard to the various advantages of technology-related affordances in school leadership, it would be conceivable, for example, to consciously perceive them, reflect on them and attempt to use them in a targeted manner for school leadership work. To this end, however, a further investigation of other affordances and possible assemblages of these would first be relevant to uncover them on the one hand and to sensitize those involved in school practice on the other. However, the presented results not only offer implications for the professionalization of school leaders, but also for future research. In addition to the previously mentioned links to existing research, other aspects appear relevant for future studies: For example, it could be of great interest to investigate possible irritations and resistance to affordances and afforded action. What happens when school leaders are irritated by affordances in their daily work? Do their practices change or, conversely, does their approach to technology change? And what happens when other actors resist the affordances of school leaders, for example by not transmitting or retrieving data? These are all questions that could not be answered in this study but could provide valuable insights for exploring the relevance of technology-related affordances in school leadership practices. The role of

software developers also offers important implications for future research and school practice: on the one hand, it is important to reflect on the design of technologies and the perspectives of software developers when integrating and using technologies in schools. On the other hand, this should also be specifically addressed in future research to answer questions about which stakeholder groups are becoming increasingly relevant for schools in the course of digital transformation processes and what power they have.

Furthermore, the limitations of this article offer various implications for future research: when considering the results, it must of course be kept in mind that the data collection was carried out during the COVID-19 pandemic. While the pandemic, there were inevitably major digitization processes in schools in Germany, during which various technologies were also introduced and used in schools. Although the data provides extensive insights due to the urgency of the topic at the time, this study should be repeated. On the one hand, it can be assumed that various processes took place in schools during and after the pandemic, which also significantly influenced the (non-)use of technologies. On the other hand, it must be assumed that technological progress – which has been massive in the last two years alone in the field of AI – has led to new technologies with different possibilities and affordances being used in schools. A repetition of the study would therefore be necessary to profitably supplement the results presented. The sample should also be expanded, although the results have already provided valuable insights despite the small sample size. However, an expansion of the sample, especially to include people with different skills and abilities, could provide even more differentiated findings. Finally, it should be noted that the methodological approach proved to be suitable for the exploratory study. For future research, it would therefore not only be advisable to choose ethnographic approaches to investigate affordances, but also to creatively develop the use of the selected methods. For example, interviews could also be used for joint reflection on affordances to gain a better understanding of how affordances and the associated areas of tension are experienced individually by school leaders and translated into concrete actions. These considerations underline the need emphasized at the beginning to look at the integration and use of technologies beyond a tool perspective. Especially against the backdrop of the various promises made in connection with technologies, it will be a great challenge not to be blinded by them, but to maintain the view behind the technology.

Note

1. The following empirical examples 02S5SL_7, 02S2vSL_11, 02S5SL_10 and 02S5SL_6 have already been published as part of another study which, unlike the present article, did not explicitly focus on affordances in school leadership. For further excerpts of the data material and the analysis results as part of the research project written there, please see: Krein (2024a). *Schulleitung und Digitalisierung. Bedingungen und Herausforderungen für das Handeln von Schulleitenden* [School Leadership and Digitalization. Conditions and Challenges for the Actions of School Leaders]. Transcript Verlag.

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References

- Allert, H., Asmussen, M., & Richter, C. (Hrsg.). (2017). *Pädagogik, Digitalität und Selbst: Interdisziplinäre Perspektiven auf Subjektivierungs- und Bildungsprozesse [Pedagogy, digitality and the self: Interdisciplinary perspectives on processes of subjectivation and education]* (1 Aufl.). Transcript Verlag.
- Andrejevic, M., & Selwyn, N. (2022). *Facial recognition*. Polity Press.
- Antonietti, C., Schmitz, M.-L., Consoli, T., Cattaneo, A., Gonon, P., & Petko, D. (2023). Development and validation of the ICAP technology scale to measure how teachers integrate technology into learning activities. *Computers & Education*, 192, 104648. <https://doi.org/10.1016/j.compedu.2022.104648>
- Arnold, B., Rahimi, M., & Riley, P. (2023). The mental health of leaders in Australian government schools: Stress and burnout over a decade (2011-2020). *Educational Management Administration & Leadership*. <https://doi.org/10.1177/17411432231209713>
- Bareither, C. (2023). Ethnografische affordananalyse [ethnographic affordance analysis]. In S. Stollfuß, L. Niebling, & F. Raczkowski (Eds.), *Handbuch Digitale Medien und Methoden [Handbook of Digital Media and Methods]*. Springer VS. https://doi.org/10.1007/978-3-658-36629-2_38-1
- Beausaert, S., Froehlich, D. E., Riley, P., & Gallant, A. (2023). What about school principals' well-being? The role of social capital. *Educational Management Administration & Leadership*, 51(2), 405–421. <https://doi.org/10.1177/1741143221991853>
- Bogner, A., Littig, B., & Menz, W. (2014). *Interviews mit Experten: Eine praxisorientierte Einführung [Interviews with experts: A practice-oriented introduction]*. Springer VS. <https://doi.org/10.1007/978-3-531-19416-5>
- Brinkmann, M. (2015). Phänomenologische Methodologie und Empirie in der Pädagogik: Ein systematischer Entwurf für die Rekonstruktion pädagogischer Erfahrungen [Phenomenological methodology and empiricism in pedagogy: A systematic design for the reconstruction of pedagogical experience]. In M. Brinkmann, R. Kubac, & S. S. Rödel (Eds.), *Phänomenologische Erziehungswissenschaft. Pädagogische Erfahrung: Theoretische und empirische Perspektiven [Phenomenological Educational Science. Educational Experience: Theoretical and Empirical Perspectives]* (pp. S. 33–60). Springer VS.
- Burke, J., Kinnarney, P., & Salokangas, M. (2022). 'Split in all directions': An exploration of the impact of wellbeing and daily responsibilities on post-primary school leaders' perceived stress. *School Leadership and Management*, 42(2), 110–125. <https://doi.org/10.1080/13632434.2021.2016683>
- Dadaczynski, K., Okan, O., & Messer, M. (2021). *Belastungen und Beanspruchungen von Schulleitungen während der Corona-Pandemie: Ergebnisse einer Online-Befragung in vier Bundesländern [Stress and Strain on School Leaders during the Corona Pandemic: Results of an Online Survey in Four Federal States]*. <https://doi.org/10.4119/UNIBI/2957528>
- Dadaczynski, K., & Paulus, P. (2016). Healthy principals - healthy schools? A neglected perspective to school health promotion. In V. Simovska & P. M. McNamara (Eds.), *Schools for health and sustainability: Theory, research and practice* (pp. 253–273). Springer VS.
- Fayard, A., & Weeks, J. (2014). Affordances for practice. *Information and Organization*, 24(4), 236–249. <https://doi.org/10.1016/j.infoandorg.2014.10.001>
- Gaver, W. (1991). Technology affordances. In S. P. Robertson, G. M. Olson, & J. S. Olson (Eds.), *CHI '91: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, New Orleans, Louisiana (pp. S. 79–84). <https://doi.org/10.1145/108844.10885>.
- Gibson, J. J. (1977). The Theory of Affordances. In R. Shaw & J. Bransford (Eds.), *Perceiving, Acting, and Knowing* (pp. 67–82). Lawrence Erlbaum.
- Håkansson Lindqvist, M., & Pettersson, F. (2019). Digitalization and school leadership: On the complexity of leading for digitalization in school. *The International Journal of Information and Learning Technology*, 36(3), 218–230. <https://doi.org/10.1108/IJILT-11-2018-0126>
- Hornby, G., & Blackwell, I. (2018). Barriers to parental involvement in education: An update. *Educational Review*, 70(1), 109–119. <https://doi.org/10.1080/00131911.2018.1388612>
- Ideland, M. (2020). Google and the end of the teacher? How a figuration of the teacher is produced through an ed-tech discourse. *Learning, Media and Technology*, 46(1), 1–14. <https://doi.org/10.1080/17439884.2020.1809452>
- Jarke, J., & Breiter, A. (2021). Die Schule als digitale Bewertungsfiguration? Zur Soziomaterialität von Algorithmen und Daten [The School as Digital Assessment Configuration? On the Sociomateriality of Algorithms and Data]. *MedienPädagogik*, 44, 140–159. <https://doi.org/10.21240/mpaed/44/2021.11.01.X>
- Jörissen, B. (2014). Digitale Medialität [Digital Mediality]. In C. Wulf & J. Zirfas (Eds.), *Handbuch Pädagogische Anthropologie [Handbook of educational anthropology]* (pp. 503–513). Springer VS. https://doi.org/10.1007/978-3-531-18970-3_46
- Jornitz, S., & Macgilchrist, F. (2021). Datafizierte Sichtbarkeiten [Datafied Visibilities]. *MedienPädagogik: Zeitschrift für Theorie und Praxis der Medienbildung*, 45, 98–122. <https://doi.org/10.21240/mpaed/45/2021.12.21.X>
- Kelly, H. (2023). *School leaders matter: Preventing burnout, managing stress, and improving wellbeing* (1st ed.). Routledge. <https://doi.org/10.4324/9781003198475>

- Kirschner, P., Strijbos, J.-W., Kreijns, K., & Beers, P. J. (2004). Designing electronic collaborative learning environments. *Educational Technology Research & Development*, 52(3), 47–66. <https://doi.org/10.1007/BF02504675>
- Knox, J., Williamson, B., & Bayne, S. (2019). Machine behaviourism: Future visions of ‘learnification’ and ‘datafication’ across humans and digital technologies. *Learning, Media and Technology*, 45(1), 31–45. <https://www.tandfonline.com/doi/abs/10.1080/17439884.2019.1623251?journalCode=cjem20>
- Kozinets, R. V., Scaraboto, D., & Parmentier, M. (2018). Evolving netnography: How brand auto-netnography, a netnographic sensibility, and more-than-human netnography can transform your research. *Journal of Marketing Management*, 34(3–4), 231–242. <https://doi.org/10.1080/0267257X.2018.1446488>
- Krein, U. (2023). What’s your take on school leadership and digitalization? A systematic review of publications from the last 20 Years. *International Journal of Leadership in Education*, 1–22. <https://doi.org/10.1080/13603124.2023.2237939>
- Krein, U. (2024a). *Schulleitung und Digitalisierung. Bedingungen und Herausforderungen für das Handeln von Schulleitenden [School Leadership and Digitalization. Conditions and Challenges for the Actions of School Leaders]*. Transcript Verlag.
- Krein, U. (2024b). School leadership under the conditions of digitalization. A German insight on conditions and challenges for school leaders. In A. Kafa & N. Eteokleous (Eds.), *The power of technology in school leadership during COVID-19. Insights from the field* (pp. 151–167). VS Verlag.
- Krein, U., & Schiefner-Rohs, M. (2024). “Hey, ich habe gesehen, du hast noch zwölf Wissenslücken” (Prägende) Verständnisse von Lernen und Lehren im Kontext datenbasierter Bildungstechnologien [“Hey, I saw you still have twelve knowledge gaps” (Formative) Understandings of Learning and Teaching in the Context of Data-based Educational Technologies]. In M. Schiefner-Rohs, S. Hofhues, & A. Breiter (Eds.), *Datafizierung (in) der Bildung. Kritische Perspektiven auf digitale Vermessung in pädagogischen Kontexten [Datafication (in) Education. Critical Perspectives on Digital Measuring in Educational Contexts]* (pp. 63–80). transcript Verlag.
- Kuckartz, U. (2018). *Qualitative Inhaltsanalyse: Methoden, Praxis, Computerunterstützung [Qualitative content analysis: Methods, practice, computer support]* (4 Aufl.). Beltz Juventa.
- Macgilchrist, F. (2017). Backstaging the teacher: On learner-driven, school-driven and data-driven change in educational technology discourse. *Kultura-Społeczeństwo-Edukacja*, 2(2), 83–103. https://www.researchgate.net/publication/331316024_Backstaging_the_teacher_On_learner-driven_school-driven_and_data-driven_change_in_educational_technology_discourse
- Macgilchrist, F. (2024). *AI in education: How developers and legislators make futures. NORRAG policy insights: AI and Digital inequities.* (15–16). <https://www.norrag.org/news-policy-insights-ai-digital-inequities/>
- Madianou, M., & Miller, D. (2012). Polymedia: Towards a new theory of digital media in interpersonal communication. *International Journal of Cultural Studies*, 16(2), 169–187. <https://doi.org/10.1177/1367877912452486>
- Margolin, I. (2013). Nurturing opportunities for educational leadership: How affordance and leadership interconnect. *Higher Education Studies*, 3(3), 77–89. <https://doi.org/10.5539/hes.v3n3p77>
- Meuser, M., & Nagel, U. (2009). Das Experteninterview - konzeptionelle Grundlagen und methodische Anlage [The expert interview - conceptual foundations and methodological approach]. In S. Pickel, G. Pickel, H.-J. Lauth, & D. Jahn (Eds.), *Methoden der vergleichenden Politik- und Sozialwissenschaft: Neue Entwicklungen und Anwendungen [Methods of Comparative Politics and Social Science: New Developments and Applications]* (1 Aufl.). (pp. 465–480). VS Verlag für Sozialwissenschaften.
- Norman, D. A. (1988). *Dinge des Alltags. Gutes Design und Psychologie für Gebrauchsgegenstände [Things of Everyday Life. Good Design and Psychology for Everyday Objects]*. Campus.
- Orlikowski, W. J., & Scott, S. V. (2008). «sociomateriality: Challenging the separation of technology, work and organization». *Academy of Management Annals*, 2(1), 433–474. <https://doi.org/10.1080/19416520802211644>
- Schildkamp, K., Poortman, C. L., Ebbeler, J., & Pieters, J. M. (2019). How school leaders can build effective data teams: Five building blocks for a new wave of data-informed decision making. *Journal of Educational Change*, 20(3), 283–325. <https://doi.org/10.1007/s10833-019-09345-3>
- Schrum, L., & Levin, B. B. (2016). Educational technologies and twenty-first century leadership for learning. *International Journal of Leadership in Education*, 19(1), 17–39. <https://doi.org/10.1080/13603124.2015.1096078>
- Selwyn, N. (2020). ‘Just playing around with excel and pivot tables’ - the realities of data-driven schooling. *Research Papers in Education*, 37(1), 95–114. <https://doi.org/10.1080/02671522.2020.1812107>
- Stalder, F. (2016). *Kultur der Digitalität [Culture of Digitality]*. Suhrkamp.
- Thomas, R. A., & Ayres, J. (1998). A principal’s interruptions: Time lost or time gained? *International Journal of Educational Management*, 12(6), 244–249. <https://doi.org/10.1108/09513549810237922>
- Zillien, N. (2009). Die (Wieder-)Entdeckung der Medien – Das Affordanzkonzept in der Mediensoziologie. *Sociologia Internationalis*, 46(2), 161–181. <https://doi.org/10.3790/sint.46.2.161>
- Zillien, N. (2019). Affordanz [Affordance]. In K. Liggieri & O. Müller (Eds.), *Mensch-Maschine-Interaktion [Human-Machine-Interaction. Handbook of History - Culture - Ethics]* (pp. 226–228). J.B. Metzler. https://doi.org/10.1007/978-3-476-05604-7_31.