IN NEED OF DEVELOPMENT, LEARNING AND RESEARCH? ON THE POSSIBILITIES OF A COMMON POINT OF DEPARTURE FOR DIGITAL AND EDUCATIONAL DEVELOPMENT

Jörgen From[a] and Fanny Pettersson[a]

ABSTRACT

A growing body of initiatives aims to connect school improvement with external actors, such as universities, by means of networks and collaborative partnerships of different kinds. Simultaneously, many schools have difficulties in assessing or predicting their needs associated with the digitalization of a specific local school practice given their lack of existing tools to articulate those needs. This has made it difficult to study digitalization in a complementary and symmetrical way between academia and practice. In this study, we used a quantitative instrument to generate findings and development needs relevant to both research and school development. The instrument, which we distributed to all school leaders in one municipality, measures perceptions of three overall areas: (a) levels of digitalization, (b) organizational digital maturity, and (c) notions of leadership. The data shows, for example, that digitalization, in this municipality, was a concern or issue on an individual level. Achieving a more complex view of digitalization as school development—a collegial approach and mindset together with leadership and organization that focuses on strategy and common goals—appears to be a high priority for research and practice. To conclude, the results generated from the instrument used in this study can contribute to a shared understanding of the findings and the needs relevant to both research and school development.

Keywords: digitalization; digital technologies; organization; school leadership; school development.

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[a] Umeå University, Sweden.

1   INTRODUCTION

The digitalization of schools has been high on the agenda for almost half a century. Recently, the global but not so positive circumstances of the COVID-19 pandemic have made schools aware of the benefits of digitalization. Schools have, to different degrees, used digital technology to adjust to the pandemic; those that have a higher general level of digital competence have coped rather well and have been able to sustain education throughout periods of lockdown. Others were forced to close all activities and rely on more traditional, analogue, paper-based practices. In this, the pandemic has shown the importance of having some form of organizational conditions for digitalization. One question, however, is what these conditions might be.

Although the uptake and use of digital technologies have been studied over several decades, one prominent factor affecting outcomes has been teacher and student readiness (Olofsson et al., 2015). One aspect that has more recently become a focus of research is digital school leadership (Dexter, 2018; Liu et al., 2013; Sterrett & Richardson, 2020). Another factor, which has not been prominent in research but has often been mentioned as an important part of future research, is the degree of digital readiness schools as systems of educational activities have for keeping up with large-scale changes in society and small-scale demands from students and parents (cf. Heintz & Mannila, 2018; Leino Lindell, 2020).

In this paper, we report on a research and development project focused on organizational conditions for digitalization. In recent years, many European countries have increased investment in research and development projects focused on digitalization and school development. These initiatives aim to connect school improvement efforts with external actors, such as universities, through various kinds of networks and collaborative partnerships (Chapman et al., 2016; Day et al, 2016). Research has shown that collaborations between schools and academia might lead to meaningful changes in teaching and learning processes and improve the quality of educational practices in schools (Ainscow, 2012).

However, a particular problem in research and development projects is the difficulty of predicting the needs of a specific local school's practice when those involved in the practice have no existing tools to articulate what type of knowledge they might need. This makes it difficult to study digitalization and school development in a complementary and symmetrical way and to identify related needs that the school may be unaware of or unable to articulate yet. In this paper, we report on a study that uses a quantitative instrument developed to generate findings relevant to both research and school development. The instrument, which was distributed to all school leaders in one municipality in Sweden, measures perceptions of three overall areas: (a) levels of digitalization, (b) organizational digital maturity, and (c) notions of leadership. The aim of the study is to analyze, from the perspective of school leaders, how digitalization is enacted in schools. Thus, we formulated the following research questions:

- How are digital technologies implemented and used in schools?
- What patterns of leadership can be identified as important for leading digital school development?
- What research and development needs can be identified that are relevant for both research and practice?

2   DIGITALIZATION IN SCHOOLS – ORGANIZATION AND LEADERSHIP

The ongoing process of digitalization is increasingly affecting today's society (McAfee & Brynjolfsson, 2017). Some features of these restructuring processes are combinations of old and new innovations (e.g., a cell phone becoming a music player, camera, calculator), the restructuring of social businesses (e.g., global industry leaders such as Kodak being replaced by digital solutions such as Instagram), and the exponential development and digitalization of information.

Digitalization is also evident in the educational sector (Haugsbakk, 2020; Shanks, 2020). Over the last decades, digitalization has been high on the political agenda, and expectations that digital technologies will both disrupt and improve learning and education are high (Haugsbakk, 2020; Shanks, 2020). At its simplest stage, digitalization has been used to facilitate daily tasks and routines in schools. The distribution of computers and tablets offers students enhanced access to knowledge and information and supports the administration of teachers' and students' daily work (Haßler et al., 2016). Digital platforms facilitate communication between the home and the school (Gu, 2017), tablets support students in producing and submitting schoolwork (Bergström, 2019), and digital whiteboards, aminations, and so on are incorporated in classrooms to illustrate knowledge and information in new, innovative ways (Hapsari et al., 2019). This is often referred to as the large-scale infusion of digital technologies—hardware, software, and digital infrastructure—into school systems (cf. Håkansson-Lindqvist, 2015; Jewitt et al., 2007).

At a more complex stage, the digitalization of schools has been used to, or associated with, the power to change how people implement and think about schooling (cf. Blau & Shamir-Inbal, 2017; Lund & Aagaard, 2020; Siljebo, 2020). Digitalization, from this perspective, often involves processes of systematic, behavioral, and epistemic change (Leino Lidell, 2020; Pettersson, 2021; Shanks, 2020). As Lund and Aagaard (2020) discussed, digital technologies can be more than just tools and can "come with the potential of *transforming* the cultures they are introduced into, not by their inherent qualities or features but as a result of the interplay between artifacts and humans' capacity for transformative agency" (p. 59). This means that technologies can support daily teaching and learning practices in schools and, in some cases, can change previous practices into new ones (Aagaard & Lund, 2020; From et al., 2020; Islam & Grönlund 2016). This process has been referred to as an epistemic, behavioral, or organizational change in schools and

education, with digitalization being conceptualized as having an inherent transformational agency that changes the way people learn and develop (Aagard & Lund, 2020; Pettersson, 2021; Siljebo, 2020).

However, new educational solutions and processes of change and transformation make demands of a school's organization and leadership (Hallinger, 2010; Hallinger & Huber, 2012; Rensfeldt & Player-Koro, 2020). For example, school leaders are expected to lead their organizations through political reforms aimed at innovation and demonstrate good practices in the integration of technology into educational contexts (Avidov-Ungar et al., 2020; Sterrett & Richardson, 2019). More recently, the COVID-19 pandemic added to this complexity of opportunities and demands when it "instantly disrupted the usual modalities of teaching and learning, and as such, pushed school leaders into the digital foray overnight" (Sterrett & Rickardsson, 2020, p. 15).

Various scholars have conceptualized school leadership in digitalized contexts. Using the framework of Leithwood and Riehl (2003, 2005), Dexter (2008) developed three categories of ICT leadership. This framework has been used to study digitalization and leadership (Dexter, 2018; Petersen, 2014), goals and policies (Vanderlinde et al., 2012), and the roles of school leaders in digitalization (Håkansson-Lindqvist & Pettersson, 2019). From another perspective, Mårell-Olsson and Bergström (2018) conceptualized strategic school leadership as the awareness of goals and motives and the implementation of actions and strategies for organizing and leading processes of digital and educational change. Researchers have also studied the enactment of school leadership by analyzing microprocesses from historical and sociocultural perspectives (Vennebo, 2017 see also Hauge, 2016).

Additionally, researchers have called for enhanced research on leadership styles in digitalized contexts (Liu et al., 2013). At the same time, Day et al. (2016) argued,

> Schools' abilities to improve and sustain effectiveness over the long term are not primarily the result of the principals' leadership style but of their understanding and diagnosis of the school's needs and their application of clearly articulated, organizationally shared educational values through multiple combinations and accumulations of time and context-sensitive strategies that are "layered" and progressively embedded in the school's work, culture, and achievements. (p. 222)

Moreover, new tasks, relations, and ways to interact have been described as "a clash of cultures" in schools, leading to new considerations and priorities for school leadership to contemplate (Williams, 2008).

2.1 Conceptualization of Digitalization and School Leadership

Digital technologies are expected to both disrupt and improve learning and education. Digitalization is said to be a complex process including the infusion of tools, the development of new practices, epistemological and organizational

changes in the way people act, think, and talk about schooling (cf. Pette5rsson, 2021; Willermark & Pareto, 2020). Engeström (2015) referred to such radical, and somewhat unpredictable, changes in an activity (in this case, school) system as expansive learning. Radically new forms of acting and working, according to Engeström (2011), are "literally learned as they are being created" (p. 38).

Simultaneously, schools as producers and carriers of cultural and historical norms and practices are often characterized by slow, rather than radical, paths of change and development (cf. Siljebo, 2020). From a theoretical point of view, this means that cycles of expansive learning in schools can be difficult to trace, without being labeled or stigmatized as nonchange (Pettersson, 2021).

For studying digitalization in schools, the theorization of small and large scales could be useful. Using the concept of levels of learning (first introduced by Bateson, 1972), Engeström (2015) described smaller and inherent steps of expansive learning processes (see also Pettersson, 2021; From et al., 2000). The first level, Learning I (LI), refers to small changes in (digital) tools. Engeström (2015) divided the second level, Learning II, which is a more complex form of development, into two forms: Learning IIa (LIIa) and Learning IIb (LIIb). LIIa refers to the implementation and use of (digital) tools to support existing practices. LIIb refers to the development of new tools and ways of working, which spread to entire working teams. Learning III (LIII) includes a more radical change at the organizational level with qualitative changes in practice, structure, goals, and organization and is what Engeström referred to as expansive learning.

Another way of addressing the strategic alignment between digitalization and key practices within organizations is with the concept of digital maturity. Henderson and Venkatraman (1993) argued that the inability to see and manage the value of IT investments is due to a lack of integration between organizations' strategies and IT strategies and that if an IT investment does not deliver sufficient benefits, it is because it does not handle IT as a strategic tool but as an administrative or technical system. This focuses on the strategic aspects of digitalization, both as a formalized policy and as change work (Luftman, 2000). Digitization in organizations generally appears to be a work of change (Tillväxtverket, 2017). Kane et al. (2015) showed that the key driver of digital transformation is not the digital technologies themselves, but rather it is a question of strategy. Strategy is less about the right technology than about reconfiguring organization and practices to take advantage of the information these technologies enable (Luftman, 2000). Digital maturity is about an organization's ability to assimilate any benefits of digitization and in a way, offers a model for identifying the extent to which digitization at a strategic level is integrated with other business development (Kane et al., 2015). The model for digital maturity is intended to help clarify the sociotechnical context that characterizes organizations' digitization work (Tillväxtverket, 2017).

Meanwhile, research on leadership in organizations has increased dramatically (Dinh et al., 2014; Northouse, 2019). The different approaches to

leadership can be broadly categorized as either a specialized role (i.e., a school leader) or an influence process that occurs naturally within a social system and is diffused among members (Yukl 2002, 2013). In recent years, most definitions of leadership have involved a process of social influence (Yukl, 2013). From this perspective, the essence of leadership in organizations is, according to Yukl (2013), "influencing and facilitating individual and collective efforts to accomplish shared objectives" (p. 19). Thus, according to Yukl, leaders can improve the performance of a team or organization by influencing the processes that determine performance.

In this study, we agreed with these ideas and considered leadership for digitalization in school as a social process or pattern of relationships rather than as a specialized role in school (cf. Vennebo, 2016). This also means that leadership was referred to as a process driven by several actors (school leaders, principals, ICT leaders, educational experts, head teachers with responsibility for digitalization, etc.). We focused, rather than on specific roles, on how participants understand the importance of specific behaviors in a group when it comes to leading for digitalization in schools. This line of thought was concretized by Yukl (2013) in four metacategories "used to influence the performance of a team, work, unit, or organization" (p. 68). Yukl (2013) described the objective of these as follows:

Task-oriented: to accomplish work in an efficient and reliable way

Relations-oriented: to increase the quality of human resources and relations, which is sometimes called "human capital"

Change-oriented: to increase innovation, collective learning, and adaption to the external environment

External: to acquire necessary information and resources, and to promote and defend the interests of the team or organization (p. 68)

In this study, these metacategories were used to identify the patterns of leadership that are important for leading digital school development.

3   DESIGN AND METHODS

A growing body of initiatives aims to connect school improvement with external actors, such as universities, by means of networks and collaborative partnerships of different kinds (Chapman et al., 2016; Day et al., 2016). Research has shown that such collaboration might lead to meaningful changes in teaching and learning processes in schools (Ainscow, 2012). Literature on initial teacher education, professional development for teachers, and educational research has also acknowledged the power of school–academia partnerships to improve practices and results for students (Day & Smethem, 2010). However, only a limited amount of research has investigated how such partnerships and collaboration form or how they stem from strategic leadership (e.g., Murphy, 2017).

Furthermore, research has shown that initiatives and efforts for school development should be sensitive to the contexts and local conditions of schools (Adolfsson & Alvunger, 2017; Hopkins et al., 2014). Shanks (2020) found that "if

teachers or other professionals were not keen or passionate about the project then it was much harder for the project to be successful" and that a "clearly defined aim and meaning is essential for having people to set aside time and effort" (p. 11). Digitalization might be complicated by the fact that educational technology is often adopted in short-term, temporary projects (Shanks, 2020) and by the previously discussed difficulties schools have in assessing or predicting their needs associated with the digitalization of specific local practices given the lack of existing tools to articulate those needs. This has made it difficult to study digitalization and school development in a complementary and symmetrical way.

In 2019, the Swedish government commissioned a national pilot project (Utveckling [Development], Lärande [Learning], Forskning [Research]) with the aim of establishing sustainable collaboration models between academia and schools/the school system. The project underlines a dimension of school development and research that uses a complementary and symmetrical approach by supporting strong and sustainable relationships between practitioners and researchers. The project is expected to contribute to the research base of the school system, and its research will build on equal contributions from researchers and schools. An important principle of the project is the complementary and symmetrical formulation of the research and development needs, making the project relevant for both research and practice.

3.1 Method and Instrument

To handle the difficulties in studying digitalization and school development in a complementary and symmetrical way, a quantitative instrument was developed at the Department of Education in autumn 2019 and spring 2020 (Siljebo, 2020; Siljebo et al., 2021). The development procedure followed an item–response modeling approach (Wilson, 2005). The items were designed in a fixed-response format (Wilson, 2005), and the responses used a Likert-type scale ranging from 1 (*not relevant*) to 5 (*absolutely essential*). The respondents were asked to rate the importance of (a) levels of digitalization (based on the theoretical foundations found in Bateson, 1972, and Engeström, 2015), (b) organizational digital maturity (based on the model developed by Kane et al., 2015), and (c) notions of leadership (based on the survey developed by Yukl, 2013). All statements were formulated to measure what respondents assess as important, not what they themselves actually do in their daily practices. A series of background questions of relevance for the specific schools are also asked. The instrument is available online as a self-administered questionnaire.

The first construct, levels of digitalization, consisted of three dimensions: LIIa (use of digital technologies for supporting daily practices), LIIb (how the use of digital technology has changed daily practices), and LIII (how the use of digital technology has changed the way organizations work, communicate, and operate). Each dimension is measured with six statements.

The second construct, digital maturity, consists of seven dimensions: strategy, goals, leadership, organizational culture, competence, integration, and scope (cf. Tillväxtverket, 2017). All dimensions are assessed relative to three levels of maturity: conscious organizations, adaptive organizations, and dedicated organizations.

The third construct, notions of leadership, is measured in four metacategories: task-oriented behaviors, relations-oriented behaviors, change-oriented behaviors, and external leadership behaviors (Yukl, 2013). The four metacategories consist of 17 specific component behaviors, such as clarifying, supporting, advocating change, and external monitoring. Thus, this part of the survey consists of 49 statements, all modified to address the current state of leadership at the respondent's workplace. In this study, the survey was distributed to all school leaders in one municipality in the northern Sweden (N = 44, with a response rate of 93%), since their work roles may include insights on many different activities in schools. The total number of school leaders in municipalities in this region is low. We considered this factor in the analysis and formulation of possible inferences from the data. The primary intended use of the data collected using the instrument in this study was as a tool for mapping rather than explaining, with careful considerations of sample size in the given empirical context. The instrument was, therefore, used primarily for mapping the respondents' answers, and the statistics used were nonparametric and concerned the frequency/distribution in addition to the mean and standard deviation.

The respondent group included active school leaders in preschool classes and compulsory schools (Grades 1–9) within a single municipality. Most of the respondents were aged 41–60 years (66%) and were women (75%). Most (54.5%) had more than 5 years of experience working as school leaders, and 79% worked in schools with 25–49 employees. In a self-assessment question, 22% believed that they were usually among the first to try new digital technologies, 56% indicated that they started using digital technologies at the same time as their colleagues, and 22% estimated that they started later than the majority of their colleagues.

4   RESULTS

In this section, we present our results according to the three overall areas: (a) levels of digitalization, (b) organizational digital maturity, and (c) notions of leadership.

4.1   Levels of Digitalization

The levels of digitalization construct has three levels: LIIa, how respondents use digital technologies in their daily work; LIIb, how the use has changed their daily practices; and LIII, how the use has changed the way they work, communicate, and operate within the organization. The questions concerned to what degree the use

of digital technologies has resulted in new ways of organizing and talking about daily practice (Table 1).

Table 1. LIIa: The Use of Digital Technologies in Daily Work

I use digital technologies	N	Min.	Max.	M	SD
To plan tasks	41	1	5	3.88	1.077
To carry out tasks	41	1	5	4.02	1.084
For documentation	41	1	5	4.34	0.883
To communicate	41	1	5	4.24	0.830
To search for information	41	1	5	4.46	0.840
Valid N (listwise)	41				

School leaders rated elements of the first level (LIIa), the implementation and use of digital technologies in their daily work, highly. This level of digitalization is characterized by simple stages of digital school development, including the use of digital tools to support existing practices at an individual level.

Table 2. LIIb: How the Use of Digital Technologies has Changed Daily Practices

Digital technologies have changed	N	Min.	Max.	M	SD
How I carry out my tasks	41	1	5	3.76	1.019
How I plan my work tasks	41	1	5	3.71	0.981
How I developed new tasks	41	1	5	3.61	1.159
The way I think about my work tasks	41	1	5	3.37	1.067
The way I talk about my tasks	41	1	5	3.20	1.054
Have led to collegial discussions about my work tasks	41	1	5	3.17	1.202
Valid N (listwise)	41				

Compared to the first level, school leaders assigned lower scores to elements of the second level (LIIb), to what extent the implementation and use of digital technologies have changed work tasks. These changes relate to how tasks are conducted at an individual level (the first statements) and are less about influences on the collective level (Table 2).

Table 3. LIII: How the Use of Digital Technologies Has Changed the Way Organizations Work, Communicate, and Operate

In this school,	N	Min.	Max.	M	SD
New digital working methods are an important part of everyday life	41	1	5	3.59	1.140
We collaborate on issues of digitization	41	1	5	3.34	0.965
There is a culture that encourages development	41	1	5	3,71	0.955
Digital tools have contributed to new ways of working that have spread throughout the school's practices	41	1	5	3.56	1.050
Digital tools enable us to achieve goals and visions that contribute to school development	41	1	5	3.63	0.942
The use of digital tools has made us talk about school practices in other ways	41	1	5	3.10	0.995
The use of digital tools has led us to organize our daily operations in different ways	41	1	5	3.00	1.072
Valid N (listwise)	41				

School leaders assigned the lowest scores to elements of the third level (LIII), which concern how the use of digital technologies has changed the way they work, communicate, and operate within the school organization. Table 3 shows a similarity in patterns between and within each level. Individual aspects of change and development scored the highest, whereas collegial aspects of change scored lower. This shows that school organizations in this municipality operated mostly on LIIa and LIIb, meaning digital technology was used primarily to facilitate daily routines at the individual level and not as a means for school development.

4.2 Digital Maturity

According to the participating school leaders, the schools they worked in had relatively high degrees of digital maturity regarding organizational culture, and interest in new technology was encouraged (44%) or the staff were permissive of new technology (46%). Only 10% of the respondents identified with the statement "With us, we are hesitant about new technology." There was a similar pattern in the answers regarding the propensity to take risks in relation to new technology,

with 68% of the respondents indicating that there was either encouragement of or a permissive climate for risk-taking. On an individual level, there seemed to be a rather high level of digital competence: 81% of the school management teams and 72% of the employees estimated their digital competence was high or sufficient.

At the same time, there seemed to be a less-developed integration of ICT coordinators and daily school practices. Overall, 7% of the respondents stated that ICT coordinators were part of the school management team, 37% did not take a position, and 10% indicated that ICT coordinators and daily school practices cooperated fully at all levels. However, 56% stated that there was cooperation to some extent, whereas 15% indicated that ICT coordinators and daily school practices worked separately.

Perceptions of the schools' digital maturity relative to their strategies and goals for ICT and school development were somewhat different, especially regarding clarity, transparency, and anchoring among the staff. The answers regarding strategies for ICT and school development were distributed as shown in Figure 1.
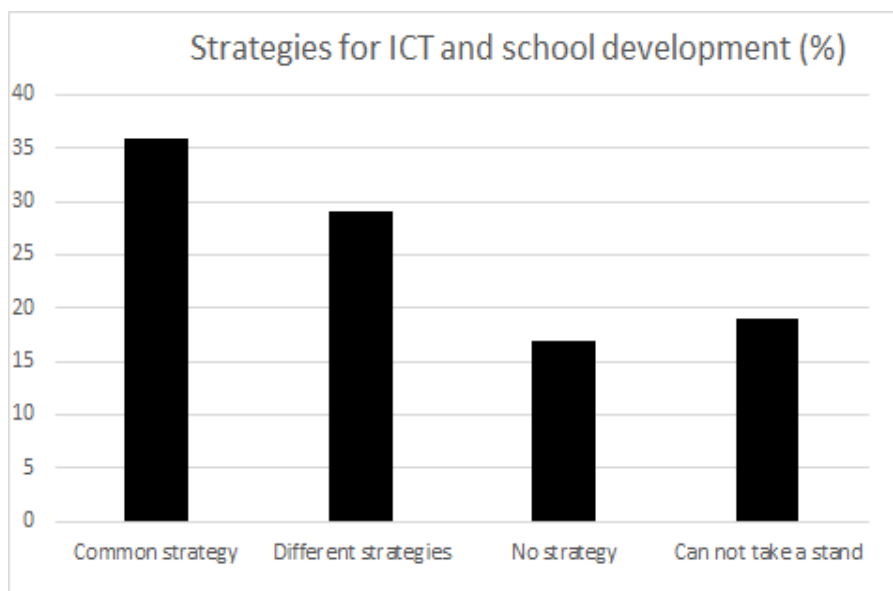

Figure 1. Frequency (%) of the Respondents' Answers

The fact that about one third (36%) of the respondents stated there was a common strategy for ICT and school development, 29% stated there were different strategies, 17% indicated there was no strategy, and 19% did not take a position is hard to explain. However, the variety of answers is, in itself, a clear indication that any existing strategy had not spread or become anchored in the entire organization. Responses to the question on goals for how ICT should support school development were similar, with 15% stating that there were clear goals, 63% reporting unclear goals, and 12% indicating a lack of goals; the remaining10% did not take a position. Again, this clearly indicates that any existing goals for how ICT

should support school development were neither spread nor anchored in the entire organization.

In summary, regarding digital maturity, the school organizations' degrees of digital maturity were good in many respects, though there was a fragmented picture regarding strategies and common goals for digitalization relative to school development.

4.3   Leadership Behaviors

The leadership construct was measured in four metacategories: task-oriented behaviors, relations-oriented behaviors, change-oriented behaviors, and external leadership behaviors. The results included some interesting findings. According to the school leaders, task-oriented and relations-oriented leadership were the most important behaviors for leading digitalization in schools. The task-oriented behaviors were mainly about clarifying (explains priorities for different objectives) and planning (determines how to schedule and coordinate activities to use people and resources efficiently), whereas the relations-oriented behaviors included mainly supporting (provides support and encouragement during difficult or stressful tasks and expresses confidence that members could successfully complete them) and empowering (involves members in making important work-related decisions and considers their suggestions and concerns).

Most change-oriented leadership behaviors were considered important but not as important as the other two types of behaviors. The highest ranked categories within change-oriented leadership behaviors were envisioning change (communicates a clear, appealing vision of what could be accomplished; links the vision to member values and ideals) and encouraging innovation (encourages innovative thinking and new approaches for solving problems). External leadership behaviors, ranked the least important metacategory, were mainly about representing (promotes and defends the reputation of the work unit or organization).

To sum up the results, the three constructs—(a) levels of digitalization, (b) organizational digital maturity, and (c) notions of leadership—indicated some kind of inner logic that characterized the whole picture: In the pattern of relationships that constitutes school leadership in the municipality, digitalization in school was not viewed as an obvious part of school development, there was no consensus on common goals for how digitalization should benefit school development or an integrated strategy for this, and digital technology was primarily used to facilitate daily routines at the individual level and not as a means for school development.

5   DISCUSSION

In this study, we used a quantitative instrument to generate findings and development needs relevant to both research and school development. Using this

instrument, we sought answers on how digitalization is enacted in schools and what research and development needs can be identified for research and practice.

This study showed some interesting findings on how school leaders experience the enactment of digitalization in schools. At first, the school organizations' degrees of digital maturity were good in many respects, such as digital competence, organizational culture, and integration between ICT coordinators and other activities, though there was a fragmented picture regarding strategies and common goals for digitalization. This correlates with the fact that digital technology was used primarily to facilitate administrative routines and for information retrieval and communication; that is, digital technology was used to facilitate daily routines at the individual level and used to a lesser extent to develop the school as a whole (cf. From et al., 2020; Islam & Grönlund 2016; Lund & Aagaard, 2020). This can also be referred to as lower levels of learning or development and digitalization, often referred to as the large-scale infusion of digital technologies—hardware, software, and digital infrastructure—into school systems (cf. Håkansson-Lindqvist, 2015; Jewitt et al., 2007).

Researchers have suggested that good leadership conditions are a key element of a school's successful digitalization (Dexter, 2008; Liu et al., 2013; Sterrett & Richardson, 2020). When it comes to leading digitalization in schools, this study shows that aspects of task-oriented and relations-oriented leadership behaviors appeared to be more prominent than change-oriented behaviors. Accordingly, it could be argued that digitalization in schools was not viewed as an obvious part of school development and there was no consensus on strategies and common goals for how digitalization should benefit school development. In other words, digitalization was associated with neither the inherent power to change how people act and think about schooling (cf. Blau & Shamir-Inbal, 2017; Lund & Aagaard, 2020; Siljebo, 2020) nor the processes of systematic, behavioral, and epistemic change (Leino Lidell, 2020; Pettersson, 2021; Shanks, 2020).

Day et al. (2016) argued that "schools' abilities to improve and sustain effectiveness over the long term are not primarily the result of the principals' leadership style but of their understanding and diagnosis of the school's needs" (p. 222). In the field of digitalization, there has been difficulty in identifying and expressing needs, for instance, in relation to the somewhat fuzzy concepts used (cf. Siljebo, 2020). The possibilities for the results of the instrument to be used as a basis for school development can be discussed as can the possibilities for the instrument to be used as an approach for research, with the intention to provide a scientific basis for school development. As suggested in previous research, initiatives and efforts on school development should be sensitive to the contexts and local conditions of each school (see also Adolfsson & Alvunger, 2017; Hopkins et al., 2014) to enable meaningful changes in the teaching and learning processes in those schools (Ainscow, 2012). At the same time, research has highlighted the difficulties in conducting research and development projects when the current practices have no existing tools to identify and formulate developmental needs. As this study

indicates, the instrument could be used to build a shared understanding of how collaboration between academia and practice could be built on strategic decisions about content for collaboration related to the digitalization of and strategic leadership in schools. In this case, for example, the results show that digitalization was implemented and used primarily on an individual level. To achieve a more complex view of digitalization as school development, there is a need for a collegial approach and mindset to address leadership and organizational preconditions for digitalization (cf. Lund & Aagard, 2020; Pettersson, 2021; Siljebo, 2020). Thus, to achieve systematic school development within the region, encouraging leadership and organizations to focuses on strategy and common goals appears to be a high priority.

To conclude, based on the results of this study, the questionnaire provides both scientifically relevant data and data for school development (i.e., data regarding things that the school has not been aware of or has been unable to formulate). To achieve systematic school development within the municipality, the above-mentioned approach may be more relevant to address than, for instance, digital competence on an individual level. However, in relation to the complementary and symmetrical approach of this research and development approach, this is a path choice and a decision that the schools must make; it is not something that research can point out. However, this research provides a well-informed basis for schools to make this decision. Furthermore, the results also enable a shared understanding between school and academia and point out possible content for joint discussions and continued and in-depth collaborations that can benefit them both.

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REFERENCES

Adolfsson, C. H., & Alvunger, D. (2017). The nested systems of local school development: Understanding improved interaction and capacities in the different sub-systems of schools. *Improving Schools*, *20*(3) 195–208. https://journals.sagepub.com doi/full/10.1177/1365480217710874

Ainscow, M. (2012). Moving knowledge around: Strategies for fostering equity within educational systems. *Journal of Educational Change*, *13*(3), 289–310. https://doi.org/10.1007/s10833-012-9182-5

Avidov-Ungar, O., Shamir-Inbal, T., & Blau, I. (2020). Typology of digital leadership roles tasked with integrating new technologies into teaching:

Insights from metaphor. *Journal of Research on Technology in Education*. Advance online publication. https://doi.org/10.1080/15391523.2020.1809035

Bateson, G. (1972). *Steps of an ecology of mind*. The University of Chicago Press.

Bergström, P. (2019). Illustrating and analysing power and control relations in Finnish one-to-one computing classrooms: Teacher practices in Grades 7–9. *Tidsskriftet Digital Kompetanse*, *14*(3–4), 117–133. https://doi.org/10.18261/issn.1891-943x-2019-03-04-03

Blau, I., & Shamir-Inbal, T. (2017). Digital competences and long-term ICT integration in school culture: The perspective of elementary school leaders. *Education and Information Technologies*, *22*(3), 769–787. DOI:10.1007/s10639-015-9456-7

Chapman, C., Chestnutt, H., Friel, N., Hall, S., & Lowden, K. (2016), Professional capital and collaborative inquiry networks for educational equity and improvement? *Journal of Professional Capital and Community*, *1*(3), 178–197. doi: 10.1108/JPCC-03-2016-0007

Day, C., Gu, Q., & Sammons, P. (2016). The impact of leadership on student outcomes: How successful school leaders use transformational and instructional strategies to make a difference. *Educational Administration Quarterly*, *52*(2), 221–258. https://doi.org/10.1177/0013161X15616863

Day, C., & Smethem, L. (2010). Partnerships between schools and higher education. In N. Verloop (Ed.), *International encyclopedia of education* (3rd ed., pp. 757–763). Elsevier.

Dexter, S. (2018). The role of leadership for information technology in education: Systems of practices. In *Second handbook of information technology in primary and secondary education* (pp. 483–498). Publisher.

Dinh, J., Lord, R., Garnder, W., Meuser, J., Liden, R. C., & Hu, J. (2014). Leadership theory and research in the new millennium: Current theoretical trends and changing perspectives. *Leadership Quarterly*, *25*(1), 36–62. https://doi.org/10.1016/j.leaqua.2013.11.005

Engeström, Y. (2011). From design experiments to formative interventions. *Theory & Psychology*, *21*(5), 598–628. https://doi.org/10.1177/0959354311419252

Engeström, Y. (2015). *Learning by expanding: An activity-theoretical approach to developmental research* (2nd ed.). Cambridge University Press.

From, J., Pettersson, F., & Pettersson, G. (2020). Fjärrundervisning—en central del i skolans digitalisering. *Pedagogisk forskning i Sverige, 25*(2–3), 69–91. DOI: 10.15626/pfs25.0203.04

Gu, L. (2017). Using school websites for home: School communication and parental involvement? *Nordic Journal of Studies in Educational Policy*, *3*(2), 133–143. https://doi.org/10.1080/20020317.2017.1338498

Haßler, B., Major, L., & Hennessy, S. (2016). Tablet use in schools: A critical review of the evidence for learning outcomes. *Journal of Computer Assisted Learning*, *32*(2), 139–156. https://doi.org/10.1111/jcal.12123

Håkansson Lindqvist, M., & Pettersson, F. (2019). Digitalization and school leadership: On the complexity of leading for digitalization in school. *International Journal of Information and Learning Technology*, *36*(3), 218–230. DOI:10.1108/IJILT-11-2018-0126

Hallinger, P. (2010) Leadership for learning: What we have learned from 30 years of empirical research [Paper presentation]. Hong Kong School Principals' Conference 2010: Riding the Tide, the Hong Kong Institute of Education, Hong Kong.

Hallinger, P., & Huber, S. (2012). School leadership that makes a difference: International perspectives. *School Effectiveness and School Improvement: An International Journal of Research, Policy, and Practice*, *23*(4), 359–367. https://doi.org/10.1080/09243453.2012.681508

Hapsari, A. S., Hanif, M., Gunarhadi, & Roemintoyo. (2019). Motion graphic animation videos to improve the learning outcomes of elementary school students. *European Journal of Educational Research*, *8*(4), 1245–1255. https://doi.org/10.12973/eu-jer.8.4.1245

Hauge, T. E. (2016). On the life of ICT and school leadership in a large-scale reform movement. In *Digital Expectations and Experiences in Education* (pp. 97–115). SensePublishers.

Haugsbakk, G. (2020). Special issue: 30 years of ICT and learning in education—Major changes and challenges. *Seminar.net*, *16*(2). DOI: https://doi.org/10.7577/seminar.4043

Haugsbakk, G., & Nordkvelle, Y. T. (2020). On the expression of hegemony in the field of educational technology: A case study of editorials in a Norwegian academic journal. *Seminar.net*, *16*(2), 19. https://doi.org/10.7577/seminar.4044

Henderson, J. C., & Venkatraman, H. (1993). Strategic alignment: Leveraging information technology for transforming organizations. *IBM Systems Journal*, *32*(1), 472–484. https://doi.org/10.1147/sj.382.0472

Heintz, F., & Mannila, L. (2018). Computational thinking for all: An experience report on scaling up teaching computational thinking to all students in a major city in Sweden. *ACM Inroads*, *9*(2), 65–71. https://doi.org/10.1145/3159450.3159586

Hopkins, D., Stringfield, S., Harris, A., Stoll, L., & Mackay, T. (2014). School and system improvement: A narrative state-of-the-art review. *School Effectiveness and School Improvement*, *25*, 257–281. https://doi.org/10.1080/09243453.2014.885452

Islam, S. M., & Grönlund, Å. (2016). An international literature review of 1:1 computing in schools. *Journal of Educational Change*, *17*(2), 191–222. https://doi.org/10.1007/s10833-016-9271-y

Jewitt, C., Moss, G., & Cardini, A. (2007). Pace, interactivity and multimodality in teachers' design of texts for interactive whiteboards in the secondary school classroom. *Learning, Media and Technology*, *32*, 303–317. DOI:10.1080/17439880701511149

Kane, G. C., Palmer, D., Phillips, A. N., Kiron, D., & Buckley, N. (2015). *Strategy, not technology, drives digital transformation: Becoming a digitally mature enterprise*. MIT Sloan Management Review.

Leino Lindell, T. (2020). Teachers calling for organizational support to digitalize teaching. *The International Journal of Information and Learning Technology*, *37*(5), 323–339. DOI: 10.1108/IJILT-02-2020-0017

Leithwood, K. A., & Riehl, C. (2003). *What we know about successful school leadership*. Laboratory for Student Success, Temple University.

Leithwood, K. A., & Riehl, C. (2005). What do we already know about successful school leadership? In W. A. Firestone & C. Riehl (Eds.), *A new agenda for research in educational leadership* (pp. 12–27). Teachers College Press.

Leithwood, K. A., Louis, K. S., Anderson, S., & Wahlstrom, K. (2004). *How leadership influences student learning: A review of research for the learning from leadership project*. Wallace Foundation.

Leithwood, K. & Jantzi, D. (2006). Transformational school leadership: Its effects on students, teachers and their classroom practices. *School Effectiveness and School Improvement*, *17*(2), 201–227. https://doi.org/10.1080/09243450600565829

Liu, F., Ritzhaupt, A., & Cavanaugh, C. (2013). Leaders of school technology innovation: A confirmatory factor analysis of the change facilitator style questionnaire (CFSQ). *Journal of Educational Administration*, *51*(5), 576–593.

Luftman, J. (2000). Assessing business-IT alignment maturity. *Communications of the Association for Information Systems*, *4*, https://doi.org/10.17705/1CAIS.00414

Lund, A., & Aagaard, T. (2020). Digitalization of teacher education: Are we prepared for epistemic change? *Nordic Journal of Comparative and International Education* (NJCIE), *4*(3–4), 56–71. http://doi.org/10.7577/njcie.3751

Mårell-Olsson, E., & Bergström, P. (2018). Digital transformation in Swedish schools: Principals' strategic leadership and organisation of tablet-based one-to-one computing initiatives. *Seminar.net: Media, Technology and Lifelong Learning*, *14*(2) 174–187.

McAfee, A., & Brynjolfsson, E. (2017). *Machine, platform, crowd: Harnessing our digital future*. WW Norton & Company.

Murphy, J. (2017). Creating communities of professionalism: Addressing cultural and structural barriers. In J. Sun, K. Pollock, & K. Leithwood (Eds.), *How school leaders contribute to student success: The Four Paths Framework* (pp. 239–262), Springer.

Northouse, P.G. (2019). *Leadership: Theory and Practice*. Los Angeles: Sage.

Olofsson, A., Lindberg, J. O., Hauge T., & Fransson, G. (2015). Uptake and use of digital technologies in primary and secondary schools: A thematic review of research. *Nordic Journal of Digital Literacy*, 2006–2016, 103–121. https://doi.org/10.18261/ISSN1891-943X-2011-04-02

Petersen, A. L. (2014). Teachers' perceptions of principals' ICT leadership. *Contemporary Educational Technology*, *5*(4), 302–315.

Pettersson, F. (2021). Understanding digitalization and educational change in school by means of activity theory and the levels of learning concept. *Education and Information Technologies*, *6*, 187–204. https://doi.org/10.1007/s10639-020-10239-8

Rensfeldt, A. B., & Player-Koro, C. (2020). "Back to the future": Socio-technical imaginaries in 50 years of school digitalization curriculum reforms. *Seminar.net*, *16*(2), 20. https://doi.org/10.7577/seminar.4048

Shanks, R. (2020). 30 years of ICT in education: Reflecting on educational technology projects. *Seminar.net*, *16*(2), 15. https://doi.org/10.7577/seminar.4047

Siljebo, J. (2020). Digitalization and digital transformation in schools: A challenge to educational theory? *Education in the North*, *27*(2), 24–37. DOI: 10.26203/b0m3-dk35

Siljebo, J., Holmgren, T, Lindberg, J. O., From, J., Pettersson, F. & Öjefors Stark, K. (2021). *School leadership in a digitalized society: Reflections on the Use of a Survey Tool for Improving Educational Practice.* Paper presented at ECER 2021, European Conference on Educational Research, Online via Geneva, Switzerland, September 6-9, 2021, abstract available at https://eera-ecer.de/ecer-programmes/conference/26/contribution/50724

Sterrett, W., & Richardson, J. W. (2019). The change-ready leadership of technology-savvy superintendents. *Journal of Educational Administration*, *57*(3), 227–242. doi: 10.1108/JEA-09-2018-0160

Sterrett, W., & Richardson, J. W. (2020). Supporting professional development through digital principal leadership. *Journal of Organizational & Educational Leadership*, *5*(2), 1–19. https://digitalcommons.gardner-webb.edu/joel/vol5/iss2/4

Tillväxtverket [The Swedish Agency for Economic and Regional Growth]. (2017). *Analysera digitalisering i företag* [Analyze Digitization in Companies].

Vanderlinde, R., Dexter, S., & van Braak, J. (2012). School-based ICT policy plans in primary education: Elements, typologies and underlying processes. *British Journal of Educational Technology*, *43*(3), 505–519.

Vennebo, K. F. (2017). Innovative work in school development: Exploring leadership enactment. *Educational Management Administration & Leadership*, *45*(2), 298–315. doi.org/10.1177/1741143215617944

Willermark, S., & Pareto, L. (2020). Unpacking the role of boundaries in computer-supported collaborative teaching. *Computer Supported Cooperative Work*, *29*, 743–767. https://doi.org/10.1007/s10606-020-09378-w

Williams, P. (2008). Leading schools in the digital age: A clash of cultures. *School Leadership and Management*, *28*(3), 213–228. https://doi.org/10.1080/13632430802145779

Wilson, M. (2005). *Constructing measures*. Lawrence Erlbaum Associates.

Yukl, G. A. (2002). *Leadership in organizations* (5th ed.), Prentice-Hall.

Yukl, G. A. (2013). *Leadership in organizations* (8th ed., Global ed.). Pearson.