# DIGITALIZATION IN SCHOOLS: FOUR EXAMPLES OF EMBEDDEDNESS

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## ABSTRACT

*Many attempts to integrate technology in Swedish schools have been initiated over the past 30 years with varying success. Although the use of digital tools has increased along with a general technology development, schools have mainly been using IT in administrative support activities. In recent years, school system reforms and developments in the educational technology sector have both required and enabled schools to digitalize. In this chapter, we follow the implementation of two technologies in a benchmark school in order to understand how technology integration is achieved. We suggest four types of embeddedness resulting from different types of activities that are subject to technology integration, as well as the social and material conditions that guide convergence during the postimplementation phase.*

**Keywords**: Technology implementation; embeddedness; digitalization; professional work; educational organizations; phenomenon-driven research

## INTRODUCTION

New technologies, applied as key organizational functions, have enabled increased organizational flexibility, emancipated professionals from spatial and temporal boundaries, and enabled the emergence of entirely new organizational forms. The ongoing digital evolution has been credited for the disruptions in numerous industries that have made music consumption more accessible, turned traveling into a collaborative sharing effort, and made work more productive. All thanks to new ways of organizing that were made possible by digital technology.

**Research in Organizational Change and Development, Volume 28, 103–126**

**ISSN: 0897-3016/doi:10.1108/S0897-301620200000028004**

Educational organizations have adapted to the general shift to digital means of communicating and information sharing in society. This evolution in the institutionalized procedure of mass schooling has been driven by formal government decisions, the teaching profession, and IT companies. In Sweden, the integration of IT in schools has been a lengthy process characterized by conflicting wills, dogmatic ideas, and high expectations.

In the 1990s, the first formal attempts to integrate IT in schools were directed at teachers, followed by a second wave that targeted students' use of computers. These attempts to introduce IT in the Swedish school system were not fruitless, but the use of digital tools remained a parallel process that was separated from the daily work in schools. Targeted initiatives to achieve change by introducing technology did not play out as intended. Successful shifts to digitalized work practices in Swedish schools have instead exemplified organizations with the sufficient prerequisites for change (Larsson, 2004; Larsson, Löwstedt, & Shani, 2001). The change myths surrounding technology in educational organizations still flourish with the increased emphasis on digitalization in the governing functions of the Swedish school system.

About a decade ago, the use of IT in Swedish schools had increased, but mainly in administrative activities, rather than in pedagogical work (Swedish Schools Inspectorate, 2012). In order to make digital tools a natural part of education, "digitalization" was included as part of nearly every subject in an amendment to the national curriculum in 2018.

The system reforms and formal change initiatives aimed at increasing IT integration in Swedish schools are symptomatic of a general increase in governance following a decentralization of the school system in the early 1990s. Over the past 30 years, there has been an increase in administrative functions exercising leadership over the traditionally autonomous teaching profession (Tengblad, 2015).

Profession-based organizations, like schools, are particularly complex when it comes to achieving change, due to the divide between profession and administrative functions. While administrative practices can be changed by managerial decisions, changes in professional practices needs to be negotiated with the professionals or initiated by professionals (cf. Börjeson & Löwstedt, 2017).

In this chapter, we present the result from a Swedish school with an explicitly high ambition concerning digitalization. We have observed the implementation of two different IT systems and their integration into different types of practices in a school unit chosen to develop best practice within a group of schools. One of the systems was implemented by as a means of formalizing a number of administrative activities, whereas the other system was introduced as a means to make pedagogical work easier. These systems were designed to support different kinds of activities, adding a dimension to the already complex endeavor to achieve change in a professional organization. In addition to addressing two different types of activities, the material features of the systems are likely to guide any changes in those activities throughout the implementation processes.

Using a phenomenon-driven approach (Schwarz & Stensaker, 2014, 2016), we will address the question of how digital technology becomes integrated in a school organization and in teachers' work in particular. We focus on two research

questions: can different forms of integration be identified, and if so, are they related to different process for implementation?

We will use the term embeddedness, which has previously been used to explain the process by which IT systems embed aspects of organizations following an implementation process. The various shapes of system implementation in TechSchool will help us illustrate that technology integration in professional organizations can be done by considering different combinations of emphasis on technology or work features. The use of the term embeddedness lets us theorize the successive merger between work features and technology features, while drawing up different combinations with varying emphasis.

## ORGANIZING FOR TECHNOLOGY-INDUCED CHANGE

Most organizational scholars would likely agree with the assertion that technologies do not possess in themselves the quality to change organizational settings. Although technology may limit the possibilities for action, changes in social settings are inherently a result of human agency (Leonardi, 2012; Löwstedt, 1985). While every technology at one point was developed as a solution for a particular problem, major changes are often thought back on as technology-induced revolutions (Mahoney, 2008). The idea of technology as a change agent lives on, in society and in Swedish schools, in attempts to digitalize, and in today's expectations on increasing "uberfication" in different markets. Nevertheless, the idea of change by technology implementation in schools has been described in terms of change myths (Larsson et al., 2001).

In order to understand the process by which technology does affect work, recent literature on technology and organizing theorizes the interrelation between social and material factors when organizational activities take shape (cf. Cecez-Kecmanovic, Galliers, Henfridsson, Newell, & Vidgen, 2014; Leonardi, 2012; Orlikowski & Scott, 2008). Different terms have been used to describe how technologies become part of organized work through adaptation to material constraints or mutual adjustments in social and material features. Affordance research (Anderson & Robey, 2017; Strong et al., 2014) has illustrated the intersection between physical conditions and human interpretation that shapes the collective use of artifacts in organizations. Mutual adjustment has been described in terms of a successive imbrication of social and material factors of work (Leonardi, 2011).

The reciprocal relation between social and technological factors that shapes organized work has for long been the topic of interest in sociotechnical system (STS) theory (Leonardi, 2012). The recent turn to "sociomateriality" in organizational research (Cecez-Kecmanovic et al., 2014; Orlikowski & Scott, 2008) was based on an STS foundation but turned research on a path toward a practice-based understanding of the interrelation between the social and the material in which the two are considered ontologically inseparable. Essentially, the notions of technical subsystems and sociomaterial practices resemble each other to a large extent (Leonardi, 2012; Scott & Orlikowski, 2013).

In line with the STS way of dealing with the social and material as separate, research that describes the process by which the two become interrelated has

described how work evolves with the introduction of new technology. One way of describing the successive inclusion of a technology in organized work is through the concept of "technological embeddedness." Volkoff, Strong, and Elmes (2007) describe how an IT system gradually embeds organizational elements following its implementation. The final equilibrium in day-to-day activities is shaped by design, social interaction, and formal decisions. The technology that they studied was an off-the-shelf enterprise resource planning system, which by default is inflexible in terms of possibilities for adjustment. Embeddedness of organizational elements into system features could also be thought of as necessary adjustments of work activity to requirements provided by the organizationally implemented system. In contrast, Leonardi (2011) uses the term imbrication in his study of the introduction of a simulation software in engineering work. The embeddedness that occurred in that case was in the form of a mutual adjustment process in work activities and features of the technology, enabling organizational elements and technological elements to embed each other.

What all the perspectives on the interrelation between social and material factors in shaping organized work have in common is that technological embeddedness is preceded by a social interaction phase, in which responses to material conditions are generated. As research often, and for good reason, is focusing on "successful" implementation (otherwise there would not be much to study in terms of technology-induced change), the social conditions on the way to organization-wide use are described with less nuance than the behavioral responses to material conditions.

Social conditions have proved to be a major factor that influences technology implementation. The seminal work of Barley (1986) was the underpinning of a stream of research based on the insight that social conditions generated differences in the organizational behavior related to the use of one and the same technology (cf. Child, Loveridge, & M.E.S.S International Research Team, 1990 Child et al., 1990; Löwstedt, 1993).

Behavior, however, is one thing. Peoples' collectively formed ideas about technologies' role in an organizational setting and how they make sense of technology implementations are something else. Outcomes of the same technology varies in different organizational settings (Barley, 1986) but may also vary with frameworks mediating differences in digitalized work organizations (Löwstedt, 1993), or between groups in the same organizational setting, depending on how the new technology is framed (Leonardi, 2013). Social conditions can shape the subsequent responses to technology features just like material conditions shape responses in work (Fayard & Weeks, 2014). In fact, the informal advice networks that emerge during postimplementation plays an important role in the convergence on collective use that enables a technology to become an organizational resource (Leonardi, 2013).

In order to understand digitalization in schools, we use the concept of technological embeddedness, while considering the entire integration process. The unique context that a school organization provides is central in the study, and the institutionalized work traditions of the teaching profession could possibly

shape both implementation processes and the emergence of the reciprocal relationships between work and technology, in this study understood as the integration of technology and teacher work.

## RESEARCH SETTING

The findings presented in this chapter comes from a qualitative case study in TechSchool, which is a private school that is part of one of the larger corporate networks of educational organizations in Sweden. It has grown rapidly since its foundation a decade ago to provide education to around 900 students from preschool to 9th grade.

The data come from repeated visits to the school between 2016 and 2019, during which observations have been carried out in teacher offices, meeting rooms, and classrooms. Interviews have been done in relation to the observations, both for clarification purposes and in more structured ways in order to generate interview data around specific topics, such as stories about the two systems, or individual use of additional technologies. In the initial phase of the study, the school was visited in order to explore how the IT profile was manifested and interviews with the school administration (principal and Head of IT) were carried out in relation to those visits. Although the explicit vision to become leaders in the use of digital tools was the topic of those initial interviews, the daily work seemed to resemble "analogue" schools to a large degree, at least at first glance. The next phase of the study was therefore aimed at understanding teachers' work in TechSchool on a more detailed level. The entry point to that stage was through the school's ICT group, consisting of teachers and representatives from the school administration. Regular visits were made to the ICT group meetings, in order to understand their work and to establish contact with its members. After participating in a few ICT group meetings, the observations were extended to other meetings and occasional classroom visits. One full week of shadowing was done in November 2017, followed by a week of participation in meetings. The intense visits helped establishing the presence of researchers in the school, which enabled ad hoc visits during 2018 and 2019. During those visits, time was mainly spent in the shared offices of the teacher teams, which enabled observations of the informal talk between teachers, and the visits were often done on the mornings when the teams had their weekly meetings. Scheduled interviews were carried out in 2019 during those visits.

The total amount of observations adds up to 80 hours, in relation to which short informal interviews (in the form chats) were done. In addition, 20 semi-structured interviews informed us about attitudes toward, and representations of, the systems.

The school was selected for a single case study because of its profiling as an exemplary school when it comes to the use of digital tools in the daily operation. When the study began, in 2016, the school had communicated the explicit ambition to become a leading example in the use of digital tools in education and gain the role as model school in the corporate group that it is part of. The exemplary

use of digital tools was part vision and part reality in 2016, with various initiatives under way (under the guidance of the school's ICT group) and high expectations on the potential in the introduction of the first of the two systems in this study: G Suite for Education. G Suite for Education is a platform that includes a set of cloud-based productivity tools, such as a word processor, a presentation tool, and a space for document sharing. In essence, it is a modified version of Google's cloud-based services, bundled together and complemented with a virtual classroom, which enables teachers to coordinate assignments and give real-time feedback. When the study was initiated, TechSchool had just hosted a nationwide conference on the use of G Suite for Education with the aim of exploring and sharing the possibilities of the platform with representatives from other schools, especially those belonging to the same corporate group as TechSchool.

The second system, an administrative system called Schoolsoft, was implemented in 2017 and replaced an older administrative system. The reason for changing the systems was primarily to homogenize the administrative tools within the corporate group. In fact, that was also one of the reasons for introducing G Suite for Education as a support tool for pedagogical work, although that was not how it was presented to the teachers. In a large group of private schools aiming to attract students in competition with other schools, the idea of forming a somewhat unified way of scaffolding the daily operations was a matter of branding. Schoolsoft provided a formal means for communication between TechSchool and students' homes. All formal information had to be communicated via Schoolsoft and the students' guardians were obliged to keep themselves up to date with that information. Any requirements in terms of scheduled activities, tests, and assignments were to be added in Schoolsoft, as was all assessments and evaluations that composed the formal support for grading. Consequently, not only information such as instructions and marks were to be communicated through the system. It had to be accompanied by references to the national curriculum and its specific learning goals.

## THE DIGITALIZATION INITIATIVE IN TECHSCHOOL

The digitalization initiative in TechSchool was initiated by the school's head of IT and was picked up by the school management. The ICT group became responsible for introducing new digital tools and to find ways to integrate them in the organization. The ICT group consisted of representatives from different parts of the school. It was an arena for discussion between pedagogical staff and administrative representatives about any IT-related matter. The head of IT was responsible for the IT infrastructure in TechSchool, but he shared a passion for the use of digital tools in education with a few teachers.

Both Schoolsoft and G Suite for Education were introduced by members of the ICT group during staff meetings where all teachers were gathered. The stages in the digitalization process varied between the systems and also between different features of the systems. We will illustrate that by describing four stages in the digitalization process (see Table 1).

***Table 1.*** Stages of Implementation.

| Stages | G Suite for Education | Schoolsoft |
|---|---|---|
| Initiation | Emphasis on work | Emphasis on technology |
| Implementation | Slow | Swift |
| Postimplementation | Trial-and-error | Problem solving |
| Retention | Work retains technology | Technology retains work |

### *Initiation*

When this study began, G Suite for Education was already being used to some extent, whereas Schoolsoft was about to be implemented. G Suite for Education had been introduced in TechSchool on the initiative of the school's head of IT along with other members of the school's ICT group. In an effort to increase the use of digital tools in the school, he headed the introduction of G Suite for Education by arranging different activities. To inspire teachers to try it, he arranged staff meetings, in which the system and its features were demonstrated.

The demonstrations were held by the ICT group and were focused on activities that were already part of the daily work of teachers. The features of G Suite for Education were demonstrated as suggestions to make those activities more productive, e.g., by coordinating assignments and feedback in the virtual classroom. By taking a starting point in the idiosyncratic activities in teachers' daily work, the ICT group maintained a deliberate separation between IT and ICT, which the head of IT carefully maintained as guiding principle in the way he talked about digital tools. He referred to the technology and infrastructure as "IT," whereas "ICT" referred to the use of digital tools in pedagogical work. G Suite for Education was therefore introduced by demonstrating its potential use in certain activities, rather than simply as a set of technical features.

G Suite for Education was thereby introduced with a clear focus on its potential as a set of supporting tools in the professional work of teachers. With the teachers' different ways of working in their respective subjects in mind, the system was demonstrated as a general set of features with different areas of use and with the possibility to complement with additional apps.

Schoolsoft was implemented following a decision in the group management to change administrative system in all of its schools. The initiation thus originated outside of TechSchool, and the decision was communicated through the school administration with focus on the technology itself, rather than on possible areas of use. In other words, the implementation was preceded by the message to the teachers that "from this date, you will have to use Schoolsoft." The introduction of Schoolsoft also took place during a staff meeting. Members of the ICT group demonstrated the features that were becoming mandatory and how those features were supposed to be used. The

system features were introduced as specific tools for specific parts of administrative work, such as communicating detailed instructions to students or reporting grades.

It is important to note that both systems were introduced as organizational initiatives involving the school administration, although the initial communication to the group of teachers addressed different things. When introducing G Suite for Education, ongoing work was addressed, whereas the implementation of Schoolsoft was communicated in terms of a change initiative.

### *Implementation*

Following the differences between the initiatives when it comes to origin, the implementation processes of the two systems also differed. G Suite for Education diffused organically over time, whereas the top-down implementation of Schoolsoft was a swift process. The main reason for the difference was that G Suite for Education was introduced as an optional means in ongoing work, while Schoolsoft was implemented as a mandatory system for a number of administrative tasks.

As G Suite for Education was introduced, it was demonstrated in relation to a number of activities and was initially picked up by a few curious teachers. Later, the use varied between individuals, but a few features diffused organically in the school until they were used by virtually the entire staff. Naturally, the process was relatively slow, since a few teachers began trying out some features instantly, while others chose to carry on their work as usual. As the general use of the platform diffused within the teacher group, a few of the features were adopted to the extent that they developed into organization-wide means for performing certain activities. For example, the sharing feature became widely used to store organizational documents (such as yearly plans or teaching material) from year to year. When features in G Suite for Education successively were established in school-wide practice, it was in some cases accompanied by a formal decision, such as that to move all stored documents into the cloud-based shared space.

The implementation of Schoolsoft was a much faster process. As it was based on a formal decision to replace a previously used administrative system, it was implemented as a restructuring of the IT infrastructure in TechSchool. In other words, it was a change that happened overnight that the teachers had no other choice than to adapt to. As such, there was no room for trying out the system features, which led to situations in which teachers had to make sense of how (and why) to use the system features as they began doing so.

The two modes of implementation were each other's opposite. In the case of G Suite for Education, teachers had time to try out the features in relation to their ongoing work, which led to a slow implementation process that ended in a high degree of consensus in relation to its role in the activities it became part of. In the case of Schoolsoft, teachers had to quickly adapt to the system's presence and were forced to learn how to use the required features, rather than first understanding the part it had in the organizational processes.

### *Postimplementation*

It is difficult to distinguish between the implementation and postimplementation stages for G Suite for Education. As described above, the introduction of the platform was followed by a process of organic diffusion, during which individual ways of using the features emerged, while some features successively gained an "organizational" status. The flexibility in the platform's interface enabled teachers to find their own ways of incorporating its features in their daily routines.

In the cases where platform features became general ways of doing certain things, it was because of a number of different factors. First, the trial-and-error phase had generated a general consensus of the usefulness of a specific feature among the teachers. Second, as the use of that particular feature became widespread, it was in some cases formalized and in other cases normalized. The document sharing feature had been formalized, as the database containing documents had been moved from a previously used cloud storage into G Suite for Education. The school-wide use of the cloud-based document sharing feature in planning activities is an example of normalization, which emerged as its use increased among the teachers, who were often doing planning in smaller groups, and the shared documents became an informal requirement to be part of those activities. One teacher described it as follows:

> *The benefits spread among the teachers until that poor last person who was sitting there without [G Suite for Education] went 'What!? Oh, show me! How does it work?'.*

In contrast, the implementation of Schoolsoft generated a more difficult postimplementation adaption. Following the swift implementation, the teachers had to make sense of the inflexible system features, as they encountered them while performing the required tasks. The system's interface was perceived as difficult to use, with the general opinion that it took too many clicks to perform a simple task. The teachers had problems understanding how to use the system in many cases, why to use the system in some cases, and why some features were designed as they were. Most notably, the system required detailed information input that was divided into "boxes" based on predefined categories. For example, this meant that teachers needed to communicate the outcome of performance evaluation talks by writing information under several predefined categories. Another problem occurred when teachers added assignments in the system, which the system required that they linked to specific curriculum goals. The curriculum goals had been divided and subcategorized in a different way than in the national curriculum, which proved confusing to both teachers and to the students receiving the information. In addition, the system only had space to show the first few words of each curriculum goal in the drop-down menu, which became a problem as many formulations began with the same three words.

The difficulties of using Schoolsoft led to a phase of collective problem solving among the teachers, in which they consulted each other to understand what to do with the system. As it was mainly the problems that were addressed, the

conversations about Schoolsoft were in reference to the system and the "correct" use of it, rather than being about the activities that it supported.

### *Retention*

Features of both G Suite for Education and Schoolsoft were retained as part of teachers' daily work, yet in different ways. Some features of G Suite for Education were retained as part of organization-wide activities, while the majority of its features were used on individual and situated basis. The ones that were used throughout the organization had been adapted through the extended process of organic diffusion that was described above and had therefore been associated with specific underlying activities. The features were consequently retained as legitimate means not only for specific activities, through recursive activity, but also in the talk about activities. The document sharing function could be used as an example of both. It has become a means for teachers to store and share teaching material and plans from year to year, while the material continuously is being edited. It has become the means for making plans before meetings, as agenda points are collected in shared documents that are turned into open meeting protocols during the meeting. The use of the document sharing function has become widespread enough to be synonymous with the word "share" within the school.

Schoolsoft was retained as a mandatory aspect of administrative tasks. The use of the system became a part of work in itself and specific activities were thereby retained through the technology, rather than the other way around.

The fact that teachers were required to use it was obviously a major factor in its retention as a means in the daily work. There were some characteristics of the system that further established its presence by enhancing the degree to which it was visible in the organization. The collective problem solving, which we described as a major characteristic of the postimplementation stage, continued with adjustments in plans and group constellations. In turn, it made Schoolsoft visible in the daily work through continuous discussions among the teachers about how to use it (Fig. 1).

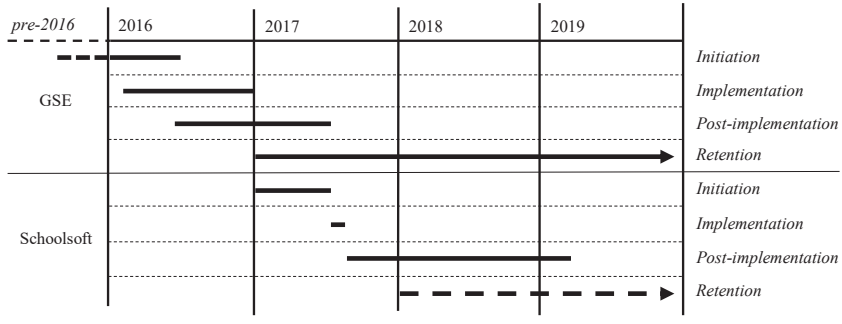


*Fig. 1.* Timeline.

## FINDINGS I: FOUR IMPLEMENTATION PROCESSES

As described, the activities for implementation of the two systems varied based on not only a number of factors that had to do with the obvious differences in system design but also how technology features were presented to the teachers, degree of flexibility in feature use, and expectations on outcomes. We identified four forms of drivers for integration in the two implementation processes: management, professionals, opportunities, and individuals (see Table 2).

### *Management-driven Integration*

The first category contains change initiatives in which the entire process was orchestrated by the school management. When a technology was introduced for the purpose of formalizing, or homogenizing, work for organizational purposes (e.g., to standardize, or to enable measurement), technology integration followed a swift change of means based on a managerial decision.

Such decisions, made externally to the teacher collective, were based on ideas of desired activities as well as the functions of different technologies. The implementation process therefore involved conveying the preconceived link between technology features (including how they were supposed to be used) and the expected outcome of using them.

Management-driven integration included a high degree of faith in technology from the management's perspective, as a large-scale implementation was expected to generate effects on people's behavior in a specific way. As such, teachers did not necessarily have to share decision-makers' idea of purpose. Instead, an organizational technology could be used as a means of living up to formal requirements.

Management-driven integration was thus not only about the top-down character of its initiation but also about the planning perspective that characterized the entire implementation process. The initiation of the implementation was based on a management decision, but so was also the subsequent "correct" ways

***Table 2.*** Implementation Processes.

| Implementation Processes | Purpose | Approach |
|---|---|---|
| Management-driven integration | Standardize activities for organizational purposes/live up to formal requirements | Swift change of technology, static features, problem solving |
| Profession-driven integration | Standardizing IT infrastructure/ make work more efficient | Demonstration of platform, flexible system, trial-and-error, organization-wide diffusion |
| Opportunity-driven integration | Digitalization, standardizing IT infrastructure/pedagogical development | Demonstration of platform, flexible system, trial-and-error, local diffusion |
| Individually driven integration | Pedagogical development | Individual introduction in small settings |

of using the system features, often accompanied by a minimal degree of flexibility in the design of the system features. From the very start of the implementation, the organizational user behavior was narrowly channeled so that work automatically converged around the material conditions of the system features.

Although we describe this as management-driven integration, there are other forms of integration resulting from management initiatives (see the next section). What is unique about this category is the level of detail by which it dictates the conditions for professional work and how effective it seems to be. Some of that can be explained by the fact that we mainly observed such integration in the case of administrative activities, often in relation to administrative system features.

The two systems in this study naturally fall under different categories of intended use, as Schoolsoft was designed to be an administrative tool, whereas G Suite for Education contains tools for classroom use. The differences in how the two systems initially were framed illustrate the predefined intentions of the two systems. Schoolsoft was introduced as a means for a number of administrative activities and was mandatory to use from a certain point in time. Over time, features of the systems overlapped in terms of use, which impacted both administrative and professional work, but in the early phase of initiation, they had different purposes.

Swift implementation of system features with predefined areas of use created scenarios in which the postimplementation phase became a problem solving effort. The strict instructions on how to use features in Schoolsoft, combined with a detailed user interface, became a source of frustration in the teacher group. The postimplementation phase in the management-driven integration therefore became a process of finding ways to adjust work to technology conditions, as well as finding a meaningful purpose for using the new tools.

### *Profession-driven Integration*

The previous type of integration was initiated by the school management and maintained a character of limited flexibility throughout the integration process, due to detailed user-requirements and system interface.

When the implementation of a technology was directed at professional work, a different strategy was used. The integration of technology in professional work was instead characterized with the conveyance of a sense of choice or flexibility, both when it came to the option of using a technology and when it came to the design of the technologies. G Suite for Education exemplifies this type of integration. It was introduced as a platform in which teachers had the possibility to adjust the various features to different needs, while it was demonstrated as an optional tool. It was then up to the teachers to find ways of using it, which they did over time. The case of G Suite for Education shows a successive convergence on use during the postimplementation phase. The convergence on technology features as common means represents the core of profession-driven integration, i.e., integration generated from within the group of professionals to form common ways of performing specific activities.

The introduction of G Suite for Education was based on ideas of its potential use in teachers' day-to-day work. The configuration of the ICT group enabled

discussions of technologies' usefulness and suitability for teachers' work to be contained and dealt with in a small group prior to a school-wide introduction. The goal of the group during the introduction of G Suite for Education was to emphasize the parts of teachers' work in which it could be useful and to demonstrate the platform features in relation to those. The group maintained focus on pedagogical work, rather than the platform features, although implementation of a common platform also would have organizational benefits through increased standardization.

A key factor for the success in the introduction of G Suite for Education was the demonstration of potential activities in which the platform could be useful. During demonstrations, potential areas of use were communicated, within which different platform features could be used as a means in pedagogical work. Highlighting pedagogical work, rather than technology features and their designed purposes, was a deliberate strategy of the ICT group.

While it may sound counterintuitive, the introduction of G Suite for Education was built on the maintenance of a separation between the technology and the activities it could support. This does not mean that the demonstrations emphasized one or the other. On the contrary, throughout the introduction, the platform was demonstrated in contextualized ways that exemplified activities in which it could be used. This, however, was enabled by the separation of IT and ICT as referring to two different things. IT represented the hardware, infrastructure, and tools themselves, whereas ICT referred to the use of digital tools in pedagogical work. Explicitly making that distinction allowed for better questions to be asked in the process of introducing new technology. Instead of discussing what digital tools to purchase, or, on the other hand, what routines to digitalize, efforts were made to base the introduction of G Suite for Education on existing work in relation to the potential usefulness of the platform. In that process, the teachers' professional work was considered and catered to.

In the case of G Suite for Education, the demonstrations had aimed at inspiring teachers to try out the many features as part of their daily work, without defining what they could expect in terms of specific areas of use, nor outcomes. The postimplementation stage became a trial-and-error phase that enabled teachers to try out the platform features in their work, to accept or reject features, and most importantly to evaluate the platform based on their own expectations.

Profession-driven integration occurred when teachers converged on technology features that diffused and became standardized means on an organization-wide level. Examples of that would be the use of shared documents for creating meeting agendas or pedagogical plans. As means became standardized, work activities were guided by the supporting technologies in a similar, but less formalized, way as in what we described as management-driven integration.

### *Opportunity-driven Integration*

A consequence of introducing a technology as optional was that the shared ideas of its functionality took shape over time and outside of the scope of managerial

influence. This meant that some features diffused as organization-wide means (through profession-driven integration), while other features became rejected.

In cases where flexible technologies were introduced as optional means, a third type of integration was observed. It resembles the former type but differs when it comes to how the technology became retained as part of the organization. When features of a technology were experimented with in an early postimplementation phase, teachers gained experience in using them, which in some cases led to convergence in the form of organization-wide use. In other cases, it led to convergence in a nonmaterialized way, where teachers found technologies useful in specific parts of their own professional work.

Features of a technology were then retained individually, or in smaller teacher groups, and were used sporadically when a situation allowed for it. Such "opportunity-driven integration" could occur if a teacher found a certain feature useful in certain pedagogical activities under certain conditions, which may not have been suitable for a teacher in a different subject or a different grade.

We still describe it as a form of convergence, as it requires a shared idea of the technology as a plausible means in professional work, in addition to the trial-and-error experience from the early implementation phase. The initiation activities gave necessary legitimacy to technologies that integrated into professional work in situated, opportunity-driven, ways.

Opportunity-driven integration did not depend on the technology features to guide work. Instead, technology features were retained as part of the organization through the occasional use in teachers' work.

### *Individually Driven Integration*

We want to include an additional type of integration that was observed, although slightly outside of the scope of this chapter, as it relates to technologies that are brought into the organization for sporadic use by individual teachers. It does, however, account for an important type of technology integration in schools, as different educational technologies are brought in by individual teachers to be used in different subjects and in different assignments. Individually driven integration needs to be taken into account in the context of a general digitalization in schools.

## FINDINGS II: FORMS OF EMBEDDEDNESS

Based on the observed types of technology integration processes in TechSchool, we found that the resulting scenarios of digitalization in teacher work could be defined as different types of embeddedness. Embeddedness has been used to describe which aspects of an organization become absorbed into an IT system as a result of an implementation process. In TechSchool, we found that such scenarios could have different characteristics based on variations in the implementation processes. We define these different constellations of social and material aspects as four different types of embeddedness (see Table 3).

***Table 3.*** Types of Embeddedness.

| Embeddedness | Material Conditions | Social Conditions | Institutional Conditions |
|---|---|---|---|
| Technological | Static | Adjusted to technology | Administrative, regulatory |
| Professional | Adjusted to work | Situated | Professional, normative |
| Mutual | Flexible | Adjusted to technology | Professional, normative |
| Illusive | Static | Situated | Administrative, regulatory |

### *Technological Embeddedness*

Technological embeddedness has previously been described as organizational aspects becoming embedded in an IT system (Volkoff et al., 2007), in other words, when an IT system has been implemented to coordinate and standardize organizational processes as a "backbone" in a formal structure. This requires certain types of processes, with formal roles and routines. It was difficult to identify such a unidirectional relation between an IT system and aspects of the organization in TechSchool, although Schoolsoft had the characteristics of such an organizational support system.

The increasing amount of administrative work in schools, combined with efforts from the corporate group to standardize the IT infrastructure, paved the way for the implementation of Schoolsoft as an administrative system in TechSchool. Strict guidelines for how the system was supposed to be used and a system design that required detailed information input guided teachers' behavior in relation to the system. The material conditions and formal requirement to use the system meant that teachers' work had to be adjusted. The system thereby successively embedded aspects of work, as they converged to match the system requests and became standardized.

As only administrative activities were possible to standardize in a way that generated technological embeddedness, this type of embeddedness was not related to system features that were used for pedagogical purposes. Technological embeddedness was found in relation to technology that was used by teachers for the purpose of being part of the organization, which further enforced the standardization of administrative activities.

### *Professional Embeddedness*

Most of teachers' work includes variation and would be difficult to reduce to standardized routines. It does include regular elements but differs between subjects, grades, and classes. In addition, teachers' work includes many ad hoc elements that need to be dealt with in the moment. The irregular part of work in a school organization could therefore not be standardized to the degree that would allow it to become embedded in an IT system.

Instead, digital tools become one of the numerous means that teachers have at their disposal and may use when the situation allows it. Aspects of professional work guide the use of those tools. We call this professional embeddedness, as

aspects of technology are embedded in teachers' work and included in different activities based on experience and professional judgment.

In TechSchool, this type of embeddedness was manifested when digital tools were used in pedagogical work. Sometimes it was the result of individually driven integration, but there were also many occasions when features of G Suite for Education diffused within smaller groups and were used in teaching.

The adaptable system features allowed for numerous areas of situated use, enabling professional embeddedness. System features that were introduced in a formal arena, where it was given initial legitimacy, could be retained within the profession following a phase of trial-and-error.

### *Mutual Embeddedness*

A third integration scenario led to yet another type of embeddedness, which is related to the former, but generates adjustments in organizational-wide administrative activities. Mutual embeddedness occurs when an adjustable technology is introduced through a management decision, but not in relation to any requirements regarding its intended use, leaving the organization-wide potential to be defined through the use among the professionals.

In TechSchool, mutual embeddedness occurred when features of G Suite for Education had become standard means in administrative activities. Similar to professional embeddedness, the predominant focus in mutual embeddedness is on professional work, rather than on technology features. The difference is that mutual embeddedness also emphasizes professional productivity, which generated routines that spread among all parts of the school.

Mutual embeddedness occurred when a standard way of using a technology had been generated from within the professional core, embedding a technology feature in work, whereby it subsequently embeds aspects of work. Mutual embeddedness was the result of a reciprocal process where aspects of a technology and of existing work practices embedded each other and generated an organizational outcome.

The introduction G Suite for Education, as a flexible IT platform, in TechSchool scaffolded a successive emergence of new or altered work practices when teachers began using some of its features as standards means of communication and information sharing. Mutual embeddedness emerged out of professional work, based on which technology aspects were adopted. Although it developed out of an emphasis on work, the technology features were retained as part of the day-to-day activities in various way. In some cases, they were retained as plausible means in a certain task, such as sharing teaching material or meeting agendas. In other cases, system features were subject to formal decisions and retained as conditions that guided work. For example, it was formally decided that the cloud-based document sharing space would become the standard storage for organizational material.

### *Illusive Embeddedness*

A fourth type of embeddedness occurred as a failure to bridge the divide between management and profession. As it builds on the appearance of routine use of a

technology as part of organized work, whereas various workarounds and translation activities maintains status quo, we call it "illusive embeddedness." Illusive embeddedness occurred when formal requirements maintained a predominant emphasis on technology features, although they became ends in themselves, decoupled from both administrative and professional activities.

Illusive embeddedness could pose risks in situations where, for example, data were arbitrarily added to a system, leading to decisions being made based on representations that did not reflect its underlying activities. It did, however, have a functional aspect, as it enabled professionals to organize around a technology.

## DISCUSSION

Focusing on two different IT systems, we examined the processes by which features of those systems gained organizational functions and became part of teachers' work.

The integration of system features in teacher's work took different shapes depending on what types of features were integrated and what types of activities they were integrated in. This is an important point to make, as it highlights the fact that digitalization could be different things depending on numerous factors. While this is an obvious point, especially when it comes to change processes and influences from both social and material conditions, it should be emphasized that it is also true for what type of outcome that can be expected.

Digitalization is currently being used as an umbrella term for including digital means to achieve school development. However, the sometimes conflicting interests of a traditionally autonomous teaching profession and an increasingly influential school administration adds complexity to questions of how to achieve change for purposes of school development.

Achieving change in different activities requires initiatives to be adapted to these varying circumstances. A higher degree of involvement of the profession was required when professional work was subject to digitalization initiatives. In addition, the initial framing shaped the reception of the technologies in the immediate postimplementation phase (Leonardi, 2013). Technological features conditioned the convergence of use during postimplementation, but the use was also conditioned by the perceived legitimacy of the technology as a means in the school context.

In TechSchool, IT integration in administrative work could be achieved in a direct way by implementing a system that all teachers were required to use. Highly specific instructions and static system features further enforced the "correct" use of the system, enabling the predesigned system features to successively "embed" aspects of the organization (Volkoff et al., 2007).

Changes in professional work, on the other hand, needed to make sense from the perspective of the professionals (Börjeson & Löwstedt, 2017). This gave rise to different scenarios where IT integration needed to emerge from within the professional core. Such integration could be initiated by the school management, but required establishing preconditions, rather than making direct changes in the IT infrastructure. Instead of providing detailed instructions to static system features,

the implemented technologies had a high degree of adjustability. It could thereby scaffold work, rather than constrain actions. Over time, teachers converged on plausible uses for system features that were used occasionally as part of professional work (professional embeddedness) or emerged as organization-wide means (mutual embeddedness).

While all types of embeddedness contributed to organizing work in TechSchool, by making it more homogenous, the effects on specific practices differed between them. Digitalization in administrative practices made information flows more efficient and enabled standardization, while the integration of digital tools in professional work had more to do with pedagogical development and the quality of professional work. Earlier IT initiatives were often focused on digitalization as a unidimensional end in itself (Larsson et al., 2001). We have highlighted the differences between types of technological embeddedness, as sociotechnical constellations that suit different scenarios. By doing so, we want to emphasize the differences in character between professional and administrative development.

It should be noted that while different situations call for different types of embeddedness, the situations themselves should be seen as part of an interrelation, rather than as factors that prompt certain types of correct responses. A model of embeddedness would include an institutional component, which both affects and is affected by any adjustments made to ongoing work or to the existing IT infrastructure.

The different types of embeddedness take shape depending on more than just social and material factors that adjust each other. Professional organizations are subjected to institutional forces that also act constraining on individual action. The divide between the professional and administrative could be described in terms of different institutional conditions. The professional sphere contains long-standing work traditions, whereas the administrative sphere dictates work on a formalized, regulatory level. We can talk about STSs and include institutional factors as a separate constraining aspect that shape that relation. The different paths of IT integration in the implementation process put different emphasis on aspects of work, technology, and institutional factors, which in turn generated different forms of embeddedness (see Fig. 2).

Each type of embeddedness consisted of different sets of interdependent aspects. Not only do the social and material factors shape each other but also mutually condition actions to varying degrees, in turn shaping a narrow path for action in situations of organized work.

In TechSchool, each type of embeddedness was generated from the initial focus on either technology features or on professional work, in relation to one of the institutional spheres, which, in turn, prompted a response during the post-implementation phase that focused on the third component in the model. We described technological embeddedness as generated through strict requirements regarding use in administrative activities, in combination with static and detailed system features. It was framed within the administrative institutional sphere and detailed material conditions were emphasized. This prompted a response in the social realm, as work had to be adjusted to fit those requirements. In turn, the

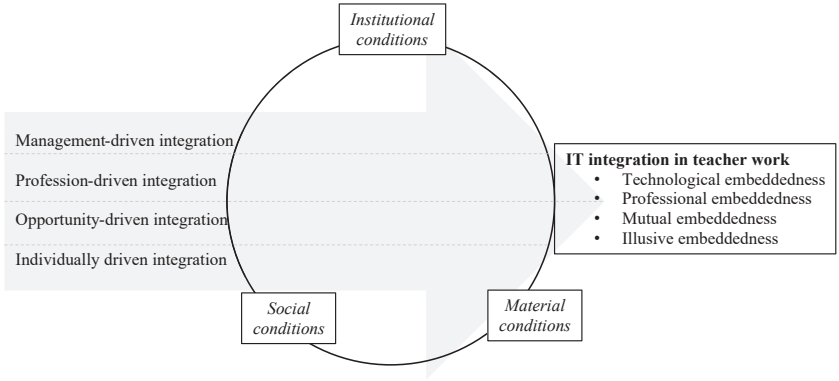


*Fig. 2.* Process Generating Different Types of Embeddedness.

technology was established as part of the infrastructure and the administrative sphere was enforced through increased standardization. Management-driven integration enabled the emergence of technological embeddedness. Such integration processes established fixed areas of use in administrative work, which were further enforced by material conditions of the technology. Aspects of work thereby became embedded in system features.

Professional embeddedness, on the other hand, emerged when there was a high degree of flexibility in a technology that was optional to use, and that, in combination with an introduction that emphasized potential benefits for pedagogical work, enabled focus to be on existing work during the integration process. During implementation, the response focused on the material realm, as teachers experimented with system features to find use for them in their work, or reject them. Profession-driven and opportunity-driven integration processes enabled types of embeddedness that were based in teachers' ongoing work. G Suite for Education was implemented as a platform that scaffolded work and allowed for the teachers to try out different features in relation to their own needs. The retention of technology was shaped by professional work and the social conditioning within the teacher group.

## IMPLICATIONS

Digital technologies were found to be embedded in the school organization as administrative activities homogenized through management decisions and static system features. Digital tools could at the same time be used by teachers and thereby become embedded in their ongoing professional practices. The integration of technology in professional work required a process based on trial-and-error, during which technology features were interpreted within the teacher collective. The role of the school management in such professional embeddedness was to demonstrate platform features and encourage their use.

We suggest that the implications from our study for school managers as well as for OD scholars/practitioners can be formulated in three implications that need to be considered when integrating digital tools and platforms in professional organizations.

### *Dynamic Framing*

Changing professional organizations is more complex when it is directed at professional, rather than administrative, practices. Change in administrative practices can succeed without taking professionals into account, whereas changing professional practices requires negotiation between management and the professional core (Börjeson & Löwstedt, 2017). Similarly, we found in this study that administrative tools could be added or replaced by management decisions, whereas integration of IT in teachers' professional work required their understanding of the content and purpose of the digital tools.

The initial framing of a technology is a key factor to how they are interpreted and received among the teachers. In the case of administrative technologies, they can be explicitly introduced as formal means in relation to an organizational purpose. Technology intended to be integrated in professional work can be introduced as potentially helpful tools in teachers' daily work. In the case of the latter, this can initiate a trial-and-error phase that enables teachers to form their own understanding of the content and purpose of the tools.

An organizational precondition in TechSchool was the ICT group, in which negotiations between representatives from the teacher group and the school administration could negotiate any IT-related issues successively in a small arena. Organizational functions, such as an ICT groups, that enable initial framing activities to be the result of careful planning, help setting a direction for the implementation. It also enables framing to be dynamic and adaptive to deviations in the change process.

### *Professional and Managerial Interrelating*

Getting people to begin using a technology is the first step. When they do, it needs to be taken into account that the technologies will be partly in command of the change direction. The point of describing an interrelation in this case is to emphasize that an adjustment in the technological structure will have effects on work and on the administrative, or professional, context. Similarly, an adjustment directed at work will have effects on technology as well as context.

We have shown that technologies settle in their organizational roles during the postimplementation phase, but they also begin to condition work. Framing a technology as "administrative" not only leads to an adjustment in administrative practices but also subsequently strengthens the administrative part of teachers' work and enforces the administrative role of the technology. Similarly, a professional framing generates responses in teachers' work that in turn leads to adjustments in the professional domain.

It is therefore important to understand an IT integration process as the establishment of a new means in the organization, rather than maintaining focus on what is expected to be achieved by implementing the technology. That is because intraorganizational interests differ, especially in a professionally driven organization. Hence, managerial and professional interest needs to be interrelated in converging means (Weick, 1979), so that different groups or individuals benefit in different ways from sharing those means. By being aware of the conflicting interests, means can be established in ways that the different interests can be used to the organizations' advantage. In TechSchool, the introduction of a platform that the teachers began using for organizing purposes enabled them to develop their professional productivity, while simultaneously contributing to the standardization of organizational activities.

### *Social and Technological Integration*

Our study is based on the idea of separate interests between teachers and the school administration. Integrating IT must be done with that in mind. Different strategies for technology integration are needed based on the impact of both framing activities (e.g., meetings and demonstrations) and postimplementation social and/or material conditioning. We have described the outcomes of these as different types of embeddedness, suitable for different scenarios.

The different types of embeddedness emphasize social and material factors to different degrees. When making adjustments in administrative activities, an administrative framing in combination with strong focus on static technology features will prompt responses on the social level that subsequently will shape a path of action. For professional work, a professional framing is needed, in combination with more flexible technology features and emphasis on ongoing work. The initial framing, in combination with the emphasis on work, leads to a postimplementation convergence that shapes adjustments made in technology features.

We found that administrative processes could be changed by achieving technological embeddedness through management decisions. IT integration in professional work required the teachers to be at the center of the process, which could be achieved by a trade-off, where the management gave up the detailed control over specific tools, while being in charge of the IT platform.

### *Success or Failure in Digitalization Processes*

Changing professional practices due to digitalization may be difficult for management as well as for change agents, but we suggest that it is possible when the different characteristics of professional and managerial concerns are considered. However, our study also explicated the risk of failure to bridge the divide between management and profession (Table 1).

We described "illusive embeddedness" as the consequence of such failure, which is a state of continuous workarounds and arbitrary system input that is decoupled from the underlying activities in which a technology is supposed to be

used. Illusive embeddedness occurs when using a technology becomes an end in itself and different ways to fulfill the system's information requirements are developed within the teacher group. The result is a scenario in which the information requested by the system is too far from the daily professional work to become incomprehensible, which leads to input of loosely translated, or arbitrary, input. Illusive embeddedness could pose risks in situations where decisions being made based on representations that did not reflect its underlying activities. However, this can at best enabled professionals to organize around a technology.

There is a trade-off between the degree of change that is possible and the amount of control that can be maintained over the outcome of the change process. We suggest that dynamic framing, professional and managerial interrelating and sociotechnical integration may be means to handle this trade-off. The design of the change process requires arenas for interaction and negotiation of administrative as well as professional aims and means. Based on careful consideration of what type of technology and what type of activities that is subject to integration, the process can be designed to enable an outcome in a suitable type of embeddedness.

## CONCLUSION

In this chapter, we have examined the processes of integrating digital technology in a school in which there is an explicit intention to become a model example of a digitalized school. Following three decades of unsuccessful attempts to increase the use of IT in Swedish schools, we want to understand how a school can go about to include digital tools in day-to-day activities.

Previous studies have shown the difficulties of integrating IT in schools when preconceived ideas exist of technology as a mediator for organizational change. Such change myths are based on a planning perspective on technology and organizational effects and creates expectations that are difficult to realize. By studying different IT integration processes in TechSchool, we not only looked at such processes that were based in decisions but also found that integration could be generated from professional activities.

We have shown that IT integration processes take different shape depending on how they are initiated and on the subsequent adjustments in work and/or the technology. In TechSchool, the different integration processes related to different types of practices and outcomes, which we describe as four types of embeddedness.

The study shows how digital systems and tools become integrated in a Swedish school organization. Results from adapting the implementation of different technology features to both organizational preconditions and material conditions of the IT systems were presented.

Seeing IT integration in terms of different types of embeddedness enables an understanding of why previous IT initiatives, focusing entirely on placing computers in classrooms or encouraging teachers to use IT, have been less effective than planned. It also provides us with an understanding of how digital tools

became part of most activities in TechSchool, although with different results in terms of increases in organizational efficiency and pedagogical results.

The different types of embeddedness carried different degrees of compromise between interests in the organization. Digitalization in different types of activities required consensus around both the technology features and professional work. Depending on what type of technology that was implemented into what type of practice, focus had to be directed at either of those aspects to different degrees in order to create preconditions for embeddedness. Different types of integration processes created those necessary preconditions.

Technology integration was not only a matter of sociotechnical constellations but also about how those constellations were framed in an administrative, or professional, context.

## REFERENCES

Anderson, C., & Robey, D. (2017). Affordance potency: Explaining the actualization of technology affordances. *Information and Organization*, *27*(2), 100–115.

Barley, S. R. (1986). Technology as an occasion for structuring: Evidence from observations of CT scanners and the social order of radiology departments. *Administrative Science Quarterly*, *31*(1), 78–108.

Börjeson, L., & Löwstedt, J. (2017). Accomplish change or causing hesitance–Developing practices in professional service firms. *Scandinavian Journal of Management*, *33*(3), 185–194.

Cecez-Kecmanovic, D., Galliers, R. D., Henfridsson, O., Newell, S., & Vidgen, R. (2014). The sociomateriality of information systems: Current status, future directions. *MIS Quarterly*, *38*(3), 809–830.

Child, J., Loveridge, R., & M.E.S.S International Research Team. (1990). *InformationTechnology in European services. Towards a microelectronic future*. Oxford: Blackwells.

Fayard, A. L., & Weeks, J. (2014). Affordances for practice. *Information and Organization*, *24*(4), 236–249.

Larsson, P. (2004). *Förändringens villkor. En studie av organisatoriskt lärande och förändring inom skolan*. Ekonomiska forskningsinstitutet vid Handelshögskolan i Stockholm (EFI).

Larsson, P., Löwstedt, J., & Shani, A. B. (2001). IT and the learning organization: Exploring myths of change. *Organization Development Journal*, *19*(1), 73–91.

Leonardi, P. M. (2011). When flexible routines meet flexible technologies: Affordance, constraint, and the imbrication of human and material agencies. *MIS Quarterly*, *35*(1), 147–167.

Leonardi, P. M. (2012). Materiality, sociomateriality, and socio-technical systems: What do these terms mean? How are they different? Do we need them. In P. M. Leonardi, B. A. Nardi, & J. Kallinikos (Eds.), *Materiality and organizing: Social interaction in a technological world.* Oxford: Oxford University Press.

Leonardi, P. M. (2013). When does technology use enable network change in organizations? A comparative study of feature use and shared affordances. *MIS Quarterly*, *37*(3), 749–776.

Löwstedt, J. (1985). Contingencies or cognitions? Two paths for research on organization and technology. *Scandinavian Journal of Management*, *1*, 207–225.

Löwstedt, J. (1993). Organizing frameworks in emerging organizations. A cognitive approach to the analysis of change. *Human Relations*, *46*(4), 501–526.

Mahoney, M. S. (2008). What makes the history of software hard. *IEEE Annals of the History of Computing*, *30*(3), 8–18.

Orlikowski, W. J., & Scott, S. V. (2008). 10 sociomateriality: Challenging the separation of technology, work and organization. *Academy of Management Annals*, *2*(1), 433–474.

Schwarz, G., & Stensaker, I. (2014). Time to take off the theoretical straightjacket and (re-) introduce phenomenon-driven research. *The Journal of Applied Behavioral Science*, *50*(4), 478–501.

Schwarz, G. M., & Stensaker, I. G. (2016). Showcasing phenomenon-driven research on organizational change. *Journal of Change Management*, *16*(4), 245–264.

Scott, S. V., & Orlikowski, W. J. (2013). Sociomateriality—taking the wrong turning? A response to Mutch. *Information and Organization*, *23*(2), 77–80.

Strong, D. M., Johnson, S. A., Tulu, B., Trudel, J., Volkoff, O., Pelletier, L. R., & Garber, L. (2014). A theory of organization-EHR affordance actualization. *Journal of the Association for Information Systems*, *15*(2), 53.

Swedish Schools Inspectorate. (2012). *Satsningarna på IT används inte i skolornas undervisning*. Retrieved from https://www.skolinspektionen.se/globalassets/publikationssok/granskningsrapporter/kvalitetsgranskningar/2012/it/pm-it-iundervisningen.pdf

Tengblad, S. (2015). Ledarskap och medarbetarskap. In J. Löwstedt (Ed.), *Skolledning. Scener från den organiserade vardagen*. Lund: Studentlitteratur AB.

Volkoff, O., Strong, D. M., & Elmes, M. B. (2007). Technological embeddedness and organizational change. *Organization Science*, *18*(5), 832–848.

Weick, K. E. (1979). *The social psychology of organizing*. Columbus, OH: McGraw-Hill Humanities.