

Material Mediations Complicate Communication Privacy Management: The Case of Wilma in Finnish High Schools

ASKO LEHMUSKALLIO
Tampere University, Finland

AIRI LAMPINEN
Stockholm University, Sweden

Increasingly, school settings are implementing digital technologies to coordinate teachers' work. This article examines the role of these technologies in teachers' boundary regulation processes through the lens of communication privacy management theory, and it provides empirical insight into the renegotiation of being a teacher in the presence of rules formalized in software code. The case of Finnish high school teachers exposed to the use of Wilma, a distributed computing system used to store, process, and transmit student data, revealed experiences of a need to renegotiate formalized and trackable work processes, faster and more colloquial communication, and intensified day-to-day work. These influence modes of accountability and the need to negotiate visibility, along with understandings of rules as a central coordination mechanism for interpersonal boundary regulation. The authors suggest in addition that these technologies inure various social stakeholders to constant technical monitoring and regular accounting, thereby advancing the normalization of surveillance practices. This creates good reason to pay closer attention to how rules of engagement may be coordinated.

Keywords: communication privacy management, boundary turbulence, rules, social media, boundary regulation, high school, education, formalization, surveillance

Digital technologies are increasingly implemented in school settings to facilitate education, streamline communication between teachers and parents, and to monitor both students' and teachers' performance. Even if implemented with good intentions, they have started to influence social relations at schools in unforeseen ways. The growth of tracking and accounting for one's actions, coupled with amassing of information on successes and failures in huge databases, has muddled the "rules of engagement." In our experience, it is not uncommon for high school teachers to maintain that the boundaries between teachers and students are now blurred, that they find this problematic, and that they associate it with the implementation of digital technologies.

Asko Lehmuskallio: Asko.Lehmuskallio@tuni.fi
Airi Lampinen: airi@dsv.su.se
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As characterized by Petronio (2002), fuzzy privacy boundaries are a possible source of boundary turbulence. The affordances of novel communication technologies complicate boundary management by introducing parallel mechanisms for coordinating social interactions that differ greatly from earlier modes of communication. Their implementation is an opportune moment for reevaluating how coordination is handled because earlier rules of engagement need to be modified and adjusted. Our recent interviews with high school teachers, however, show that this blurring of privacy boundaries, with the associated turbulence, remains poorly understood once digital communication technologies are deployed in their workplace and in society at large.

In diverse countries, among them the United States, Switzerland, and Finland, schools have implemented systems for reporting incidents internally and to communicate conveniently with relevant stakeholders, such as the parents. In Finland, where these systems have been in use since 2000, most schools have implemented the Wilma distributed computing system, by StarSoft, to store student data in preconfigured databases, process the data in accordance with prescriptive rules, and transmit the resulting information to selected parties. In 2013, StarSoft reported that Wilma is used in more than 95% of primary and secondary schools in Finland, and its acquisition in 2016 by Visma heralded its introduction for higher education facilities and kindergartens. With its rules, the system influences norms as to how teachers “should” act, thereby ushering in situational uncertainty related to social roles. Moreover, using Wilma is compulsory for the parents, too—at least if they want to be informed of changes in class schedules, see requests related to sports practice, and the like. These developments gave impetus to our study of high school teachers’ experiences of Wilma and its impacts on interpersonal boundary management.

Our study was grounded in Petronio’s (2002, 2013) communication privacy management (CPM) theory, a rule-based approach that extends Altman’s (1975) early work to account for complexity in boundary management processes. The concept of rules is important in CPM, where it can be understood to refer to an ad hoc situational guideline for determining what kinds of information to reveal, to whom, and when, by placing particular emphasis on social context. Recently, CPM theory has been applied in an educational context, with scholars such as Hosek and Thompson (2009) studying how privacy rules are developed and privacy boundaries are coordinated in a university context and within the student–teacher relationship. This article answers Hosek and Thompson’s call for research that addresses how the Internet affects boundary regulation in schools. In doing so, it builds on and complements CPM scholarship on computer-mediated communication and interpersonal boundary management (Child, Haridakis, & Petronio, 2012; Child & Westermann, 2013; DeGroot & Vik, 2017; Frampton & Child, 2013; Imlawi & Gregg, 2014; Lampinen, 2016; Litt & Hargittai, 2014; Palen & Dourish, 2003; Petronio, 2013; Pike, Bateman, & Butler, 2009; Stutzman & Hartzog, 2012; Vitak & Kim, 2014).

Our study focused on the role that material mediations play in boundary regulation processes, specifically by providing empirical insight into the renegotiation of being a teacher in the presence of rules formalized in software code. Lauer (2012) has argued that 19th-century inventions, including photography, the phonograph, and the telephone, have contributed to the proliferation of evidence-producing communication technologies—or even an evidential paradigm—and thus to the intensification of contemporary surveillance. That perspective only accentuates the need for further research on privacy management in conditions of electronic surveillance in the workplace and as surveillance is becoming normalized, at least in terms of what young people accept as part and parcel of full participation in social life (Fulton & Kibby, 2017). Whereas Allen, Coopman, Hart, and Walker (2007) examined the establishment of privacy boundaries during new-employee

orientation, we turn our attention to a case wherein the organizations change as new technology gets introduced. Although teachers have long needed to adjust to codes of conduct enshrined in legislation, national curricula, and school-specific guidelines, the obligatory use of particular software in teaching influences the flexibility of making personal choices, based on the teacher's professional discretion, and it changes patterns linked to teachers' accountability for their work. We address the roles played by various communication media in the renegotiation of privacy boundaries, placing emphasis on the complex mediated entanglements within which teachers navigate socially (Vigh, 2009). In addition to CPM scholarship, we thus contribute to computer-supported cooperative work scholars' research on affordances and relational infrastructures (Bowker, Timmermans, Clarke, & Balka, 2016; Guribye, 2015; Schmidt & Simone, 1996) and also to the growing body of research in media studies (Evans, Pearce, Vitak, & Treem, 2017; Gillespie, Boczkowski, & Foot, 2014; Marwick & boyd, 2014; Schüttpelz, 2016).

We will begin by describing Wilma, the software system at the center of our analysis, and introducing our theoretical framework and the setting for our study. We then present our analysis of teachers' experiences of Wilma, elaborating on how the software system formalizes work processes and renders them more traceable, supports faster and more colloquial communication, and intensifies the day-to-day interactions at work. The introduction of Wilma in schools transforms rules for boundary linkages, boundary co-ownership, and boundary permeability.

The Wilma Software

Wilma has become a central coordination tool in Finnish school settings. It includes a set of rules addressing how to archive, process, and transmit information that pertains to everyday activities in schools. Wilma's Web-based interface enables students, teachers, and parents to follow and coordinate education work, with the back end involving databases provided via two separate programs, Primus and Kurre, to enable management of student- and education-related school matters. In line with our interviewees' practice, we refer to the entire bundle of software (composed of the Web-based interface and the databases) as Wilma.

Wilma provides channels for one-to-one and one-to-many communication among teachers, students, and the students' guardians. Some interviewees compared Wilma's messaging functionality to instant messaging and others to e-mail. The messaging function can be used by any parties to communicate with any others, except that parents cannot send messages to students. Wilma's functions are categorized by the action involved, helping people organize, report, and share information related to day-to-day school life. In essence, Wilma provides a discipline mechanism applied for reporting school-related data to the stakeholders. It aids the school in its work as a broader disciplinary institution, helping to form students' bodies into societally desired ones, as "primuses," as literally suggested by the database name.

The various stakeholders differ in their access and communication rights and hence experience the system in different ways. Each group interacts with a Web-based interface tailored to that group and personalized for it and its individual members. Instead of allowing users to add "friends" and thereby determine the sets of people they interact with, as is typical of social-network services in the leisure domain, Wilma establishes an online social network for each individual, based on that person's role in the social world of the school.

Teachers, including the principal and school counselors, have the most extensive access rights, with the principal having access to all content, the study advisers to most, and the teachers to information on the school in general and on the groups and individual students whom they teach. Teachers use the system both for gathering and tracking data about students and for communicating with students, other teachers, and parents. The students, in turn, obtain general information related to the school and their curriculum, their grades, and their absences, whereas parents (or other guardians) get information about the child and the school in general. Students are able to access their own data and communicate with school representatives. Parents, too, can access the relevant student's data. They can also use Wilma to communicate with teachers. If this is not outright required, they are at least very strongly encouraged to do so.

Theoretical Background

We subscribe to scholarship arguing that privacy should be considered explicitly in its social context (e.g., considering contextual integrity; see Nissenbaum, 2010) and with sensitivity to the networked character of digital social interaction, especially such elements as networked privacy (see Marwick & boyd, 2014). Literature on interpersonal boundary regulation and CPM (Altman, 1975, 1977; Petronio, 2002, 2013) has offered models for considering negotiation of privacy within a broader social context. One premise of that work is that humans as social beings take up roles in interpersonal interaction and may behave differently in keeping with the particular situation in which they find themselves. The same individual might talk, walk, and think differently when acting as a teacher than when filling the role of a friend, a tourist, or a spouse. These regulation mechanisms can be employed not only by an individual but also by groups of people, who may regulate their boundaries together (Altman, 1975; Petronio, 2002).

Boundary Regulation as an Interpersonal Process

Altman is commonly credited with providing a framework for understanding boundary regulation as an interpersonal process. His framework is widely used in research on computer-mediated communication (see, e.g., Palen & Dourish, 2003; Stutzman & Hartzog, 2012) and is of particular importance for recent work employing Petronio's (e.g., 2002, 2013) approach to CPM (Child et al., 2012; Child & Westermann, 2013; DeGroot & Vik, 2017; Frampton & Child, 2013; Litt & Hargittai, 2014; Pike et al., 2009; Vitak & Kim, 2014).

The starting point here is an individual who, irrespective of cultural variation (Altman, 1977), needs ways to manage a "satisfactory match of desired and achieved privacy" (Altman, 1975, p. 26). In Altman's model, privacy is a dialectical process that is influenced by the inputs from others to an individual and the outputs that the individual gives to others. Excessively little interaction leads to social isolation, and too much yields feelings of crowding and intrusion. According to Altman, boundary regulation processes are essential for defining boundaries of the self. The means to control, define, and observe boundaries give agency to the individual, who is considered able to regulate the boundaries in an effort to make sure the level of privacy desired and the level achieved match.

Communication Privacy Management Theory

Petronio took Altman's approach further by developing CPM theory, which focuses explicitly on the ways in which individuals and groups decide how to regulate the revealing or concealing of private information and provides more in-depth understanding than does Altman's fundamentally cybernetic model. Petronio (2002) suggests that "when we reveal, we disclose private information" (p. 5). The definition is narrowed down by suggesting that private information is something individuals consider to have personal ownership over (Child & Petronio, 2011, p. 23) and that individuals develop and apply rules to control information flow (Petronio, 2002). From these starting points, she goes on to characterize boundary regulation as a rule-based management system that individuals and groups employ for deciding to whom private information is to be disclosed and from whom it is to be withheld (Petronio, 2002, p. 86). Once an individual shares a particular piece of private information, that information becomes collectively co-owned by those among whom it is shared. In sharing, the individual applies rules addressing with whom to share what kinds of information, when, and under what circumstances.

Petronio's rule-based rendering of how information flows are controlled in social interaction pays particular attention to this collectively co-owned information and to how people manage collective boundaries, such as those within families, in groups of friends, or among work colleagues (in our case, teachers). Scholars of CPM posit three types of rules that are used to coordinate the flow of private information and manage collectively held boundaries (Child & Petronio, 2011, p. 24; Petronio, 2002). First, privacy-boundary permeability rules are rules that individuals and groups develop and employ for regulating the kind and amount of private information that they disclose to others. These might be very rigid, allowing very little private information to be revealed, or rather loose, restricting the revelation of only a few specific types of private information. Second, privacy-boundary ownership rules are applied to regulate who possesses specific types of information. When disclosing private information, an individual might, for instance, reserve the right to decide on those to whom others are allowed to reveal the information. Finally, privacy-boundary linkage rules are rules that individuals and groups apply to decide on the people to whom private information is linked and, thus, whose concern the private information is going to be. For example, people in certain professions, such as teachers or police officers, are required to reveal private information to state authorities when that information may indicate harm to people or damage to property.

Boundary Turbulence and the Notion of a Rule

Central to both Altman's and Petronio's approach is the understanding that individuals must proactively regulate interpersonal boundaries and that if they do not do so, they risk not having a "satisfactory match of desired and achieved privacy" (Altman, 1975, p. 26). When expectations have not been fulfilled, boundary turbulence occurs, and rules for regulating private information have to be renegotiated. Petronio (2002) notes that "turbulence occurs when the rules for managing the tensions between privacy and disclosure somehow fail to be coordinated among the boundary members" (p. 19). Accordingly, although rules are situational and contextually applied, some rules gain stability by being repeatedly used or with the expectation of use. These rules may be maintained by an individual, dyad, or collective, as in the case of rules on disclosure of family or corporate affairs. While boundary turbulence may take many forms, it—as the word "turbulence" suggests—describes a situation of confusion or conflict, found when outcomes are not

in line with the desires and expectations of those involved. It follows that, in many cases, active coping strategies are developed for dealing with boundary turbulence.

The notion of a rule, although central for description of communication privacy theory, is, again, very broadly defined in Petronio's (2002) work. She presumes that "private disclosures are dialectical, that people make choices about revealing or concealing based on criteria and conditions they perceive as salient, and that individuals fundamentally believe they have a right to own and regulate access to their private information" (p. 2). Although Petronio describes rule management processes as central to her framework, "rule" seems to denote primarily a situational heuristic that is contextually applied. Hence, rules are not fixed ab initio, but change over time, may be not adhered to in some cases, and can be renegotiated. By its very nature, the "rule" structuring device that is so central to the theory is flexible, malleable, and adjustable.

Activated Affordances and Relational Infrastructures

There is an important difference between the notion of rules as discussed by Petronio and rules as implemented in a software system such as Wilma: Whereas Petronio's understanding of a rule refers to situated, often ad hoc, guidelines for determining what kind of information to disclose to whom and when, algorithmic systems, including Wilma, rely on rules that have to be explicitly laid out in software structures. This formalizes the sequence of operations, leaving less freedom and flexibility for pursuing boundary negotiation. These kind of computing systems thereby formalize social relations, transforming how they may be upheld and negotiated. The clash between negotiable rules, as described in CPM theory, and the formal, often immutable rules of software systems merits closer attention.

In considering how material mediations complicate boundary regulation, we draw on literature on affordances and relational infrastructures. Gibson (1988) coined the concept of affordances to describe the relations between human beings (or animals) and objects in their environments. While, for example, some objects afford humans' throwing of them, others may be too large and heavy, thereby giving greater affordance to such actions as standing or sitting on them. Media scholars have increasingly focused on affordances (Evans et al., 2017) to aid in explaining medium-specific differences in the use of communication media. In our understanding, affordances are not necessarily noticed; they have to be activated as part of meaningful actions (Lehmuskallio, 2012).

We use the concept of activated affordances to pay specific attention to the relations that teachers take with the various devices when using Wilma and how these, together with the software, afford medium-specific actions that have an impact on interpersonal boundary regulation, as outlined in CPM. These affordances have to be activated as part of interpersonal interaction, and this activation is situationally and contextually negotiated.

Importantly, software systems do not become visible only as part of specific interactions (e.g., affording specific types of communication)—they are part of relational infrastructures. These are embedded and transparent; embodied in keeping with standards and linked with conventions of practice; built for a base of existing structures, with membership and learning of their use bound up together; and visible only upon breakdown (Bowker et al., 2016; Star & Ruhleder, 1996).

A focus on relational infrastructures allows us to point toward the spatiotemporal settings in which Wilma is embedded, and it enables discussion of how these influence boundary negotiation. For example, software systems are presented somewhat differently on the basis of who is using them, while maintaining a recognizable common identity across sites. In CPM theory, rules are negotiated at both the individual-level and collective-level boundaries. Instances of boundary turbulence serve as lenses for examining the effect of activated affordances on boundary-negotiation processes at both levels. Because we consider infrastructures to be relational, we focus on negotiation processes of one particular social group at schools—teachers—and their activation of particular affordances, specifically those related to Wilma. By taking on the case of Wilma in Finnish high schools, our work addresses how material mediations affect the management of communication privacy in the presence of rules formalized in software code.

Material and Methods

Our study examined teachers' experiences of using a specific online social-network tool and database application, for purposes of yielding insight into its role in their boundary-regulation processes. To this end, we examined the values and objectives built into Wilma, as they may be revealed by Wilma's main features and the types of action it allows for and encourages, and how teachers perceive its impact on their experiences of everyday school life in light of these. The data were collected by applying an approach similar to the walkthrough method (Light, Burgess, & Duguay, 2018) in going through the actual user interfaces used by selected high school teachers. Data were provided also by the software company's demo mode, which is used to sell the software to educational facilities. Our analysis of Wilma was complemented with examination of material from nine semistructured one-on-one interviews with Finnish high school teachers. The participants were recruited from public high schools in the Helsinki Metropolitan Area, where Wilma has been in long-term use. In the invitation, we asked teachers to take part in a study on the effects of the increasing everyday presence of various ICTs on their work and leisure. Of the nine interviewees, four were female and five were male. One had begun teaching only recently, whereas others had extensive experience. All participants used Wilma and other ICTs implemented in their school's work flow as a part of day-to-day professional life, although to a varying degree and with variable enthusiasm.

A transcription service was used for translating the interview data into textual form, and the two authors then collaboratively conducted thematic analysis (Braun & Clarke, 2006). The analysis focused specifically on understanding how material mediations complicate CPM, by coding relevant sections of the material and then interpreting these in more detail in reference to the empirical material and related literature. We regularly discussed findings and their interpretations by meeting in person and online. After several rounds of meetings, we concluded that thematic saturation (Guest, Bunce, & Johnson, 2006) had been achieved and deemed further interviews unnecessary. The interview excerpts presented below are translated from the original Finnish, with the aim of achieving accuracy in both meaning and style.

Findings and Interpretation

Our analysis focused on teachers' accounts of boundary turbulence, their perceived needs for CPM, and the changes in codes of conduct they associate with the introduction of ICTs at schools in general and that of Wilma in particular. We illustrate the influences in terms of the boundary-negotiation

dimensions outlined by Petronio: privacy-boundary linkage rules, boundary-ownership rules, and boundary-permeability rules.

The First Major Theme: Formalized and Trackable Work Processes

Wilma transforms how teachers contact parents, students, and fellow teachers. The rules specified within the software influence how individuals may act in the role of teacher, parent, or student. Wilma, as a software system, is built with logical sequences and formal rules in mind. Teachers are made accountable about how they follow specific instructions, without as much room for flexibility and renegotiation as is found in face-to-face encounters. This increases the likelihood of boundary turbulence.

Automation of Boundary Linkages

Boundary linkages are the connections made to other people, extending privacy boundaries from individuals to dyadic and larger-group relations (Petronio, 2002, pp. 29–30). Making some linkages is expected. For example, when a student arrives at school late, the parents should be notified, and students should be informed in advance when a class is rescheduled. Wilma is used for exactly these types of purposes. Not all communication flows via Wilma, however. Instead, some individuals resort also to e-mail messages, social-network sites, phone calls, text messages (SMS), and face-to-face meetings. This makes it more challenging to coordinate communication flows in line with everyone's expectations and can lead to boundary turbulence.

Wilma automates some of these boundary linkages. This is in line with descriptions found in classic computer-supported cooperative work literature on work-flow systems wherein "formalism makes it possible to embed the categorisation into a computer system [with] parts of this formalism . . . entirely automated by the system" (Grinter, 1997, p. 173). All users receive particular access rights within Wilma, with their assigned roles determining their access to input information. This influences the possibility of negotiating boundary linkages because the ad hoc property familiar from face-to-face rule use is lost. The use of varying degrees of boundary linkages, commonplace in teachers' work, is more difficult to control: Because the details are disseminated to a predefined group, everyone receives the same information.

Punishments meted out for discipline are registered in Wilma under the heading "detentions." The user interface for teachers provides access to data about punishments for all students at their school, even those a particular teacher does not teach. This boundary linkage extends teachers' knowledge of the schools' students significantly beyond that in earlier forms of boundary linkage, wherein similar information would travel, but less systematically, through discussions among teachers.

Permanence of Boundary Co-Ownership

Boundary linkages lead, in turn, to boundary co-ownerships. These need to be negotiated: Once private information is disclosed, the rules for rights and privileges related to the disclosed information must be agreed upon, if particular behavior is to be expected (Petronio, 2002, pp. 30–31). In schools, teachers are subject to various rules arising from their role, of which many are legally binding. Additionally, teachers

have regular faculty meetings, where they may collectively discuss newly arisen issues. Many also speak directly with a few colleagues about the issues they face.

Wilma's automation of boundary linkages, coupled with the permanence of the communications entered in the system, leads, at times, to problems related to boundary co-ownership. To aid teachers in aligning their communication correctly, Wilma has inbuilt text corpora that present modes of address suggested as appropriate. The software provider has also published a guidebook, *Communicate Wisely With Wilma*. The guidebook notes the following:

The modes of addressing legal guardians are surprisingly important. Those kinds of messages seem to work best that (1) in addition to pointing out a problem also mention how the teacher would like the student to behave in the future and how this is useful, (2) say something that creates a belief in a positive outcome, and (3) ask the guardian for help or advice. (Furman, 2013, p. 4, authors' translation)

The descriptions of these rhetorical means, with templates provided in software as concrete examples, give teachers guidance for particular modes of address. The guidebook recommends explaining explicitly to parents how the teacher wishes the student to act in future, and why. Additionally, the message should contain a positive statement, showing belief in positive change. Finally, the message should underscore the role of the parent as the foremost expert on the child.

Because these modes for boundary linkages and co-ownership do not always meet the expectations of the stakeholders involved, the guidebook stresses a need to circumvent some of the elements inherent to Wilma if boundary turbulence with parents does occur. Especially recommended, also according to the interviewees, is the technique of not leaving traces of communication in the system if a parent is particularly strident, demanding, or even hostile. The guide recommends always communicating in person or by phone in these cases. This is in clear parallel to literature on how technology formalizes work flows and how people find ways to work around constraints that impede them from reaching their goals and collaborating with others (e.g., Bowers, Button, & Sharrock, 1995; Lee, Kusbit, Metsky, & Dabbish, 2015). Although this leaves more space for negotiation and can counteract the system's tendency to increase the tracking and surveilling of individuals' actions, it is also used to reduce teachers' liability in cases of conflict.

The Second Major Theme: Faster and More Colloquial Communication

In the experiences of the teachers we interviewed, ritualized modes of communication, focusing on creation of an interpersonal setting for mutual awareness, respect, and recognition, seem absent from much of the computer-mediated communication in schools. On account of their position in the school's hierarchy, teachers are used to being addressed with deference, and if they are not, computing technologies are held to blame for part of the perceived loss.

Changes in Communication Frequency and Modes of Address

Characteristics of communication technologies have an impact on the frequency of interpersonal

contact and the modes of address that are used. Changes in these can result in boundary turbulence if communications are not consistent with expectations and relevant rules pertaining to deference and demeanor (Goffman & Best, 2005). Wilma is introduced not to a tabula rasa but in a particular sociotechnological environment that informs its uses. Another important source of norms related to Wilma comes from broader Internet cultures that espouse less formal modes of address, relatively short messages, and occasional bursts of frequent contact that subside quickly. Interviewee 1 stated,

Fundamentally, a kind of modesty, politeness, and skill in argumentation is lacking in Internet fora . . . This comes to mind as I listen to the self-centered ways in which students think, act, and talk. I don't know whether it's due to the Internet or due to the parenting.

The less formal modes of address are accompanied by discussion of topics that teachers do not consider appropriate to the sphere of a teacher–student or a teacher–parent relationship. Many teachers draw their boundaries such that hobbies, the precise location of one's home, or holiday plans remain strictly separate from the professional realm. Some students and parents do not respect these boundaries. Turbulence is perceived when matters considered private are addressed in interpersonal discussions, in a manner that pollutes the purity of the separation of social roles.

Increasing Boundary Permeability and the Difficulties in Closure

Questions about boundary linkages and co-ownership are related also to boundary permeability—that is, the amount of information that is revealed or concealed in any interaction. The degree of boundary permeability ranges from complex webs of restrictions to complete openness. Although teachers have freedom for negotiating how they desire to relate to students and parents, ICTs can promote connections that otherwise might not be made—for instance, when it comes to automated suggestions for creating links on Facebook, a social media service all stakeholders use alongside Wilma.

Actually, I invited a few of them accidentally as “friends” . . . It was at a time when I hadn't had much experience with social media. I just assumed there was a link to further friend invites. But then it was just the opposite; the software suggested friends, and new suggestions popped up. (Interviewee 2)

These nearly automated boundary linkages lead to boundary permeability that is not always obvious to all stakeholders. Seeing other parties' interactions from many realms of life is prone to prompt boundary negotiation. Excessive boundary permeability leads to situations wherein stakeholders become accidental co-owners of private information intended for other social domains. Because communication behavior from social-network services is seen spilling over to Wilma and into the classroom, some interviewees explicitly ask their students to change their way of communicating in these services, so as to “protect” modes of address in the school environment.

Although interfaces with others may be created via linkages, thereby opening a relationship, collapsed contexts in particular also lead to felt needs for closing those boundaries, effectively cutting off parts of one's communication network (for an overview of context collapse, see Vitak, 2012). Although

Wilma must be used in accordance with the guidelines set forth by the service providers and within the school, potentially permeable boundaries established by other communication technologies may be closed down more effectively.

I've made it a principle not to accept students as "friends," not even if I'm able to not show them some of my own [social-network site] content. I decided to draw a line here.
(Interviewee 3)

By negotiating sets of communication partners, media setting specifically, teachers get a sense of coping with the changes brought by ICTs. Yet these coping mechanisms are only partially effective, particularly as social media sites such as Facebook are designed to increase boundary permeability. Wilma and other ICTs introduced in schools provide additional flexibility with respect to some of the spatiotemporal constraints that teaching entails, but this flexibility itself is a source of new boundary turbulence. An extreme example of how teachers may cope with these pressures is one participant's choice of no longer having an Internet connection at home so as to protect the boundary between her home life and her professional role as a teacher.

The Third Major Theme: Intensified Everyday Experience at Work

Teachers need to coordinate choices pertaining to media use with students, students' parents, and the school's other teachers and staff members. This need becomes keener as the availability and variety of media increases, and because mismatches are likely to cause boundary turbulence. Moreover, the requirements for keeping records in Wilma up to date serve to intensify teachers' everyday work experiences.

Changes in the Variety of Communication Media Used

Wilma allows easy, quick access to other stakeholders via a computing terminal, even if those parties are not available instantaneously. This is considered a great improvement on the previous modes of contact, such as trying to reach someone by landline phone or face-to-face meetings at the school. Although Wilma has not fully replaced these communication media, they tend to be reserved for special occasions, for which Wilma does not seem an appropriate medium—either because of technical affordances or in light of social norms.

At the same time, while the use of Wilma is suggested, communication technologies tend to be introduced on an "installed base" of existing infrastructure (Star, 1999). Wilma functions as one possible medium of contact among many and may not supplant others:

A guardian had sent an e-mail stating that a student won't be at school today. The teacher hadn't seen the e-mail and created a message in Wilma that the student has been away from school all day and the reason remains undetermined. The guardian had become angry, stating that e-mail had been sent and the school informed. So, I think guardians still expect you to read your e-mail every day. (Interviewee 4)

Wilma is designed to serve as an obligatory passage point in most teacher-parent communications (Callon, 1986), but it does not work as intended, because several parents expect teachers to check other

communication media daily. E-mail, telephone calls, SMS messages, and messages sent via social-media services complicate the communication setting—one that was already spatiotemporally condensed into short breaks between classes— and lead to an intensified everyday experience.

Although the boundary turbulence caused by the disjunction in use of communication media between teachers and parents may be remedied over time—for instance, by instructing parents to contact teachers only via Wilma—there is a further complicating factor: Several students do not regularly check their Wilma accounts. This can make it hard for teachers to contact students outside class when doing so is necessary.

That has led several teachers to seek alternative means of reaching out, including the creation of separate social-network profiles on Facebook for contacting students. Some saw this as a fascinating new communication medium, but others expressed a fear that it could lead to further blurring of boundaries between teachers and students.

Constrained Settings for Using Wilma

Wilma demands use of particular times and places for contact. Users must access it via a computing terminal, which in schools is usually found in the teachers' lounge and some classrooms. This means that teachers' access to the software system is constrained to classrooms, the teachers' lounge, or to their personal computers at home. The coupling of the use of Wilma to particular locations influences teachers' whereabouts in the school, along with how they structure their use of work time. Because using Wilma is mandatory, teachers must find the time in the course of their day to supply Wilma with the required information. This can feel taxing:

Unfortunately, we don't have enough computer terminals for teachers, and, since absences have to be noted as soon as possible in Wilma, it might happen that it's not possible to access a computer in the teachers' lounge in time. (Interviewee 4)

The combination of limited resources and a strict schedule for classes' start and end times means that terminals tend to get congested when the work day's schedule permits entering information. The constraints on settings for using the software system are considered a particular source of boundary turbulence, especially when teachers do not find an opportunity to report on events right after they have occurred so must remember the information until the next day. This affects the reporting, creating potential for delays and omission of information that should have been shared.

Discussion

The implementation of Wilma at schools, alongside other digital communication technologies, has increasingly formalized work processes and rendered them traceable. It has implicitly encouraged faster communication, in more colloquial styles, and has led to experiencing the everyday work environment as more intense. Flexible, heuristic rules applied in face-to-face settings need to be renegotiated in the presence of rules concretized in less mutable software code. Wilma makes these patterns clear. Importantly,

systems of this sort, increasingly used in various countries, worldwide, play an integral role in normalizing being under digital surveillance while at work or at school (with regard to Facebook, see Fulton & Kibby, 2017; on electronic surveillance in the workplace, see Allen et al., 2007) while also eroding interpersonal relationships of trust between teachers and students. With the aid of communication media, responsibility for unpleasant interactions can be delegated to third parties, such as parents or the principal.

We can now examine the changes in accountability and the need to negotiate visibility that result from implementing such systems in school settings. These have implications for our understanding of rules as a central coordination mechanism in interpersonal boundary regulation.

Technical Accountability and the Need to Negotiate Visibility

Documents, traceable data, and formal registers have weight in accounting for who is responsible when something goes wrong, hence some of the emphasis in the Wilma guidelines for teachers on the importance of not discussing contested matters within the system, directing teachers to revert to talking face-to-face or on the phone, so as not to leave traces. Here, technical mediation comes to the fore in CPM.

Teachers need to negotiate particular forms of visibility in computer-mediated environments. Instead of just filling in what has happened, they need to do so in context-specific ways so as to avoid conflicts. This dilemma between a desire for data and a desire to avoid involvement in conflicts leads to partial truths in terms of the information collected and later used in the assessment of students' performance.

The insistence on collecting more fine-grained data of the everyday at schools, in a standardized form that can be stored in databases and later analyzed from various perspectives, links the introduction of Wilma in schools to other areas of society in which particular value has been accorded to data. This entered discussion several decades ago in relation to private companies with the notion of informing (Zuboff, 1988), and it has gained more and more attention lately under the rubric of datafication (van Dijck, 2014). As the amounts of information stored globally in digital form have surged, it is no wonder that associated questions of access, use, and rights related to data are being voiced ever more loudly, including in terms of surveillance capitalism (Zuboff, 2015) and data colonialism (Couldry & Mejias, 2018). What has received less attention in these discussions are the partial truths inherent to the data collected. It is especially relevant to note that the data collected always incorporate the specific social relations from which they are accumulated.

The rhetoric of technical accountability stresses the importance of inscriptions and implies the necessary partiality of these inscriptions, but the use of Wilma also shifts the spatiotemporal whereabouts of teachers at the school, hence directly influencing their location about social interaction and the need to negotiate visibility. With access to the school's Wilma terminals being limited in time and space, teachers are encouraged to do some of their work at home. Interaction that used to be face-to-face and less frequent has changed and now involves a range of technical inscriptions, leaving teachers less time for meeting students or parents in person, outside classroom or software settings. This is in parallel with what has been happening in other sectors, such as the health domain (Ruckenstein & Schull, 2017).

In another influence pattern, while Wilma is made obligatory for teachers, both students and parents

continue to rely on a mix of communication media, including phone calls, SMS, social-media messages, and e-mail, thereby largely circumventing schools' efforts to build clear passage points. This complicates the boundary-negotiation processes further, since some communications must reliably reach every member of a large set of intended recipients while attempts are made to keep others between only a few people. Hence, Wilma is less an "immutable mobile" than a boundary object, "plastic enough to adapt to local needs and constraints of the several parties employing them" (Star, 1989, p. 46), built on an installed base.

Communication Privacy Management and Mediated Rules

Petronio's CPM theory is useful for teasing apart the kinds of boundary negotiation that teachers face when dealing with new communication technologies that collapse and transform contexts. As a rule-based approach to communication and coordination (Petronio, 2002, pp. 10–12, 37), CPM theory discusses rules as providing guidelines (Petronio, 2002, pp. 58, 138) for behavior. These are flexible, adjustable, and negotiable. Teachers get socialized into preexisting rules, and they may, for example, refer to legal guidelines and codified best practices. Both rules and their negotiation are sometimes explicit and at other times implicit, and some of these rules take the form of routines whereas others get tied to particular events and are applied only seldom (Petronio, 2002, pp. 72–83).

Being a teacher is a shared undertaking that relies not only on the rules that teachers decide upon but also on the curricula they are tasked with following and the relations they engage in with students, colleagues, parents, and supervisors. Accordingly, "teacher" is a description for a particular entanglement that involves a person taking up a host of relations and weaving them together into a more or less coherent whole. A teacher negotiates boundaries relative to other people, making decisions on what kind of information to disclose, to whom, as Petronio suggests, with the aid of heuristic rules. A teacher has particular expectations of what being a teacher means, as well as expectations of other people's expectations. Each teacher attempts to situate the personal understanding of being a teacher in line with these expectations. This task is simplified somewhat by teachers' education experiences of both studying at school and attending a university. Additionally, in Finland, the National Board of Education publishes national educational curricula that provide guidelines for teachers' work.

These aids notwithstanding, teachers have to deal professionally with fundamental insecurity surrounding the role of a teacher. On account of the relationality of being a teacher, teachers necessarily negotiate interpersonal boundaries with other people in a work context, whether boundaries with students, parents, peers, or supervisors. If a teacher is to act in these relational environments, the boundaries have to be porous, and they are regularly subject to change. Therefore, teachers must make efforts to negotiate boundary linkages, co-ownership, boundary permeability, and boundary closures. This negotiation becomes more difficult when teachers need to adhere to rules that are formalized in software code and that, hence, leave less flexibility for renegotiation work. Interpersonal roles become more rigid, whereas hierarchies between roles are softened with the more colloquial modes of communication used in these computer-mediated settings.

Recent CPM studies have focused on boundary negotiation processes in computer-mediated environments, examining, for example, how the affordances of social network sites impact privacy

management (Litt & Hargittai, 2014; Pike et al., 2009; Vitak & Kim, 2014), how the lack of explicit and well-established privacy rules in online settings such as social media is a key factor in bringing about privacy violations and boundary turbulence (DeGroot & Vik, 2017), and how young people increasingly consider surveillance an everyday aspect of social life (Fulton & Kibby, 2017). Others have drawn on Altman's consideration of how physical space plays into interpersonal boundary regulation, finding this framing helpful for mapping how people negotiate boundaries in online settings that differ from the spatial and temporal structures familiar from face-to-face interactions (Palen & Dourish, 2003; Stutzman & Hartzog, 2012).

We have added to this work on the role of communication technologies in managing boundary negotiations by showing how implementing a computing system such as Wilma affects rules for boundary negotiation. Because communication technologies have important influence on how boundary negotiation may be performed, they should not be considered transparent means to an end. The material mediation of communication calls for reassessing the rules for "proper" social interaction because the bandwidth of both verbal and nonverbal communication changes with mediation, as do the ways of storing, processing, and transmitting data relevant for social interaction. What may be made transparent, and what remains opaque, depends on the affordances of digital technologies (Flyverbom, Leonardi, Stohl, & Stohl, 2016), and especially on how these are activated in specific situations (Lehmuskallio, 2012). For example, the temporal sequences in social interaction may change in consequence of the media-use-afforded possibilities opened by "time axis manipulation" (Krämer, 2006)—influencing such outcomes as who gets addressed when, in which order, and by what means. Boundary linkages, co-ownership, and permeability change as systems such as Wilma are introduced, and made obligatory, at schools and beyond. Hence, greater awareness on the part of implementers, users, and scholars alike can enrich the whole of society.

We have highlighted that the flexibility for rule negotiation characteristic of face-to-face communication is lacking in many computing environments. Here, rules, often decided upon in the software-development stage, are formalized in software code. Algorithms with particular contingency-based structures specify certain sequences of operation in advance, and these may not be readily manipulated at will afterward, because mass-produced software is not created to afford "on-the-fly" changes by users during situated negotiation. The case of Wilma concretizes several aspects of this formalization of social relations, including determining how people are categorized, who gets which kinds of access rights, and what options exist for sharing one's information with others. Interestingly, while fuzzy privacy boundaries are a possible source of boundary turbulence (Petronio, 2002), our study shows that so too are strict rules, as they leave little space for boundary negotiation. Wilma is an important example of restructuring and solidifying organizational structures at schools, but we believe it to represent only the tip of an iceberg. Going forward, we expect to see further boundary turbulence related to computer-mediated formalization of social interactions, and the felt situational needs for ability to renegotiate these. Most importantly, these systems, once implemented, will accustom various social stakeholders to constant monitoring and routine accounting, thus advancing the normalization of surveillance practices. This is why we need to pay closer attention to how the rules of engagement may be coordinated.

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