MUNDANE OR MAGICAL? DISCOURSES ON TECHNOLOGY ADOPTION IN FINNISH SCHOOLS

Complete Research

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Abstract

Information and communication technologies (ICT) have truly entered our everyday life, both work and leisure. This applies especially to the lives of our children: the children of today have been surrounded by ICT from their birth – personal computers, the Internet, mobile phones, video games, and social media have been an integral part of their everyday life from the early childhood. School should be able to adapt to this change, but this seems to be challenging to achieve: schools are lagging behind the recent developments in ICT. We inquire the reasons for these challenges as regards ICT adoption in the Finnish schools from the perspective of the school principals, i.e. the ones expected to lead their schools to utilize ICT in its full potential. This is a nexus analytic inquiry that first examines these principals' discourses on ICT and change, revealing several different discourses on them both, constructing the objects of talk in various ways. Afterwards, the study identifies influential participants helping or hindering in the process of change as well as broader societal themes or values that act as drivers of or barriers to change, as pictured in the principals' talk. Implications for theory and practice are discussed.

Keywords: School, Nexus analysis, Discourse, ICT Adoption.

1.   Introduction

Information and communication technologies (ICT) have truly entered our everyday life, both work and leisure. This applies also to the lives of our children: the children of today have been surrounded by ICT from their birth – personal computers, the Internet, mobile phones, video games, and social media have been an integral part of their everyday life from the early childhood (e.g. Prensky, 2001). Use of different ICT devices and having access to the Internet have become a norm both at home and on the move. Already in 2007 around 95 % of Finnish households with children had access to the Internet and in 2009 over 99 % of 15-year-olds in Finland had their own mobile phone (OECD, 2012).

The level of primary education is high in Finland. In PISA (the Program for International Student Assessment) results of OECD (Organisation for Economic Cooperation and Development) countries Finland has been ranked high for years (Kupari et al., 2013). Fast technological changes in society have created demands for schools to teach children the skills they need in the new 'digital society'. However, schools have been lagging behind the recent developments in ICT, even though they have been under pressure to change for long. As ICT affects our everyday lives in increasingly significant ways, we have to take seriously the risk of 'digital divide', polarization between those who have access to ICT and Internet and are able to develop their ICT related abilities, and those who don't (OECD, 2012). One of the cornerstones of Finnish school system and related legislation is to guarantee equal basis for life for all citizens (Basic Education Act 1998/628) and hence, the school should be able to tackle the problem of digital divide by providing the students with necessary ICT skills and access. The previous

Finnish government has addressed this issue e.g. through the National Knowledge Society Strategy 2007-2015, one of the key areas of which was developing citizens' ICT related abilities, e.g., by supporting the use of ICT in schools, but the responsiveness of education to the fast changes in ICT could still be better (OECD, 2012). A gap exists between the reality and practices faced by a child in a school, and in his/her everyday life outside the school walls, regarding ICT use. Altogether, school as an institution, structure and practice should be able to adapt to the change in the society, but this seems to be challenging to achieve. Our aim is to understand the reasons for such challenges as regards ICT adoption in the Finnish schools.

In Information Systems (IS) research, ICT adoption and implementation in organizations have been central topics throughout the years; however, the specific context of school has received relatively little attention. The issue of digital divide and the importance of the computing environment of the school have been addressed (Teo et al., 2002, Wei et al., 2011), some quantitative studies on the ICT usage at school and on the effects of ICT on pupils have been carried out (Belo et al., 2010; Singletary et al., 2002; Teo et al., 2002) and specific ICT solutions have been experimented with in school setting (e.g. Iriberri, 2005; Maghrabi et al., 2012; Preiser-Houy et al., 2005). A couple of studies report on the practices and challenges involved with ICT adoption in the context of school (Berquist et al., 2005; Halkola and Iivari, 2014; Preiser-Houy et al., 2005), but an overall understanding of why more full utilization of modern ICT in schools is so difficult to achieve is lacking. As schools are in a central position to offer children skills to cope in their future life, it is essential to find ways to help in this. Moreover, as schools in Finland are publicly funded, by understanding better the challenges in schools we also gain insights related to ICT adoption in public organizations more generally. We inquire this from the perspective of principals, who as school managers and leaders are expected to guide their schools towards more full utilization of ICT. Hence, this analysis will enlighten researchers interested in the managerial perspective on ICT adoption. Furthermore, we utilize in our analysis a discourse oriented approach that allows us to provide rich insights on the issue. Specifically, we use nexus analysis (Scollon and Scollon, 2004) as our theoretical framework that considers how "the broad discourses of our social life are engaged (or not) in the moment-by-moment social actions of social actors in real time activity" (Scollon, 2001, p. 139). Nexus analysis allows us to examine the actual here-and-now situations as well as to consider the wider cycles of discourse on a longer-term basis (Iivari et al., 2014). The nexus analytic concepts of 'interaction order', 'historical body' and 'discourses in place' are used as a theoretical lens to study the topic in the context of Finnish schools.

Thus, we ask *"how principals discursively position themselves regarding ICT related change in the school context"* and related to that, *"who or what act as drivers for and barriers to ICT related change in the school context"*, to better understand which aspects affect the emergence of more comprehensive adoption of ICT in the context of school, be the ICT related to school principals leading their organization and subordinates or school practices in learning and teaching. The study answers the questions through examining school principals' discourses on ICT and change, showing how these discourses are related to school management, thus affecting ICT adoption in single schools. We conducted our study in the city of Oulu, which is a 'smart city' (see Caragliu et al., 2009), well-known for its high-tech companies and the city's focus in developing the region as a high-tech centre, both related to business as well as education, being thus a very suitable context for the study. We focused the current study in general ICT use. ICT adoption in relation to specific technologies has been extensively examined over the last decades in the IS field, some studies even addressing the context of school (Iriberri, 2005; Maghrabi et al., 2012; Preiser-Houy et al., 2005). We maintain that it is also important to understand the more general attitude and discourses related to ICT use in school context, not merely to focus on single technologies. That is also what the Finnish teaching curriculum guides the schools to do: "The basic education is to offer basic knowledge about technology, its development and influence, to guide making of sensible choices, and to lead to considering ethical, moral and equality related questions" (Finnish National Board of Education, 2004). The curriculum does not specify any technologies but rather discusses technology use in general level.

In the next section the theoretical background of the study is presented. The third section reviews related research on ICT adoption and organizational change, and the fourth section introduces the methodological background of this study. Thereafter the empirical results are outlined. The final sections summarize the results, discuss their implications and limitations, and outline paths for future work.

2. Theoretical Lens

Nexus analysis (Scollon and Scollon, 2004) draws on theories of cultural-historical activity theory (Vygotsky, 1978), Goffman's (1981) theory on social interaction, Bourdieu's (1977) practice theory as well as the thinking of e.g. Nishida (1958) and Bateson (1972). In nexus analysis the basic unit of analysis is **social action** (e.g. school principals managing and leading their schools, within the context of ICT related change, as in our study) in real time and space, seen as linked into a network of other actions, situations, and events. Nexus analysis is essentially interested in **discourses in place**, i.e. on principals' discourses situated in certain time and place (Scollon and Scollon, 2004, p. 14). Here the focus is on how the principals construct ICT adoption in Finnish schools and teaching, within the Finnish society, in their interview talk. In addition to positioning ICT adoption, the principals position themselves during their talk. Discourses offer individuals modes of subjectivity through subject positions that need to be adopted if participating in the discourses. They position the speakers as 'speakers of certain kind'. (Iivari 2006, Iivari 2010.) It also needs to be acknowledged that discourses come into being when participants take part in the social action with a backpack of their historical bodies and interaction order between them, emerging in the situation. Hence, it is important also to consider the aspects of interaction order and historical body that are necessarily intertwined in the social action.

Interaction order (Goffman, 1981) between the actors directs the attention to why and how people interact in certain ways in different groupings and how this affects the social action under scrutiny. For example, related to our context, principals may bring up different issues in discussions with researchers or their principals colleagues, peers in similar kind of situation, than when talking with teachers, their subordinates at school. Or, teachers interested in adopting ICT to develop their own teaching, may act as 'lead users' and examples to their peers, thus opening the way for more wide ICT adoption in teaching in that particular school, as seen in our data. Moreover, the histories of actors are to be examined as well as available resources, current trends, discourses and news in the surrounding society or in global level. This **historical body** (Scollon and Scollon, 2004, p. 13, originally from Nishida, 1958) shows e.g., in principal's work as it being situated in a particular school with its own history in the neighbourhood and the local city, as well as in the long history of education in the country, the principal having also his/her own history as a learner, teacher student, and teacher as a personal historical body that inevitably affects what kind of routes his/her actions take when leading the school. As an example in our data, a whole school, led by a principal with background of ICT entrepreneurship, created imaginary ICT companies to offer their services to each other or e.g. pupils' parents, in order to teach children the different facets of entrepreneurship and cross the borders of school subjects.

Thus, nexus analysis has directed us to view social action as an intersection of historical body, interaction order, and discourses in place; these concepts, even though useful to analytically distinguish from each other, being all intertwined, each revealing a particular view to the same phenomenon. As nexus analysis wishes to see and tie together both micro-actions as well as broader social issues and discourses circulating in the society, it is particularly suitable for studying complex, distributed social phenomena that are bound in the histories of actors and institutions across varying timeframes, as is the one under scrutiny in the current study.

3. Related Research

As this study addresses the adoption of ICT in the context of school, IS studies addressing ICT adoption and implementation are very relevant here. Indeed, for decades one of the largest causes for change in workplaces has been ICT in its many new forms, by causing either the work practices or the

environment of the organization to change, thus forcing the organization to adapt to a new situation. For IS scholars, hence, ICT related organizational change has been one of the main study topics thorough the years. During these years, however, it has also become acknowledged that ICT related organizational change is a very complex concept that can be viewed by utilizing differing logics and perspectives (Leonardi and Barley, 2010; Orlikowski, 1996; Robey and Boudreau, 1999). Originally, ICT has been seen as a determinant or enabler of organizational change. Robey and Boudreau (1999) label the logic employed in these studies the logic of determination – ICT has been positioned as an external agent capable of transforming organizations or a managerial tool for fashioning new organizational designs. In a similar vein Orlikowski (1996) discusses the planned change and technological imperative perspectives that either assume that managers are the primary source of organizational change – managers are seen as capable of straightforwardly designing and implementing the changes needed – or that ICT is the primary and autonomous driver of organizational change. The former can be criticized as viewing change as an entity that can be simply and straightforwardly managed as well as too simplistically assuming that managers can intentionally direct and manage change, while the latter perspective can be criticized as totally ignoring human agency (Orlikowski 1996).

Orlikowski herself advocates the perspective of emergent change. This kind of change is grounded in the organizational members' ongoing practices and seen as 'ongoing improvisation enacted by organizational actors trying to make sense and act coherently in the world' (Orlikowski, 1996, p. 65). Organizations are seen as enacted: organizational members continuously improvise and adjust their work practices and change is hence inherent in their everyday practice (Orlikowski, 1996). Emergent change is unanticipated and takes place without explicit, a priori intentions, but instead becomes realized in organizational members' on-going action (Orlikowski, 1996). Robey and Boudreau (1999) also discuss the logic of opposition identifiable in some studies on ICT related organizational change. Overall, these studies have revealed that there are various kinds of meanings attached to ICT in organizations, difficulties in implementing ICT into resistant settings, people's attitudes and interpretations shaping their ICT adoption and use, and paradoxical or ironic consequences of ICT in organizations – all this implying that managers or ICT alone can never bring about change (e.g. Leonardi and Barley, 2010; Robey and Boudreau, 1999). Overall, the constructivist perspective on ICT's effects in organizations has become increasingly popular in IS research. This perspective assumes that organizational change emerges through people responding to ICT's constraints and affordances as well as to each other in various, maybe even unexpected, ways. (Leonardi and Barley, 2010.)

Besides acknowledging organizational change as a multifarious concept with a multitude of meanings attached to it, IS research has also acknowledged the same as regards ICT, revealed through reviews of existing IS research as well as through empirical studies. The literature review shows that IS researchers have attached various kinds of meanings to ICT, identifying the tool, proxy, ensemble, computational, and nominal views on ICT (Orlikowski and Iacono, 2001). The tool view positions ICT as an engineered artifact that does what the designers intended it to do: to act as a tool, e.g., for labor substitution, productivity, information processing, or social relations. The proxy view, on the other hand, focuses on issues such as perceptions, diffusion rates, or dollars spent on ICT. The ensemble view, moreover, emphasizes the dynamic interaction between people and ICT, maintaining that ICT use and development are necessarily embedded in a complex and dynamic context, in which one needs to pay attention to the various kinds of social, organizational, cultural, and political aspects. Finally, the computational view concentrates on the computational power of ICT, while in the nominal view ICT remains absent. (Orlikowski and Iacono, 2001.) Empirical IS studies have also identified cultural and symbolic aspects in ICT development and use: the studies have shown that IS development is full of myths, metaphors, and rituals (Hirschheim and Newman, 1991), cultural assumptions have been implicated in ICT management (Kaarst-Brown and Robey, 1999), and various kinds of meanings have been attached to ICT in organizations (Kaarst-Brown and Robey, 1999; Orlikowski and Gash, 1994).

This study relies on nexus analysis in examining ICT related organizational change in the context of school. Nexus analysis implies the use of discourse lens in the analysis, albeit the concepts of interaction order and historical body bring along even more breadth and depth into the analysis. Discourse

lens has also previously been utilized in IS research where studies have examined e.g. requirements specification (Alvarez, 2001; Alvarez, 2002), user task redesign (Sarkkinen and Karsten, 2005), user participation and innovation (Iivari, 2006; Iivari, 2010), and organizational transformation and change (da Cunha and Orlikowski, 2008; Monod et al., 2003; Nielsen. 1999; Sayer and Harvey, 1997) through discourse lens, showing how organizational actors construct particular kinds of understandings of the world, including ICT, and participate in discourses contributing to or opposing change. While these studies have examined local discourses in particular organizations, there also are studies examining discourses in more global sense (e.g. Bergquist et al.; 2005; Thompson, 2003) deciphering e.g. discourses on development and open source in Western society. Especially addressing context of the current study, there are studies that have examined societal discourses on learning technologies (Cukier et al., 2003) or principals' local discourses on modernizing the school (Bøje, 2008) or the impact of computers on their work (Haughey, 2006). The studies show that the advantages of learning technologies are emphasized in the discourses and metaphors relied on paint a very positive picture of the technologies, while the disadvantages are less evident (Cukier et al., 2003). Principals are also shown to utilize various discourses when discussing the reform of the school or the impact of computers on their work (Bøje, 2008; Haughey, 2006). This study will, along these lines, examine the principals' discourses on ICT related organizational change in the context of school, while nexus analysis also guides us to acknowledge the influences of interaction order and historical body on the phenomenon of interest.

4.   Research Setting and Methodology

Even though Finnish schools are all public schools, funded by the local municipality, they are still independent in teaching. Finnish National Board of Education determines the national core curriculum in Finland: the objectives and core contents of different subjects as well as the principles of pupil assessment, special-needs education, pupil welfare, and educational guidance. Based on that, the education providers, usually the local education authorities (cities/municipalities) define the actual curriculum, and the schools themselves draw up their own school-specific curricula for pre-primary and basic education within the framework of the national core curriculum, also regarding ICT use in the school. There are only few private schools and even those get funding from the state and are required to follow the national core curriculum. The schools have their own budget within which they can choose whether to buy e.g. new furniture or ICT equipment. Finnish teacher profession is highly valued: the teachers are required to have master's degree in pedagogy and only 10% of applicants are accepted for studies. One of the cornerstones of Finnish school system is the pedagogic independency of teachers: the teachers are required to follow the school-specific curriculum in their teaching but inside 'their own classroom' they are allowed to work with children as they see is the best way to teach the subject.

This was an exploratory study focusing on the perspective of the principals, starting a longer time-span research effort related to technology use in schools. Data for this study consists of 13 theme interviews of school principals in City of Oulu area, duration ranging from 60 to 120 minutes. Interview topics included the careers of the interviewees; change in schools, society, and children; challenges of management and leadership in school context; and the pedagogical use of technology. The interviewees were allowed to concentrate on the issues they felt important. In this type of exploratory research where small-scale qualitative interviews are used to understand a phenomenon better, we did not know in advance what new knowledge will be found (if anything), but wanted to be open-minded and gather as much and as versatile data as possible from the research subjects' viewpoint. A quantitative study would be needed to reveal e.g. the frequency of the observed issues, but it is out of the scope of the present paper.

Interviews were transcribed and the research data was analysed using NVivo software. Data analysis proceeded through three phases: First the general discourses regarding ICT use and related change in schools were identified from the principals' talk. After that the central actors in the principals' talk and interaction order between them were analysed to see who the principals construct as influential actors

and how they are helping or hindering change in schools. In the last phase the more abstract factors seen through the concept of historical body were identified to understand the drivers and barriers for change more clearly.

5.   Analysis Results

In this section we first discuss how the principals themselves discursively construct both ICT and change in their interview talk. Thereafter, we show the different actors who the school principals have identified to be in central role related to change in Finnish schools and school system, and the aspects of historical body affecting ICT-related change. Quotes from the interviews are shown in Table 1 in Appendix 1.

5.1.   Discourses in place: principals' discourses on ICT and change

We identified four different discourses on how the principals constructed ICT and change in their interview talk, as seen in Figure 1. The discourses in principals' talk can be divided along two main axes, as in Figure 1. The horizontal axis describes the way they talked about managing the change – whether it is something that can be planned or directed, or whether it is rather ruled by conditions outside the principals' control (cf. Orlikowski 1996). The vertical axis, on the other hand, describes the continuum the ICT discourses form: whether ICT is viewed as a handy artifact or tool, or as a highly complex ensemble (cf. Orlikowski and Iacono 2001). The four corners in Figure 1 summarize the constructions of ICT related change that the principals as 'middle managers' rely on, produce, and reproduce.

Corner I combines the views where ICT-related change is something that is and can be managed; ICT is treated as an artifact, and change seen as something that can be planned and directed. ICT use is viewed as part of teachers' work: newly discovered ways for teachers to produce and present teaching material, or to support children's learning in different levels. [Quote 1 in Table 1] Use of technology changes the accustomed ways of working, and what schools (and principals) have to do is to support teachers and develop their competences in the pedagogical use of ICT and also help them to see the advantages of ICT use. [2] The principals see that it is on their power to manage the change of this area of operations and it is part of the task of management as any other.
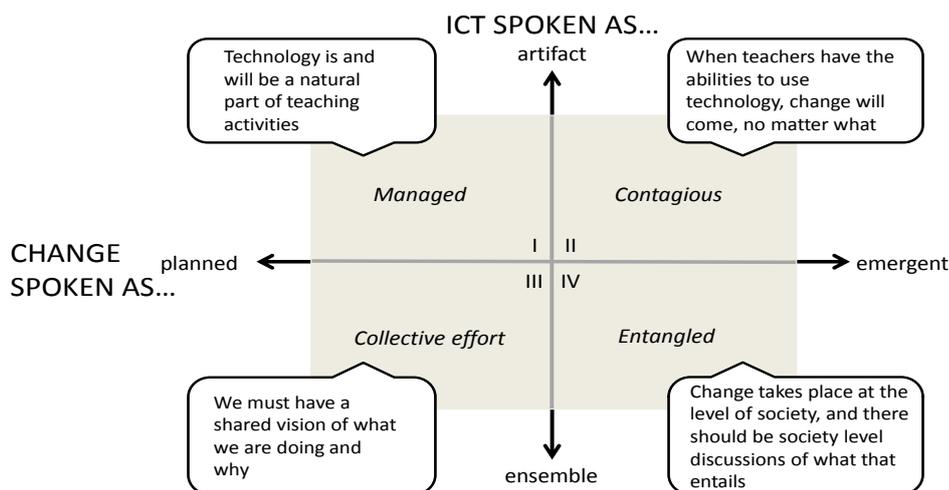

Figure 1   Constructions of ICT-related change in the principals' talk

In **Corner II**, on the other hand, ICT use is seen as 'contagious' in the sense that it is assumed that once teachers learn how to use technology, the use will spread within the school. As in Corner I, ICT is seen as an artifact and teachers' competences are stressed. The main difference is that here change is not viewed as directly manageable. Due to teachers' pedagogical freedom, principals feel that they can

only little by little nudge the change to a direction or another, by changing the structures of work. ICT use will spread through active individual teachers, 'lead users'. On the other hand, the adoption of technology in teaching will be a natural process as children use ICT in their lives outside school and this reality of children is where the change comes through. Gradually, the school will come in terms with this, and the school's reality is drawn nearer with the reality of the children. [3]

What combines the **Corners III and IV** is the way principals talk about ICT – as an ensemble: something deeply entangled with the wider structures of society and a first indication of what the future that the children are learning for will look like. Therefore, the mere existence of ICT is highlighted here: since it exists, it has to be reacted to. [4] There is also something glamorous in technology as it creates new possibilities and ways of thinking for children, and makes them to take responsibility of their learning. [5] The principals were concerned of the radically different survival skills the children will need in the future, relating to the use and interpretation of ICT and ICT-mediated information. The considerations deal with the questions of substance: what the children should be taught, what is the school's purpose, what are the meta-skills that are required in the survival?

In **Corner III**, ICT-related change is viewed as a collective effort. Even though it is a society-level phenomenon, it is up to the schools, through discussion and creation of shared understanding, to manage the change at the school level and pose critical questions relating to the society-level change: how the schools are going to respond to those changes? [6] **Corner IV**, finally, positions ICT-related change as entangled with everything, both at the level of society and at the level of individual schools. Change in society – in parenting practices, society-level values, or governmental structures and legislation – takes place and schools cannot control it but have to adapt to it according to their best ability. There is a need for society-level discussion of what this phenomenon entails in our lives, what kinds of skills are needed in the future, what kind of values we, as a society, want to teach our children, the future decision-makers, and what role technology plays in this. [7] In general, the principals construct technology in their talk as a compelling force that the schools need to somehow react and adapt to, whatever stance the principals take in managing and leading their school towards the change.

5.2. Interaction order: the various actors affecting change in Finnish schools

In addition to the discourses of ICT and change, nexus analysis guided us to identify different actors that the principals saw to be involved in the ICT related change in schools, and the multifaceted interaction order between them, as described by the principals. The most significant actors in the principals' talk are seen in Figure 2. The actors are divided into three groups. First, there are actors within the schools, such as principals, teachers, developmental teams, and pupils. Second, there are actors that are part of the schools' network: the partner schools in the city or in different collaborative networks, either in Finland or abroad; study material providers such as publishers; and technology providers such as e.g., device and software manufacturers, as well as the city technology provider organization. Third, there are actors that form the education organization as a whole: the country government and the Ministry of Culture and Education, local city officials, and teacher education providers both locally and nationally.

One key actor group is naturally our interviewees, **principals,** and how they actively manage and direct or gently push the teachers for change (see section 5.1.) Another key group is the teachers, among who **'lead users'** driving the change are highlighted, i.e. teachers who use technology actively and are willing to share their experiences and practices. This group of actors was always present in the discourses in a similar way – deemed as the most essential for ICT adoption. [3] On the other hand, there are **resistant teachers** who are not necessarily willing to change their ways of teaching, unless they are shown the benefits of change. [8] For contextual reasons, also **teacher education** is mentioned to influence greatly: as formal education changes, younger teachers have different kind of mindsets and abilities to come in terms with technology. [3] Also, in-service training is seen to act in an important role in forwarding the change. [9] An actor that through its actions both drives and hinders change is

the local **city** as part of the education organization. It provides the schools with resources and support structures (e.g. a new organizational model with team structure and regional principal network for support and information sharing) but also restrains the schools as the principals felt that at the same time the city was cutting the budget and forcing the schools to buy their devices through more expensive purchase practices. [10]
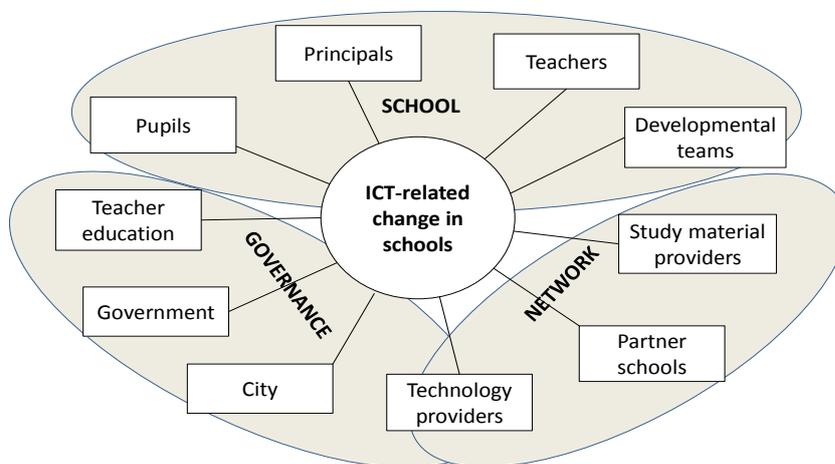

Figure 2.   Driving and challenging actors, affecting ICT related change in Finnish schools

Interestingly, the interaction order with the actors varied within the corners of Figure 1. Corner I (ICT related change as 'managed') represents a more classical management approach: ICT related change is seen as a managed aspect of everyday operations, and the change comes through interaction between **principals** and **teachers** within everyday practices. The principal's job is to encourage teachers to develop their teaching practices, and teachers are engaged in trainings and developmental activities within the frames of their pedagogical freedom. [9] In Corner II (ICT related change as 'contagious'), on the other hand, **teachers as lead users** are seen as the main source of change. The adoption spreads as other teachers come in terms with what the lead users have been doing and catch the same enthusiasm. In Corner III (ICT related change as 'collective effort'), then again, the role of **principal** in removing obstacles from learning and sharing is highlighted. Also **technology providers** and their support in developing practices and providing networking/partnering possibilities with like-minded **partner schools** is an important actor group, like Microsoft's Pathfinder network for 'lead user schools'. These lead user schools act as examples for other schools and networking with other active schools helps principals and teachers in adopting new practices and driving the change. [11] Finally, the role of **teachers as lead users** in Corner IV (change as 'entangled') resembles Corner II as change is seen as emergent. In addition to lead users, the role of the **government** and society in general is here deemed crucial for change. Change is seen to take place at the level of society, and technology as entangled with every form of human activity. Principals are expecting the government to take action in raising discussion on deeper level about the purposes and values behind society's and schools' activities. Currently this was not happening and principals were not sure how the change is going to unfold. [6]

5.3.   The influence of historical body

At the school level, historical bodies of the actors and institutions form more abstract drivers and barriers to change in Finnish schools, relating to two core elements: pedagogical aspects and school resources. The historical body in Finnish school system relating to **pedagogical aspects** clearly affects ICT-related change in Finnish schools. Pedagogical independence of teachers, overall understanding of learning, and divergent pedagogical paradigms were positioned by the principals as influential aspects. The *pedagogical independence of teachers* is protected by legislation: the teachers have auton-

omy in making decisions concerning their teaching methods. This can both drive and hinder change. In some schools, the freedom has been interpreted in a way that nobody can force teachers to use ICT in teaching. [8] This independence can be a driving force when a teacher is interested in developing teaching methods, but at the same time a hindering force, if the autonomy is used as an excuse for not using ICT in teaching. Thus, the change depends largely on the way the principals and teachers are able to identify the existing understandings and paradigms and act on actively changing them.

Another significant pedagogical issue is the current *understanding of learning* that is changing slowly. Traditionally, teachers have been considered as having quite much authority in Finland, as gatekeepers for information. The way schools and teachers are seen has gradually been changing as the society in general is changing. One of the reasons is ICT and the way it has made access to information possible anytime, anywhere. Still, traditional views on learning where the teacher talks and the others listen were seen to live strong, especially within secondary schools where the substance-based pedagogy is practiced. [12] On the other hand, understanding of learning in general has changed a lot within the previous decades as teacher education has changed. Constructivist views and empowerment of students have gained foothold in classrooms. [13] These views that adopt a more holistic view on children's development, act as a driving force also for ICT adoption.

What lies beneath the understanding of learning of individual teachers are the dominating, and mutually contradicting, *pedagogical paradigms* within the teachers' education in Finland: class teacher pedagogy in elementary school and subject-based pedagogy in secondary school. The education preparing for these teaching professions follows different paths: the class teachers major in pedagogical studies whereas the subject-based teachers major in their own subjects. This division is a relic from the beginning of the 20th century when Finland had a different school system. Even during the later school system reforms this division has proved to be a too difficult question to be touched, so the division has remained inside the current system where elementary and secondary schools otherwise form a unified whole. The class teacher pedagogy aims at a holistic view on child's development, whereas subject-based pedagogy is more interested in the substance to be taught, not in learning or child's development as such. At the secondary school, the structure based on the subject-based pedagogy was seen to cause a lot of limitations for teaching that would require crossing the boundaries between subjects. [14, 15]

The historical body related to **school resources** was also positioned as significant in affecting how easily change can proceed. Due to *purchase practices* at the level of city/municipality, where competitive tendering is required by European Union and national legislations, the costs of ICT purchases are so high compared to free markets that schools simply cannot afford to buy ICT as the price due to collective purchases may even be tripled. [10] Here, principals within the frame set by budget need to have courage to make choices and put scarce resources into ICT instead of other learning materials, for instance. [16] Some schools have long history of taking part in different *development projects*. In these projects they have partnered with ICT firms and manufacturers (e.g. Microsoft) who offer support in both teaching method development as well as innovative ICT use in exchange of cooperation. Schools have also applied for additional funding e.g. from the city or European Union in form of development projects. [11] Schools with long tradition of taking part in projects were often equipped better compared to the ones acting within the tight budget provided by the city. Thus, the historical body of an individual school shows as a collective *school competence*, embedded in the skills and mindsets of individual teachers, some of whom have e.g. taken part in many development projects or have personal histories in active ICT use, affecting the school daily practices. This school competence is also very much related to the principals' discourses identified above (Corners I-IV in Figure 1).

6.   Concluding discussion

This study was motivated by the fact that schools are lagging behind the recent developments in ICT, even when ICT has otherwise truly entered our everyday life – both work and leisure. In addition, school as a context has remained neglected in IS research, although it definitely is a relevant context in which the adults of tomorrow are being raised and educated. This paper enquired the reasons for the

challenges as regards general ICT adoption in the Finnish schools from the perspective of the school principals, i.e. the ones expected to lead their schools to utilize ICT in its full potential, by posing research questions: "how principals discursively position themselves regarding ICT related change in the school context" and related to that, "who or what act as drivers for and barriers to ICT related change in the school context". We relied on nexus analysis in our inquiry on this complex matter; it was viewed to suit well as it allowed us to examine in detail the actual here-and-now situation as well as to consider wider discourses on a longer-term basis.

6.1.   Summary of the results

Nexus analysis guided us to first examine the principals' situated discourses within the social action, i.e. school principals managing and leading their schools in the challenging situation where ICT use is pushed to school environment from many fronts, starting from governmental strategies and ending in principals' worry of pedagogical practices being too far away from children's ICT use outside the school. Regarding the first research question, the principals relied on four discourses when pondering on this problem as school managers and leaders, constructing the objects of talk in various ways. In the principals' talk ICT-related change was constructed 1) as 'managed', i.e. as adoption of useful tools that as a process can and should be managed by principals; 2) as 'contagious', in the sense that once some teachers learn how to use ICT in teaching, the use will spread within the school, the principals acknowledging that teachers are the ones having the power of decision in this process; 3) as a 'collective effort' within a school, needing to encounter the inevitable push of ICT use in a well-managed manner, led by the principal but in cooperation with numerous other actors; or 4) as 'entangled', i.e. as an inevitable encounter with ICT as a complicated ensemble, entangled with the wider changes in the society. Overall, the principals constructed ICT in their talk as a sort of force of nature: it steamrolls everything, even to the extent that we can talk about ICT using the principals rather than the principals using ICT, similarly as in the old theories talking about technology as a force shaping and designing the organizations. In the talk, ICT was seen as entwined in just about everything and one just cannot ignore it, one needs to react to it just because it exists, and the principals just had to take some stance related to it. It seemed to act as a magical wand, making learning more interesting for children and, at the same time, changing radically the basis of teachers' work – what they teach and how they do it. On the other hand, it was also positioned a very mundane and practical issue.

Regarding the question of who or what act as drivers for and barriers to ICT related change in the context of school, nexus analysis guided us to identify in the principals' talk the multifaceted interaction order and historical bodies of the schools and different actors involved in the ICT related change. The actors or more abstract factors and their differing influences could be associated with the different constructions of ICT related change identified from the principals' talk. The 'managed' view of ICT related change produces the most traditional understanding of the principal as the driver of change who is to encourage teachers to develop their teaching practices. Here the principals saw themselves as strong leaders, guiding their school towards more full utilization of ICT. The 'collective effort' view shares some aspects with that as the principal is given very important position, while the importance of other actors in the society is acknowledged as well (e.g. technology providers, other schools). Here, partner schools provide important peer support related to pedagogically sound ways of ICT use and they also act as role models and mentors. The 'contagious' view instead highlights the power of the lead user type of teachers especially, who are to encourage and invite also other teachers to experiment with ICT. Here teachers' pedagogical freedom may act as a catalyst for change. The enduring understandings of learning and prevailing pedagogical paradigms combined with pedagogical freedom, on the other hand, can also act as a barrier to change, in case of teachers who are more hesitant to use new ICT. Hence, the results show that the historical bodies of these actors influence the change. Finally, the 'entangled' view deems government or the society in general as crucial actors as regards the complex and inevitable ICT related change. In the two latter viewpoints the principals viewed change to happen inevitably, school subsequently responding to these changes, teaching being in a very central

position and the principal gently guiding or nudging the change to a certain direction. In addition to these, school resources in the sense of competencies, purchases and budgets figured also as significant drivers as well as obstacles to the change.

6.2.   Implications of the study

This study adds to the long lasting stream of research on ICT related change, aligning especially with the constructivist perspective (Leonardi and Barley, 2010). The study contributes by introducing a new but highly significant context as well as through providing interesting findings through a novel approach. The context of school has so far remained neglected in IS research even though it is a significant context for ICT adoption and use, and so far proven out to be a very challenging one. Naturally, the context of school has very distinct characteristics, but the findings of this study should also be relevant for other kinds of IS contexts: the variety of drivers and barriers for ICT related change identified likely are relevant for research on public sector ICT adoption, within which our findings on the complex interaction orders and historical body related aspects may bear clear resemblance.

Moreover, the study contributes by introducing nexus analysis with the associated discourse lens. Discourse oriented studies have been carried out in IS research also earlier (e.g. Alvarez, 2001; Alvarez, 2002; Bergquist et al., 2005; da Cunha and Orlikowski, 2008; Iivari, 2006; Iivari, 2010; Monod et al., 2003; Nielsen, 1999; Sarkkinen and Karsten, 2005; Sayer and Harvey, 1997; Thompson, 2003), but there is room for much more thorough utilization of such approaches in making sense of organizational life and ICT related change, among other issues. As regards the existing discourse studies, the one concentrating on educational technologies reminded us that not all consequences of ICT are positive and at the level of our society there may even be a tendency to downplay the negative consequences of educational ICT (Cukier et al., 2003). The discourses considering ICT as a useful tool for learning naturally lead us to considering all the positive consequences of educational technologies, but we should not forget the possible downsides of technology. Nexus analysis, moreover, enabled us to acknowledge some significant influences as regards interaction order and historical body, albeit we are not claiming that the aspects identified are the only relevant aspects related to these wide-ranging concepts. Nevertheless, these concepts enabled to take a look at this complex phenomenon from several angles, not just focusing on discourses *in situ*.

While our study reproduces the findings on the importance of lead users and managers in ICT related change, our study also shows that a variety of other drivers need to be considered as well. Especially when considering ICT-related change as 'entangled', i.e. as an inevitable encounter with ICT as a complicated ensemble, entangled with the wider changes in the society, the influence of individual principals and teachers becomes less significant. Moreover, the pedagogical and school resource related factors show that much broader themes, values, and considerations may be driving as well as hindering ICT related change in schools.

In line with the existing IS studies, some of the discourses we identified positioned ICT as glamorous or even magical (Kaarst-Brown and Robey, 1999; Hirschheim and Newman, 1991), while others saw it as a very mundane matter. The notions of principals constructing ICT either as a relatively simple tool or artefact or as a highly complex ensemble thoroughly embedded in its surroundings bear clear resemblance with the notions of ICT employed by IS researchers in their studies (Orlikowski and Iacono, 2001). Hence, this study indicates that at least some of these researchers' notions picture also in the practitioners talk, these practitioners being involved in talking about as well as in leading ICT related change in their organizations. Moreover, the principals constructing change as planned or emergent resonates with the notions of change widely discussed in the IS as well as organization and management literature: planned versus emergent (Orlikowski, 1996). Hence, again, the study implies that these notions of change are not only relevant for researchers making sense of such endeavours but also for practitioners deeply embedded in and entangled with such endeavours.

This study also contributes to IS research interested in the management perspective. The study focused on the managerial discourse on ICT and change, interestingly revealing variety in the manager talk.

This indicates that managers should not be viewed as a monolithic group of stakeholders sharing similar perspectives and assumptions. The results show that the principals relied on four different discourses when pondering on ICT related change as school managers and leaders. The discourses identified showed as basic standpoints for the principals, not driving or hindering ICT-related change as such, but through those discourses the principals still inevitably positioned themselves and their school to certain ways of thinking that may strongly affect how the principals direct their schools' future, both consciously and unconsciously, inside the school boundaries as well as in being in contact outside the school, with pupils' parents and the rest of the surrounding society. Based on the subject positions the principals adopted in their discourses, we were able to identify four archetypal change subjectivities of the principals of this study. When ICT-related change was constructed as 'managed' or 'collective effort' (the change was 'planned') the principals representing this type of subjectivity felt their possibilities for action quite good: that individual agency is possible and change manageable, either led by principals or executed collectively. When the change was seen as 'emergent', the possibilities for action were seen more limited and therefore also the way the principals positioned themselves in the change discourse was different. However, also the discourses of ICT defined these subjectivities. When ICT was regarded as an artefact, the focus of management was on the use of ICT and trainings for its use, device purchases, and other resources. The difference between 'managed' and 'contagious' was the sphere of influence the principals felt they had on the matter: larger, when 'planned', and smaller, when 'emergent'. When ICT was regarded as an 'ensemble', the focus of management was on creating shared understandings through dialogue and philosophical-pedagogical discussions, co-operative methods, and society-level influence. The difference between 'collective effort' and 'entangled' was again the perceived possibilities for action.

Hence, our study contributes by indicating that change subjectivities play an important role in the ICT adoption process. Here, ICT adoption literature shares a common interest with management studies. In the case of principals, the way they position themselves in the change discourse, either as a subject (planned) or as an object (emergent), defines what kind of possibilities of action they see. Combining this view with the identification of the multifaceted interaction order between different actors evident in these change discourses gave the context for explaining these subjectivities and contradictions in the discourses. The principals saw that the school as an institution is gradually changing, and it is also facing a lot of pressure to change. Considering the general discourses that have circulated for years in relation to technology and schools, we have seen how government, parents, individual school-renewal activists, teachers' education representatives and researchers as well as technology providers all want to have a say on the question of how schools should be changed. There is also a discursive battle taking place around the school system where competing pedagogies are taking a different stand towards technology. More technology-oriented pedagogy (to which more 'artefact' subjectivities are related) is the one that is worried about children being left behind in the rapid technological development and pushes technology into schools. On the other hand, a counter force in the form of 'reverse pedagogy' (more 'ensemble' subjectivities) has been already predicted that would drive deeper discussion related to the value-added of technology and the effects it has on children's development.

As for implications for practice, it is useful for the principals to see this big picture, to be able to put their efforts in the right place. The challenges involved in the adoption of ICT involve, at the level of teachers, anxiety and resistance in general. Technology forces people to rethink their ways of working – how teachers teach, for instance – and learning. If one seriously considers the opportunities ICT holds, one has to reconsider also the individual-based, passive understanding of learning in which one talks and others listen. It seems that principals are needed to take active lead in setting the vision for the school and then facilitating the change by either strong leadership or relying on the active lead user teachers – giving the teachers a chance to make difference. This kind of change needs a clear vision and actions to follow that vision, without pressing the teachers too hard and giving them time to adapt and learn, as many of our interviewees stressed. Teacher education is in the crucial role here, regarding both before-service as well as in-service training. We would also encourage schools to take part in partner networks and developmental projects as those seem to ease the change as well. Finally, as the

principals we interviewed lead and direct their schools in their own ways, from their own perspective, they also see ICT use differently. ICT adoption in Finnish schools proceeds in its own pace in different schools, the way it suits the vision of the school and feels right. It does not mean, however, that we should just be happy with the situation and let the schools make all the decisions. Instead, if the change seems to be too slow, the government or the city or the school principals may push the change harder, but for that also (economic) resources for the schools need to be provided as well as more support in form of e.g. in-service training for teachers and principals.

6.3.   Limitations of the study and paths for future research

Regarding limitations of this study, even though the principals used some specific technologies as examples to illustrate their thoughts, we did not concentrate on any specific technology as such but discussed technology use on higher level. Other studies have already examined the adoption of specific ICT in the context of school, while we considered this kind of broader understanding as needed. Discussion on this level was clearly more important for the principals, too. However, it also became clear during the interviews that the schools use technology in numerous ways in their teaching, differing from school to school and they have differing kinds of devices in their use. All the principals we interviewed were interested in discussing what change entails in their schools and in the society. In further research it would be very interesting to find such schools where principals are more hesitant with change, if possible. That may be difficult, however, as all the schools are required to follow the national curriculum as well as the local City adaptation of it and both of those univocally argue for the change, for the best of children's future, guiding thus the educators through their values. Therefore, it is actually very interesting to see that despite of the similar requirements and the general pro-change attitude of the principals, the schools and their principals were very different and the practical situations between different schools varied very much. There was very much variation and criticism in the principals' thoughts regarding change, how and when it should happen, who is responsible for it, and also in how their schools had been able to adapt to the required change. Regarding the number of interviews, we considered these 13 interviews as enough in this kind of exploratory research as the general themes started to recur in principals' talk, indicating thus that some kind of saturation point was achieved. Also, only principals' viewpoint has been asked in this explorative study as we were specifically interested in seeing how the principals, who are in the position to manage and lead their school's daily work and set visions and direction for the change in schools, see technology-related change. After all, as managers they are in a central position to either promote the change or cause inertia amongst their school and teachers. Thus, understanding how they see the change from their own position and what this might imply for how change happens (or not) in schools forms a good basis for further studies where viewpoints of other actors, for example the lead user teachers, can be inquired to get a more comprehensive picture of the situation.

Acknowledgements

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Appendix 1. Quotes from the principals' interviews

#	Quote
1	[…] if we think about this year's strategic goals for development […] we have use of ICT in supporting learning and teaching, those are our this year's developmental goals and we aim to train personnel for them, and have been training already earlier. And one of our teams is this ICT-team. (Principal 4)
2	But in that, crucial is the way a teacher is supported in this kind of work. It is not enough that we go and push the trolley into the class that here it is, go ahead. But thinking about how to bring that into practice. What they [equipment] are to be done with. So that it won't be like the devices are there but nobody knows what to do with them. (P5)
3	My guess is that in ten years, all these things are really mundane and they are not that much thought of. It [technology] just comes. Nobody knows what, how the use of ICT proceeds in schools. Even though there are nice plans, they won't necessarily become realized. [Technology] will come eventually, its position has grown stronger all the time. Without following any of those plans that have been written. And the greatest reason is that the students and the younger teachers are used to take it for granted. […] Somebody adopts something. And others go and see that what have you done. […] when we work in these co-operative groups, there it all comes from. (P5)
4	The specifications for use do not come through what I can do with the device as an adult, to have courage to drop the mask, that 'here's this kind of tablet, never seen one before, let's take it and we have this kind of group assignment here, how could this help us with that', and we'll ask also the children whether it's of any use. (P8)
5	Technology enables, it has magic, glamour, enchantment, it gives a possibility and makes one to make the child responsible of his/her own learning. (P12)
6	We haven't begun to think about what should change in our activities so that we would be able to take into consideration the changes in the society, and what they have caused to children […] we should start asking what we should develop here at the school so that we have tools to tackle the society-level change […] we see that the ICT related skills are civics, already today. […] And when the children fly off, it is a prerequisite for learning, those skills. (P1)
7	I want to maintain the view that a child develops also without devices. And the most important thing develops here [pointing towards heart]. And that's what we teachers have to hold on to. Nothing can threaten it. […] If we can find helping devices that the children are interested in, even better. But blindly speeding forward, that is a bit scary. And the lack of discussion which at least I find a problem. […] Because I'm interested in this [technology]. And I want to use it, and in both of these houses there are people that use a lot and do really smart things. (P5)
8	A Finnish teacher cannot be forced to do something, but if you can show him/her the pedagogical advantages, s/he is willing to change. (P11)
9	I feel that training is extremely important. I mean, when working, in-service training, very important. (P9)
10	Bringing ICT to schools is incomprehensibly expensive. […] There is a monopoly unit […], no other purchasing possibility, and we pay for that, I dare to say multiple price compares to free competition. (P1)
11	Now we are […] the only [Microsoft Pathfinder] school in Finland […] there are about 50 schools from all around the world, which are willing to […] ponder together what learning will be in the future and what schools will be like in the future. We have […] online meetings regularly […] We have our own mentor [school] […] from England. Then we have face-to-face meetings […], at least once was a Global Forum where all the pathfinder schools met. […] So this is a network where you can benefit each other, mentoring. (P11)
12	Well, the school does continue the activities in a surprisingly traditional ways. That the teachers always go to the classrooms. There, most of our teachers do have their doors open, and in that sense openness has increased, and we know that, but it has not changed this traditional routine much. (P13)

#	Quote
13	For instance, co-operative learning, research learning, creating different themes, etc. How this school could be changed from this kind of old system into a one that would be flexible, where flexible learning would be possible from first to ninth grade, and even in high school. And how the students could find their own strengths. (P7)
14	It's challenging and difficult since most of the teachers have been educated in the 70's or the 80's and who, especially here at the junior high are strongly anchored in the subject-based pedagogy. (P7)
15	In the subject-based system, the teachers are quite anguished, as when they teach a group for one hour per week, then if you want to teach some topic using technology, it may take four five hours. (P10)
16	We use more [money] for ICT, for leasing costs, but it lessens the amount we can use for something else, for example teaching material and textbooks. (P8)

Table 1.   *Quotes from the principals' interviews*