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EDITORIAL

Nordic STS transition

By Tomas Moe Skjølsvold

Two years ago, I visited Cornell University, who hosted an event to celebrate that 40 years had passed since they hosted the first 4S conference in a small room at campus. Since then, the annual 4S meeting has evolved into an academic mega event with thousands of delegates from around the world. This year, celebrations occur closer to home, as the STS Centre at NTNU, Trondheim reaches the age of 30. Thus, here too, STS has become a force to be reckoned with, as there are multiple STS centers in all Nordic countries, regular conferences, several journals and countless scholars who work under the banner within many disciplines. Hence, Nordic STS is growing up.

This moment, resembling a rite-de-passage, would be a nice opportunity to engage in retrospective appraisal of achievements. While this would be warranted, I find it more fruitful simply to acknowledge the tremendous work of the generations before us. They have built a solid body of theoretical and empirical scholarship and trained countless students. Just as important, they have paved the way for many careers in STS and related fields, through opening up a series of institutional spaces in Nordic universities and other research institutions, where STS today is a legitimate and important field in its own right. Such stable institutional anchoring has been essential, because it has allowed for collective efforts of experimentation with regards scholarly practices, public engagement, and in the case of the Nordic Journal of Science and Technology Studies, publication practices.

The current issue of NJSTS represents an effort to continue this experimentation. As usual, we have a nice selection of peer reviewed

research articles, which addresses key concerns within and around contemporary techno-science. The topics this time ranges from digitalization to welfare technology and asking how Science talents become what they are. In addition, there is artwork and a book review and we do hope you find this eclectic collection of to be of interest.

In other news, NJSTS is also in the midst of a transition, as this is my final editorial note. In fact, this issue has been co-edited together with a new editorial duo consisting of Roger Andre Søråa and Jenny Melind Bergschöld (Read more about Roger here: <https://www.ntnu.edu/employees/roger.soraa> and Jenny here: <https://www.ntnu.edu/employees/jenny.bergschold>). I am confident that this transition in NJSTS will prove successful and that the journal under their management will become an even more exciting venue for Nordic STS research than it has been in the past.

Editing NJSTS has been a great privilege. The community of reviewers has been overwhelmingly positive, rejecting requests only in rare occasions. This is tremendously important for the journal, and I do hope you all keep this spirit up, despite being busy with everyday academic life. It has been great to observe the diversity of Nordic STS work up close, and it is nice to see that the field is thriving. NJSTS has an important role to play over the next years in keeping this momentum up.

Thus, I wish the new editors all the best, and I really look forward to following the journal further as an interested reader.



SEEKING ADEQUATE COMPENCIES FOR THE FUTURE:

The Digital Skills of Finnish Upper Secondary School Students

by Meri-Tuulia Kaarakainen, Suvi-Sadetta Kaarakainen and Antero Kivinen

Digital skills are a prerequisite today for working, studying, civic participation, and maintaining social relationships in our digitalised technical world. These skills are also important both as a general goal and an instrument for learning. This study briefly presents the aims that are related to digital skills of the Finnish curricula, and explores, using a large sample (N = 3,206) of Finnish upper secondary school students, these young people's digital skills and their distribution. The study provides new insights into the state of these skills and differences found in them and focuses on the relationship between these results and the students' present educational choices and future study/employment intentions. The actual variability of digital skills among upper secondary students is one of the main findings of the study. On the same educational level, it was found that digital skills vary enormously, particularly for students' current educational choices and their future intentions. Digital skills are also distinctly associated with age for 15 to 22-year-olds. At the same time, gender alone appears to have no prominent effect on the level or adeptness of upper secondary school students' digital skills.

Keywords: digital skills, upper secondary education, curricula, educational choices, gender

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Introduction

Global trends in rapid technological development and the rise of the digital economy have produced new kinds of competence requirements. Increasingly nearly every job, every level of study, and every field of education, civic participation, and communication and social relationships require at least a reasonable degree of digital skills. This technological development has altered the character of both civic skills and jobs. The new digital economy offers new opportunities and ways to work, but it also requires new combinations of skills and the ability to constantly improve them. In its first phase, digitalisation replaced routine manual work and then manual non-routine tasks. Now it also affects cognitive routines and non-routine tasks and is rapidly displacing lower-skilled workers. Jobs with higher complexity and higher skills requirements are more resilient, and these changes in the labour market have benefited the most skilled workers, particularly for non-routine and cognitive tasks. (European Commission 2016b; Nübler 2016; Levy et al. 2012.) The future labour market will be seeking digitally intelligent workers to cope with emerging, complex, and interactive assignments (van Laar et al. 2017). At the same time, citizens in a digital society are expected to have the skills and knowledge to be able to engage well with digital public services and all ranges of information. Indeed, Smart Cities expects Smart Citizens (e.g., Janowski 2015; Cocchia 2014), as they are described as being in highly technologised environments that use information technologies to adapt to changes in different physical circumstances and easily engage with local people using open innovation processes and e-participation (e.g. Komninos 2013).

There have been numerous efforts to predict the changes in civic life and the labour market brought about by this new technology. However, it has turned out to be difficult to predict specific future professions, so researchers and policy makers have instead sought to outline the skills believed to be required for the future (van Laar et al. 2017; European Commission 2016; 2016b; Davies et al. 2011). According to Davies et al. (2011) the ten most crucial skills for the future workforce are sense-making, social intelligence, novel and adaptive thinking, cross-cultural competency, computational thinking, new-media literacy, transdisciplinarity, a design-mindset, cognitive load management, and virtual collaboration. Many of these future skills are also associated with versatile digital skills.

Van Deursen and Mossberger (2018) remind us that the potential benefits of ubiquitous technologies and digitalisation are accompanied by social costs that include widening inequalities, not only in the labour market, but also in digital citizenship. Users with inadequate skills are less likely to benefit from opening opportunities, are less empowered to make decisions on their own within complex digital services and platforms, and may even suffer a loss of privacy. Ideally, digital citizens possess new forms of information skills and data literacy, including the ability to

access, interpret, assess, manage, and use data, the skills to both communicate on social platforms and understand different forms of communication, and the strategic skills needed to make security and privacy control decisions effectively. According to van Deursen and Mossberger (2018), digitalisation may also deepen certain inequalities through the greater use of big data and analytics, for example, those being used for hiring, credit, insurance, health care, and service access. The risk, therefore, rests in the non-representative data (which excludes minorities) behind such automatic decision-making, and these can reinforce existing biases, by producing a false illusion of objectivity (O'Neil, 2016).

When it comes to digital skills, the definitions, viewpoints, and frameworks used in previous studies are numerous. In most cases, these concepts consist of a domain part (such as a computer, ICT, or Internet) and a knowledge perspective (competence, literacy, or skills) (Hatlevik et al. 2015). Van Laar et al. (2017) argue that the current concepts in this area are increasingly taking into account knowledge- or content-related skills that are intending to widen the traditional dominance of technologies in concepts like digital or ICT competency. Van Dijk and van Deursen (2014) recommend using the term "digital skills" as it captures the entirety of transferable skills that are needed for one to be able to use digital media and services successfully in a digitalised society.

As Hoffman and Schechter (2016) point out, digital skills will become a key prerequisite for civic participation, social communication, information searching and processing, academic skills and professional success in future societies. According to Berger and Frey (2016), although all kinds of digital skills are expected to increase in importance in the future, there is a particularly growing demand today for more advanced technical skills in the labour market. This focus makes digital skills necessary for both success and overall professional well-being in a digitalised world. Consequently, digital skills should be considered as desired, even necessary, educational outcomes that students must work to achieve. These skills also need to play a central role in curricula at every educational level. (Aesaert et al. 2015.) This paper thus discusses digital skills in the context of the Finnish curricula, examines the digital skills of Finnish upper secondary school students and indicates how these skills are associated with current students' educational choices, future study/employment intentions, genders, and ages.

Digital Skills and the Finnish Curricula

In the Finnish education system, the upper secondary level is divided into general and vocational upper secondary education, and both provided an opportunity to continue on to the tertiary education level. Upper secondary school students in Finland are increasingly expected to use digital technologies and the Internet when seeking information, preparing texts and presentations, undertaking cooperative learning and communication in school and



for homework (e.g., FNBE 2016; FNBE 2012). In Finland, digital skills and information technology skills are not included as a subject of their own in the national core curriculum offered in general and vocational upper secondary education. Instead these skills are taught as part of all separate subjects and study modules (FNBE 2016; FNBE 2012).

In the core curriculum of Finnish general upper secondary schools, digital skills are one of the six transversal competence areas designated as Technology and Society. These skills are targeted to use to overcome educational challenges in the present society and thus implemented in all subjects. The goals are to deepen students' abilities to appropriately use and interact with digital technologies in a responsible, safe, and ergonomic manner – both independently and with others. Students are offered different possibilities to examine and evaluate, for example, topics in the following themes: Technological development and its effects and potentials, the human computer relationship, technological impact and its role for the evaluation of lifestyles, and the interaction of science, art and technology. Further still, the learning goals encourage students to use their potential, creativity, and problem-solving skills to seek and find solutions to hands-on challenges, promote the understanding that mistakes are a part of the creative learning process, enhance cooperation skills, gain experience in entrepreneurship and technology enterprises, develop the competencies needed to make reasonable choices as both citizens and consumers, and gain the abilities to evaluate the interactions between technology, the economy, and public life, and the technological impacts to produce successful occupational restructuring. In addition, the advanced syllabus in mathematics includes a specialised course in algorithmic thinking. (FNBE 2016.)

In Finland, vocational upper secondary education covers 8 fields of education, including more than 50 vocational qualifications. These studies are comprised of both compulsory and optional study modules. (FNBE 2013) The curricula in vocational education consist of a common part for all the fields of vocational education and training and then a qualification specific segment of the curriculum. Technology and information technology skills are seen as a key competence for lifelong learning. The goal is for all students to gain various experiences in the technologies that are used in their profession, have knowledge of all related technological benefits, limitations, and risks, and become versatile users of computer technology as both a professional and a citizen. Digital skills are thus part of the key competencies that are common to all vocational fields. (e.g., FNBE 2012; FNBE 2011a.)

Within this common qualification that is delivered to all the fields of education, digital skills are the study modules for mathematics and natural sciences (e.g., the use of applications, security, and network identity issues, receiving and giving commands, saving and sharing files), communication and media skills (e.g., information and media skills, digital communication), and active citizenship and knowledge of different cultures (e.g., social media and

civic participation, e-government services and consumer skills, digital skills for job applicants) (e.g., FNBE 2012; FNBE 2011a). In addition, within these ICT- or technology-related qualifications, the qualification specific part of the curriculum includes program specific study modules, for example, knowledge of the process that occurs from software implementation to software specification and design and the integrated applications for understanding server systems (FNBE 2012; FNBE 2011b).

These curricula provide a foundation on which the skills of future citizens and workers in Finland are built. According to the Official Statistics of Finland (OSF 2016a), a fair 50 percent of students continue on to general upper secondary education and about 40 percent continue on to vocational education immediately after completing their basic education. Less than 10 percent of young people opt out or drop out of their secondary education studies each year. After the secondary level, 37 percent of those who have completed their qualifications in general upper secondary schools in year 2016 continued their studies at the tertiary level or in other forms of education within one year after graduation. In contrast, for the graduates from vocational secondary school, those who are still full-time students one year after graduation only totalled 8 percent. Even though the graduates of general upper secondary school continue their studies on the tertiary level at some point in their lives, for many of these young people, upper secondary school is the last venue where they receive any formal training in digital skills. This knowledge stresses even further the clear importance of reaching an adequate level of these skills during upper secondary level studies, and, this fact should be noted in the curricula of every study program at the secondary education level. Secondary level education is the last chance to reach the majority of each age group and ensure that the adequate skills they need to be a citizen in a digital society and a labour market entrant in today's highly technologised labour market are effectively delivered.

The Digital Skills of Upper Secondary School Students

It has too often been taken for granted that young people possess the competencies they will need to proficiently utilise digital technologies (i.e., Bennett et al. 2008). However, many of the previous studies (e.g., Kaarakainen, Kivinen & Vainio 2018; Kaarakainen, Kivinen & Kaarakainen 2017; van Dijk et al. 2014; Calvani et al. 2012) have learned that this optimistic portrayal of young persons' digital skills is poorly founded. Whereas at the basic education level, the focus of teaching digital skills is to offer students experience with computers and teach some operational skills, at the secondary education level, this instruction focus transfers to content-related digital skills, and indeed pronouncedly, to information skills. Students receive assignments that require the use of the Internet independently for sources. Yet, too often, teachers tend to forget that the general digital skills of secondary education level students are commonly insufficient, and these students need more instruction on these skills. (Van Dijk et al. 2014.) Anzera and Comunello (2014) emphasized that despite the general belief ("surely everyone knows how to google"), information skills are



complex by their very nature and cannot be properly or fully acquired without some direct teaching of them. The same is true for general digital skills. Van Dijk and van Deursen (2014) argue that in post-basic level studies, before using any digital technologies for educational purposes, a student's level of digital skills should first be tested. Unskilled students need to be taught the precise skills they need before they can simply be assumed to be able to independently cope with all of the typical digital technologies and digital learning environments.

The systematic review of Siddiq et al. (2016) targeted the finding of having a comprehensive picture of the present state of the field of digital competence assessment in the contexts of both basic and secondary level education. They found that the majority of assessment tools were used with lower secondary level students, and there was a lack of assessment instruments; therefore, only a few of the previous research results, particularly regarding upper secondary level student skills. Based on their analysis, of the majority of assessment tools that measured students' skills related to managing digital information, only a fair half of these tools also measured the skills related to content-creation, digital communication and technical operations. Further, only a few of the assessment tools measured the competence areas that require strategic skills, such as safety or problem-solving (Siddiq et al. 2016.)

As addressed by Siddiq et al. (2016), there are currently not a large number of available studies that relate to upper secondary school students' digital competence. However, these available previous studies do indicate that upper secondary school students lack many of the skills they will need in today's digital environments. For example, in their study, Calvani et al. (2012) showed that Italian upper secondary school students mastered visual literacy (e.g., they could identify menu bars and computer signals) and troubleshooting (e.g., they knew what to do when audio was not heard or a printer did not work) quite well. However, for those tasks that required critical cognitive and socio-ethical skills, these same students' knowledge and competence was found to be inadequate. These results were similar to the observations made by van Dijk and van Deursen (2014), who assumed that young people have adequate medium-related skills (i.e., button knowledge), but they lack particular content-related skills (i.e., information, content creation, and strategic Internet skills.)

Studies of Finnish secondary and upper secondary level students do not unambiguously support the aforementioned assumptions. Instead, previous studies done of Finnish students have indicated that this group of young people have technical or operational skills that are highly overestimated. These students were found to perform satisfyingly on schoolwork-oriented items (e.g., information seeking and word processing), but failed to do the same

on technical-oriented items in particular (e.g., basic operations, information networks, different kinds of programming, and database operations) (Kaarakainen et al. 2018; Kaarakainen et al. 2017). This inadequacy in technical-oriented or medium-related skills was due to the fact that the majority of Finnish youth today are well experienced with easy-to-use Smartphones and other mobile devices, but they are not experienced enough in using devices with a wider range of technical capabilities (Kaarakainen, et al. 2017). Another reason for this difference is the major role that self-learning is now playing to deliver these skills to many young people. As van Dijk and van Deursen (2014) argue, learning these digital skills outside of formal education results in acquiring only those skills that are urgent to use at a particular moment. This kind of learning is likely to be only partial, and indeed, many related operations, principles, techniques and applications are simply bypassed for the sake of convenience.

This large variation in digital skills of upper secondary school students has been addressed in previous studies (e.g., Authors et al 2017a; Hatlevik et al. 2009). Hatlevik and Tømte (2009) also found in their study that the Internet safety awareness of Norwegian upper secondary school students varied between schools, classrooms, and students; students' social backgrounds were also a factor in determining their safety awareness. Based on yet another study of Norwegian students in upper secondary level education, both cultural capital and language integration were positively associated with digital competence, meaning that digital competence is at least to some extent distributed across family backgrounds. In the same study, it was also found that self-efficacy and strategic information use predicted these students' digital competence. Further, student academic achievements were found to predict the actual level of digital competence. (Hatlevik et al. 2015.) Earlier, Hargittai (2010) showed that there is a great variety in Internet usage and the skills of young people, and both aspects are not randomly distributed. Rather, higher levels of parental education, being a male, and other socio-economic factors were positively associated with higher levels of web-usage skills. Van Deursen et al. (2011) found that among the common explanatory variable candidates of the same age, gender, and education, educational attainment was the most significant predictor for both medium- and content-related digital skills. More educated people outperformed lesser educated people.

The Survey of Adult Skills, known as the PIAAC (OECD 2016), examines literacy, numeracy, and problem-solving in technology-rich environments, including the skills of 16–24-year-olds. The section on Problem solving in technology-rich environments focuses on skills that are needed in a digitalised society for personal, work-related and citizen-related situations. Both problem-solving and basic computer literacy skills are measured by testing how well test-takers are able to use ICT tools and applications to assess,



process, evaluate and analyse information in goal-oriented situations. Based on PIAAC results, young adults (ages 16 to 24) in Finland possess a higher proficiency in technology-related problem-solving compared to the total Finnish adult population. In general, the results among Finnish adults indicated that education had a significant relationship to all measured skills, and those who had taken part in general upper secondary education succeeded significantly better than those who attained skills in vocational upper secondary education. This effect was particularly strong for the skills needed in problem-solving in technology-rich environments (OECD 2012; 2016). Correspondingly, Brunello and Rocco (2017) argued based on the PIAAC data from 17 countries, that the level of proficiency in basic skills revealed that vocational education is less effective than academic education at the same level of education.

Similarly to the above-mentioned research, a previous study of Finnish upper secondary school students (Kaarainen, et al. 2017) indicated there are also significant differences within the same

educational level in students' digital skills, as average students in the general upper secondary schools possessed stronger digital abilities than did those students in vocational upper secondary schools. Still, as mentioned earlier, in Finland, vocational education has several fields of education, and these skills presumably vary a lot for each vocational student depending on the study programmes. Thus, in this current study, this variety of study programmes in vocational upper secondary education was taken into account. Overall, this study sought to explore the digital skills of Finnish upper secondary education students by age, gender, not just current educational choices, but also future study/work intentions. The research goals for this study, therefore, are the following:

- 1) Examine the level and variation in digital skills for upper secondary school students
- 2) Analyse the relationship between upper secondary school students' digital skills and their gender, age, current educational choices, and future study/employment intentions

Methodology

Participants

The data for this study were collected in Finland during the year 2017 as part of a project financed by the Strategic Research Council (SRC) at the Academy of Finland. The participants came from 43 municipalities (88 educational institutions) around the country and consisted of 3,206 upper secondary level students between the ages of 15 and 22. Mean age of the participants was 16.73 with a standard deviation of 1.23. Of the participants, 69 percent came from general upper secondary schools, and 31 percent came from vocational institutions. Table 1 summarizes the frequency of these

participants by educational choices and gender. In general, a fair 50 percent of Finnish students continue on to general upper secondary education and about 40 percent of those continue on to vocational upper secondary education immediately after completing their basic education (OSF 2016b). Thus, general upper secondary school students were overrepresented in terms of their share of the total population in this current data set. Of the participants from general upper secondary schools, 64 percent were female students, and 36 percent were male students, whereas in the vocational schools, 55 percent of the students were male, and 45 percent were female.

TABLE 1

Educational Choices	Female Students	Male Students
<i>General upper secondary education:</i>		
Basic syllabus in mathematics	627	276
Advanced syllabus in mathematics	778	520
<i>Vocational upper secondary education:</i>		
Culture	26	6
Natural sciences (ICT)	2	20
Natural resources and the environment	3	26
Tourism, catering, and domestic services	81	30
Social services, health, and sports	173	16
Technology, communication, and transportation	58	377
Social sciences, business, and administration	112	75

Table 1: Frequency of participants' educational choices and their designated genders.

Measurement

The data were collected using an instrument called the ICT skill test that was developed in the Research Unit for the Sociology of Education (RUSE) at the University of Turku (Kaarakainen 2018). The test starts with questionnaires that collect the students' background information (age, gender, postal code, and education level), current educational choices (general upper secondary school or vocational institution, whether the student was a general upper secondary school student participating in a basic or advanced syllabus in mathematics or not, and if the test-taker came from a vocational upper secondary school, was she/he studying culture, natural sciences (ICT), natural resources and environment, tourism, catering and domestic service, social services, health and sports, technology, communication and transport, or social sciences, business and administration).

Voluntary digital activity was gathered as usage activity for the following specific purposes: Maintaining social relationships, communicating, running daily errands, following the news, searching for information, creating digital content, sharing digital content, playing digital games, consuming digital entertainment, and studying using digital technology. Schoolwork-related digital activity (use of devices, online services and software and digital educational materials for learning at school), and the participants' future intentions were also compiled (the field (ISCED-F) for where they desired to study or work after graduating from their current educational plan). In this study, only their demographic information, current educational choices and future intentions were analysed concurrently with the test performance information.

The actual test was undertaken after the questionnaires were completed. The ICT skills test consisted of 18 items (see Appendix 1) divided into 6 modules based on item topics (see Figure 1). Each item consisted of multiple subtasks (1–6) and/or chains of actions in which every action (selection or operation) was linked to the previous one; together they formed a coherent item. For these items, a combination of close-ended questions (conventional multiple-choice, true-false multiple-choice, multiple true-false multiple-choice, and matching) and open-ended questions or questions requiring the participants to interact with the test environment (input the right values or select and click the right function icons) were applied (see examples in Figure 2). The majority of these items can be seen as context-dependent item sets (cf. Haladyna et al. 2002), as they consist of a problem scenario for the participants to solve by choosing the right actions from given options related to a progressive storyline. In the ICT skills test, the interest is not simply on does the test-taker get the item completely right, but how much of each item requirements test-taker masters. Scores

for each item ranged from 0 to 2 resulting in a total score of 36. Items were assessed automatically based on specified options and actions or simple text mining algorithms.

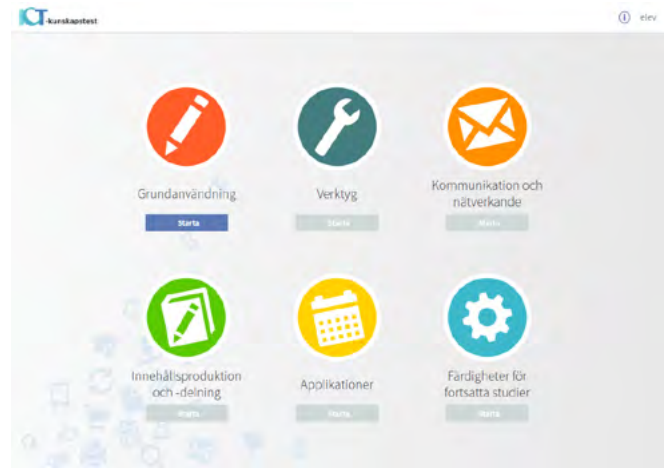


Figure 1: Six modules (basic operations, office tools, communication and networking, content creation, applications, and prerequisites for ICT-related studies) of the ICT skills test (all print screens are from a Swedish user interface)

The test items were implemented in such a way that the user interface and the graphics attempted to simulate common ICT applications and hence mirror real-life settings. The test was bilingual, as both Finnish and Swedish are official languages in Finland. The ICT skills test was implemented as a web application, written in PHP and JavaScript languages, using the TinyMVC- and Bootstrap-frameworks. That application is supported by PostgreSQL database software for storage purposes. The tested competence areas (15/18 items) were chosen based on the Finnish national core curriculum for basic education, wherein digital skills are one of seven transversal competences that are integrated into all subjects so as to offer every student the following skills: Understanding of the basic operations and concepts of ICT, the knowledge to use ICT in a responsible, safe, and ergonomic manner; the abilities to use ICT as a tool for information management and creative work; and the competence to use ICT for both interaction and networking (FNBE 2016). The last three items are broadly based on the curriculum of the information and communications technology field in Finnish vocational upper secondary schools and the Universities of Applied Sciences. The Cronbach's alpha for the ICT skills test (all 18 items) was .86, which exceeded the common threshold of .7 (Nunnally et al. 1994). The results of a more specific item-level analysis were presented in a previous study (Kaarakainen 2018). In this current study, however, the ICT skills test scores are only considered at the total score level.

BILDBEHANDLING

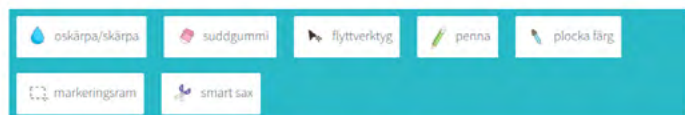
Du vill skicka din kompis en bild av en tröja som ni talade om när ni träffades tidigare på dagen. Du vill inte skicka hela bilden, utan avgränsa den och fokusera bara på den tröja ni talade om. Dessutom vill du redigera bilden så att barnet inte kan identifieras.



1.1 Välj rätt verktyg genom att dra dem från rutan nertill.

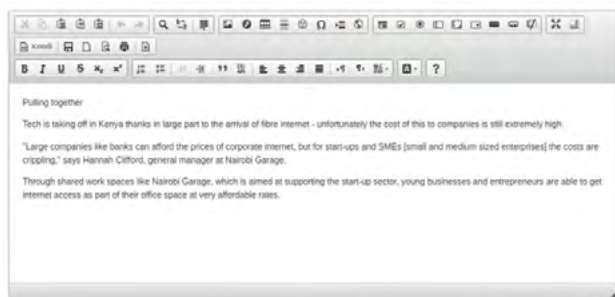
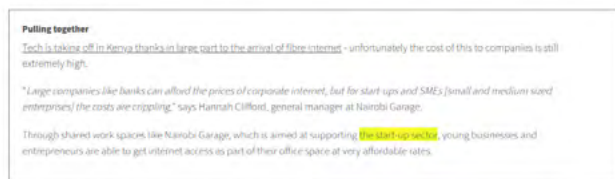
Välj det verktyg som kan användas för att avgränsa området som syns på bilden så att det kan klippas till en egen bild:

Välj det verktyg som kan användas för att göra pojakens ansikte oigenkännligt på det sätt som visas på bilden:

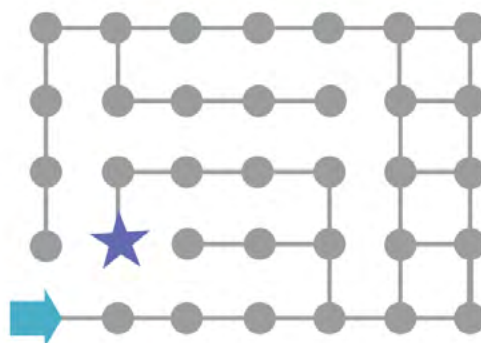


ORDBEHANDLING

1.1 Gör fet stil, kursivera, stryk under och betona texten på samma sätt som i modelltexten.



GRUNDERNA I PROGRAMMERING



3.1 Skriv i kommandofältet nertill en kommandoserie med vilken du kommer från pilen som är startpunkten till den stjärnformade slutpunkten.

Kommandon:

- man rör sig mellan knutpunkterna med kommandona F (framåt) och B (bakåt)
- inne i *knutpunkten* svänger man med kommandot V (90° svängning till vänster) och H (90° svängning till höger)
- kommandot kan upprepas genom att skriva antalet upprepningar före kommandot; exempelvis "fyra steg bakåt" är antingen "B, B, B, B" eller "4B"
- kommandona separeras med kommatecken och mellanslag
- pilen vid startpunkten visar startriktningen

DATASÄKERHET

3.1 Välj fyra påståenden om säker webbkommunikation som stämmer:

- I Finland får ingen behandla en annan persons meddelanden med vissa lagstadgade undantag
- Arbetsgivaren har alltid rätt att läsa alla meddelanden som den anställda skickar från sin e-postadress på arbetet
- Det kan inte garanteras att kommunikationens konfidentialitet bevaras utanför Finlands gränser
- Sabotageprogram som kommit till datorn kan ha tillgång till all datakommunikation
- Alla kommunikationstjänster som erbjuds för finländare är datasäkra och konfidentiella
- När man använder e-post är förbindelsen alltid skyddad
- SSL-kryptering krypterar innehållet i trafiken mellan datorn och webbsidans server

Figure 2: Examples of items: a matching type multiple-choice item (top left; image processing), an open-ended item (top right; elementary programming), an interactive item (bottom left; word processing) and a true-false multiple-choice item (bottom right; information security) used on the ICT skills test (see item requirements in English in Appendix 1).

Analysis of the Data

The first research goal addressed in this paper, namely, the level and variation of upper secondary school students' digital skills, was answered by examining the variable range, means and standard deviations, and the differences between the genders for these scores. These scores were analysed by using an independent samples t-test, as it is a suitable test to use to compare the sample means from two independent groups for at least interval-scale data (see e.g., Warner 2013). A Chi-squared test was utilised to test the differences between the genders in popularity of the fields

for both current educational choices and future study/work. The Chi-squared test is a common statistical hypothesis test used to determine whether there is a statistically significant difference between the expected frequencies and the observed frequencies in one or more categories being tested (Greenwood et al. 1996). The associations between students' current educational choices and their future study/employment intentions using digital skills were examined by analysing first the test scores by study programmes or by future intentions (ISCED-F fields) and then further case-by-case by gender. One-way analysis of variance (ANOVA)



was used to test the differences between the study programmes. ANOVA is a common statistical method used for comparing three or more group means. If the ANOVA is significant, then a post-hoc comparison between these same groups is necessary to identify the specific significant differences between each pair of groups. In this study, pair-wise comparisons were conducted using the Bonferroni method. (Rupert 1997.) After comparing the means between different study programmes/future intentions, an independent samples t-test was used to test the differences between the genders within each specific study programme.

Multiple linear regression analysis was used to analyse the relationship between upper secondary school students' digital skills, gender, age, current educational choices, and future intentions. Multiple linear regression is an extension of simple linear regression. It allows one to answer questions about the kind of a role multiple independent variables play when accounting for any variance of a dependent variable (Nathans et al. 2012). This analysis was run separately for students in the general upper secondary schools (GUSS) and those in vocational schools (VUSS) since the background variables for these students were different.

Results

The ICT skill test total scores ranged from 0 points to 32 points (maximum points on the test were 36) indicating that the variation in different students' skills was extensive. The mean score of all 18 items was 12.41 with a standard deviation of 5.74, meaning that on average, students achieved only one-third of the available points from the ICT skill test. The mean score for male students was 12.84 (SD 6.41) and for female students, 12.11 (SD 5.18), and the difference between the two was statistically significant ($t = -3.422, p = .001$). Further analysis revealed that the mean scores for the ICT skill test varied more between those students in different study programs than between the genders as shown in Figure 3. These differences, based on a one-way analysis of variance, between the different study programs were highly significant ($F(8, 3184) = 36.830, p < .001$).

Figure 3 shows the mean scores on the ICT skill test by gender and current educational choices. When examining the gender differences within educational choices, it should be noted that gender distribution in educational choices were significantly unequal for both the general upper secondary education mathematics studies ($X^2 = 23.285, df = 2, p < .001$) and fields of study in vocational education ($X^2 = 435.484, df = 6, p < .001$). Students from vocational upper secondary schools who studied vocational qualifications in information and communications technology (natural sciences (ICT)) performed best on the ICT skills test. Even when the bar of female students on the bar chart (Figure 3) were

The R-squared values for the following two models remained low: For general upper secondary school (13 variables) adjusted to $R^2 = .09$, and for the vocational schools (18 variables) adjusted to $R^2 = .22$. The low R-squared values do not mean that the regressors were inappropriate; it simply suggests that the models missed certain explanatory variables (Marsh et al. 2002), and the skills to explain a much more complicated group of factors than those examined in this study. The autocorrelation influence was assessed using the Durbin-Watson test. The Durbin-Watson statistic d ranges from 0 to 4, and should be near 2, as low d values (near 0) indicate a positive serial correlation; high d values (near 4) indicate that successive error terms differ from one another (Durbin et al. 1951).

Chasing a more accurate view of the associations of age, educational choices, and digital skills, the performance mean scores were separately visualised by age for the general upper secondary school students (GUSS) and the vocational upper secondary school students (VUSS). The differences between the students in these two groups at each age point were analysed using an independent samples t-test.

notably higher, the difference between the genders for the mean scores was not significant (see more of the details on gender differences in Appendix 2). This result was due to the unequal sample size (male dominance in the field of natural sciences), which reduced the statistical power (see Rusticus et al. 2014). The students from vocational upper secondary schools, who studied a field of culture (vocational qualifications in audio-visual communication) ranked second, and students from the general upper secondary schools, who studied an advanced syllabus in mathematics, ranked third. Among the audio-visual communication students, gender differences were not significant, but among the general upper secondary school students studying an advanced syllabus in mathematics, male students outperformed the female students (see Appendix 2). After the top three ranked in vocational upper secondary education came those students from the social sciences, business and administration and technology, communication and transportation study programs, and then general upper secondary school students who studied basic syllabus in mathematics. No statistically significant differences between the genders were found among these groups (see Appendix 2). Among the bottom three were vocational upper secondary school students from programs in natural resources and environment, tourism, catering and domestic services, and social services, health and sports studies. Again, there were no significant differences between the genders for any of these groups (see Appendix 2).

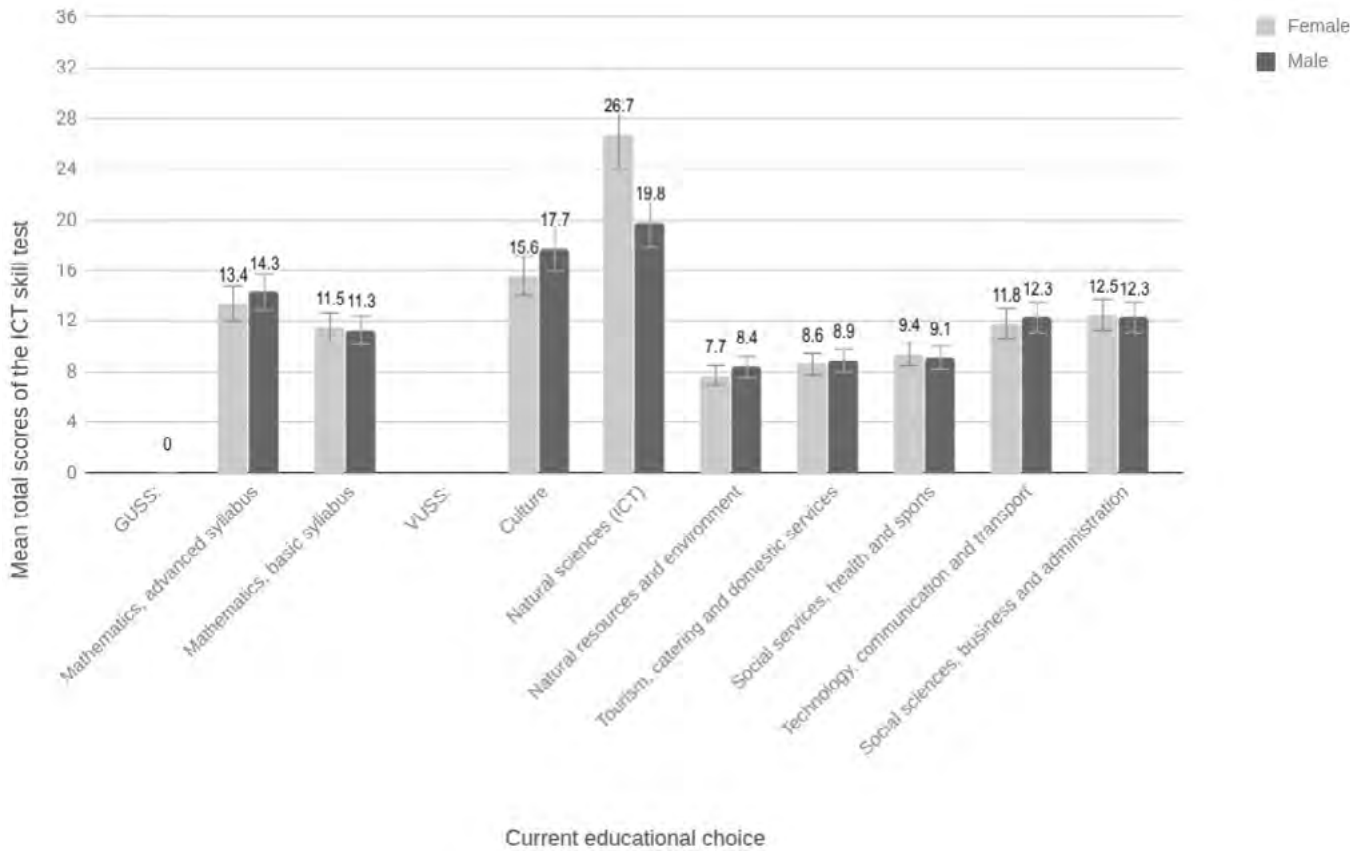


Figure 3: Mean scores on the ICT skill test by gender and current educational choices with error bars.

Figure 4 represent the popularity of fields of future intentions among students by gender. The Chi-square test indicated that among Finnish upper secondary level students there existed significant differences in the popularity of fields of future study/work between the genders ($X^2 = 776.389$, $df = 9$, $p < .001$), except in the field of business, administration, and law, which was popular for both genders and the fields of agriculture, forestry, fisheries, and veterinary, which in turn were unpopular for both genders. The most popular field for female students was health and welfare, whereas for male students, engineering, manufacturing and construction were clearly the most popular fields for future studies or work. Among the female students, the fields of business, administration and law, education, arts and humanities, and social sciences, journalism and information were also popular choices for future study/employment. On the contrary, the ICT field was the most unpopular choice among female students, and agriculture, forestry, fisheries, and veterinary ranked right after ICT in unpopularity. Among male students, the fields of business, administration and law, and ICT ranked next after engineering,

manufacturing and construction. The most unpopular choices for males were social sciences, journalism and information, education, and agriculture, forestry, fisheries and veterinary.

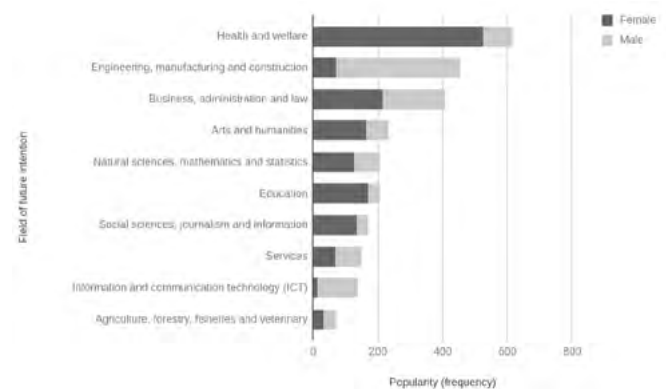


Figure 4. Student popularity of fields for future study or employment by gender among students.



Figure 5 indicates the mean scores on the ICT skill test by future study/employment intentions and by gender. The differences in digital skills between students with different future intentions were highly significant (ANOVA: $F(9, 2958) = 30.976, p < .001$), as students' aiming for ICT or other STEM fields outperformed the other students. In turn, digital skills were the most insufficient for those students' aiming to enter the fields of education, services and

agriculture, forestry, fisheries and veterinary. Based on an analysis of an independent sample t-test, there were no significant differences between the genders among students within the same field of future intention, except for students' wanting to enter STEM fields. Within that student group, male students outperformed the female ones (see Appendix 3 for more details).

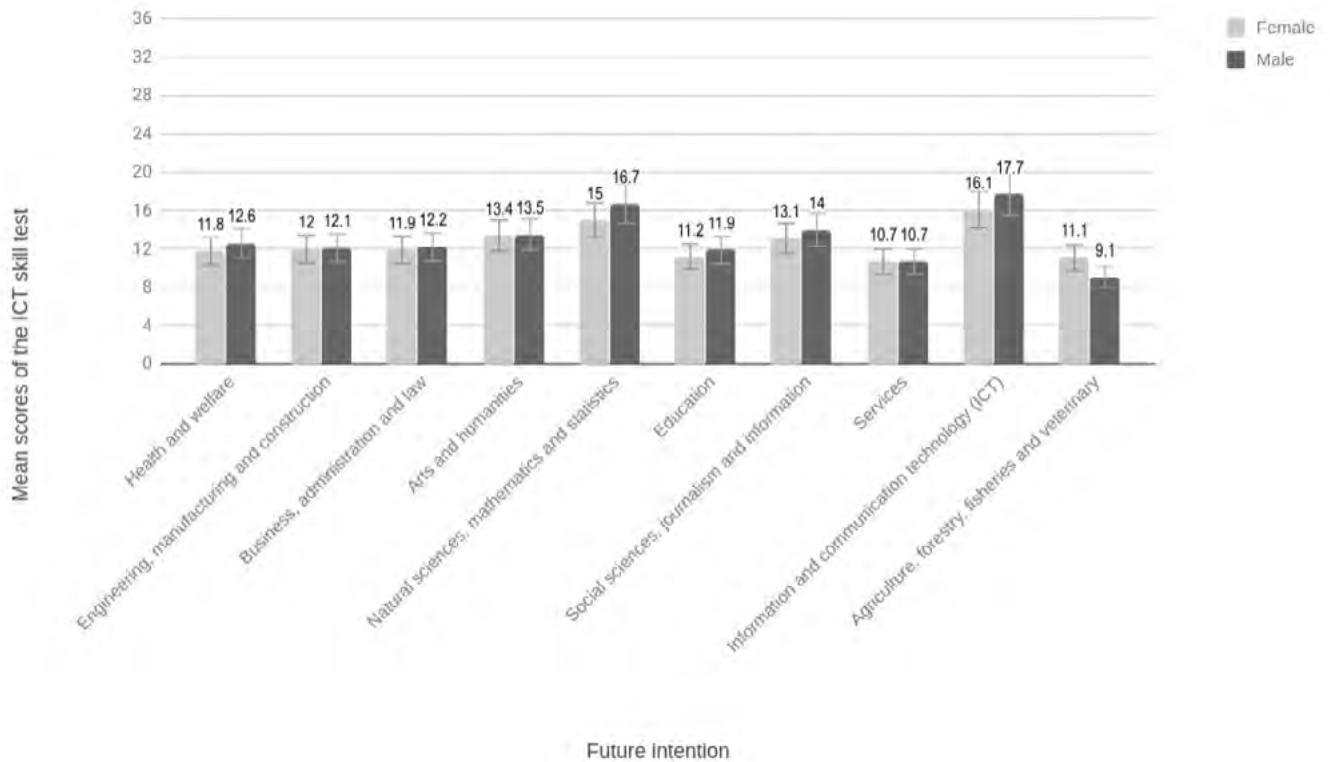


Figure 5: Mean scores on the ICT skill test by gender and current educational choices with error bars.

TABLE 2

	GUSS			VUSS		
Predictors	B	SE	β	B	SE	β
Gender (female = 0 / male = 1)	-.334	.260	.260	-.223	.459	-.018
Age	.604	.128	.098***	.781	.109	.207***
Current Educational Choices:						
Syllabus in mathematics (for GUSS only):						
Basic (= 0) / Advanced(= 1)	2.123	.241	.193***			



Studies in certain fields (for VUSS only):						
Culture				2.257	1.173	1.173
Natural sciences (ICT)				3.678	1.297	1.297
Natural resources and the environment				-1.449	1.500	1.500
Tourism, catering, and domestic services				-2.360	.786	.786
Social services, health, and sports				-1.358	.850	.850
Technology, communication, and transportation				1.220	.617	.617
Social sciences, business, and administration				1.309	.740	.740
Future Intentions:						
In the future, student wants to study/work in:						
Education	-.606	.559	-.030	-3.095	1.357	-.085*
Arts and humanities	.989	.548	.050	.035	1.229	.001
Social sciences, journalism and information	.912	.577	.042	-1.702	1.770	-.031
Business, administration and law	-.520	.798	-.031	-1.564	1.051	-.085
Natural sciences, mathematics and statistics	2.241	.557	.114***	3.033	1.783	.055
Information and communication technology (ICT)	3.961	.795	.116***	4.562	1.021	.204***
Engineering, manufacturing and construction	-.309	.550	-.016	-.802	.850	-.058
Agriculture, forestry, fisheries and veterinary	-1.390	1.016	-.030	-2.200	1.475	-.071
Health and welfare	-.199	.462	-.015	-2.064	1.113	-.116
Services	-.903	.519	-.051	-1.395	.882	-.097
R	.31			.48		
Adjusted R ²	.09			.22		
F-value	17.197***			16.334***		
B = the unstandardised beta, SE = the standard error for the unstandardised beta, β = the standardised beta, * p < .05, ** p < .01, *** p < .001						

Table 2: Multiple regression models for general (GUSS) and vocational upper secondary school (VUSS) students.

Two separate multiple regression analyses were performed (see Table 2), one for general upper secondary school students and one for vocational upper secondary school students. Table 2 presents the results of the analysis of general upper secondary school students and vocational upper secondary school students and their respective data sets. This analysis showed that digital skills among general upper secondary education students were significantly predicted by age, an advanced syllabus in mathematics, and the intention to further study/work in STEM or ICT ($R = .31$, adjusted $R^2 = .09$, $F(13, 2187) = 17.197$, $p < .001$). The best

predictor of digital skills among the general upper secondary school students was an advanced syllabus in mathematics (standardised beta coefficient, $\beta = .193$). Also the intention to study or work in ICT ($\beta = .116$) or a STEM ($\beta = .114$) field in the future, and age ($\beta = .098$) was associated positively with these students' digital skills.

For vocational schoolers, the analysis showed that digital skills were predicted by age, studying ICT (positive predictor) or tourism, catering and domestic services (negative predictor) and

the intention to further study or work in the ICT field ($R = .48$, adjusted $R^2 = .22$, $F(18, 986) = 16.334$, $p < .001$). The best predictors of digital skills among the vocational upper secondary school students were age ($\beta = .207$) and the intention to study or work in the ICT field in the future ($\beta = .204$). Further, studying the fields of natural sciences ($\beta = .089$) and culture ($\beta = .079$) increased the digital skills, whereas studying the tourism, catering and domestic services fields ($\beta = -.124$) significantly decreased these particular skills as well as the intention to study/work in the field of education ($\beta = -.085$) in the future. The Durbin-Watson d value for the GUSS (1.553) and VUSS (1.573) models indicated no major problems with autocorrelation.

Figure 6 offers the ICT skills test mean scores by age and current educational choice. Before this analysis and visualisation, all students older than 19 were removed because there were no

19+ year old students in the general upper secondary schools, and only a few in the vocational upper secondary schools. In Finland, the typical graduation age from upper secondary education is 18 or 19. Vocational upper secondary schools usually have older students due to dropouts who later return to studies and the fact that some graduates from general upper secondary schools do continue their studies in vocational upper secondary schools instead of applying to the tertiary level. As was clearly seen, at the beginning of the upper secondary level at the age of 15, students in the general upper secondary schools outperformed the vocational education students (GUSS: $M 12.37$, $SD 5.49$; VUSS: $M 7.97$, $SD 5.10$; $t = 5.629$, $p < .001$). At the age of 18, there were no longer any significant differences between the school types (GUSS: $M 13.74$, $SD 7.44$; VUSS: $M 13.58$, $SD 5.68$; $t = .100$, $p = .920$) as the vocational schoolers had closed the gap during their three-year degree studies.

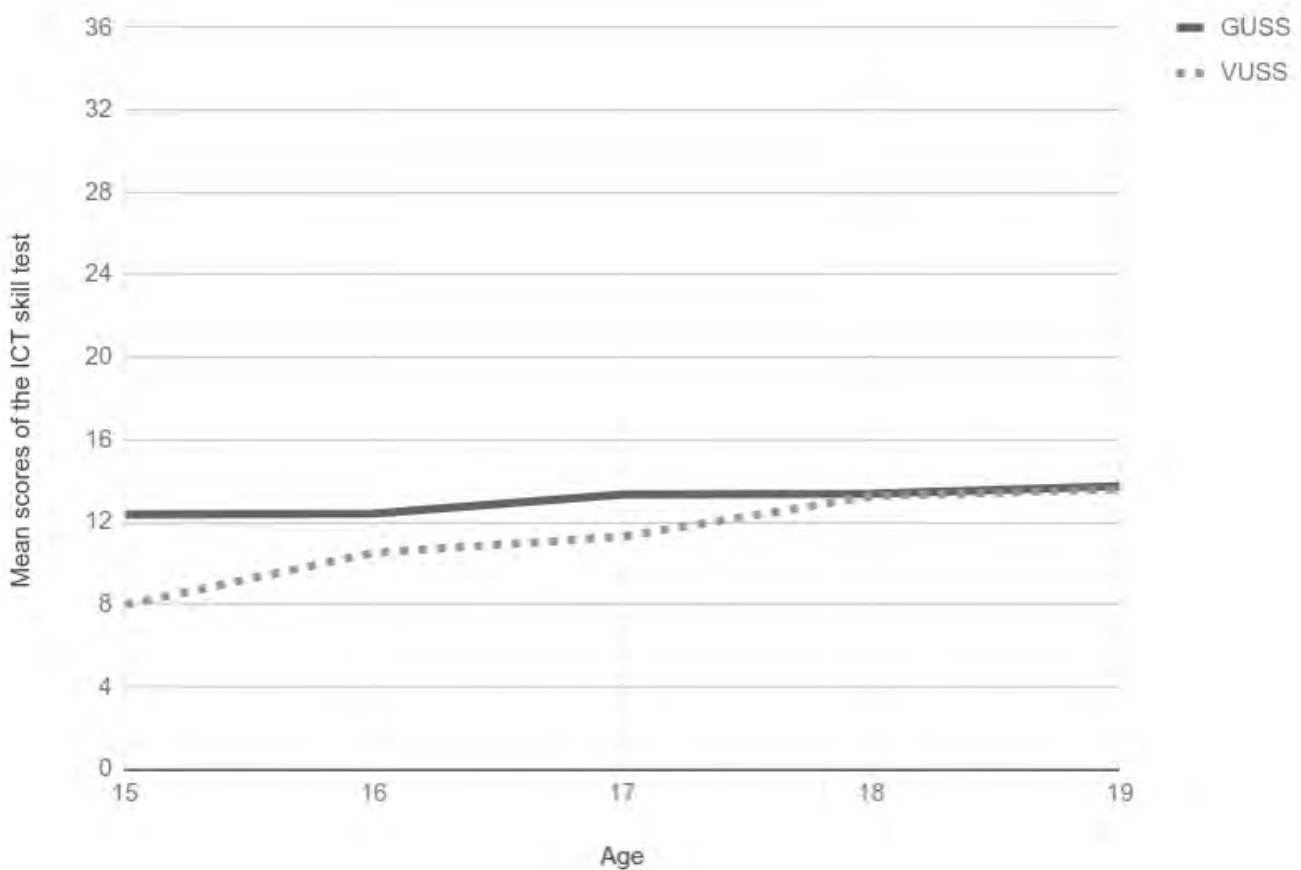


Figure 6: ICT skill test performance by age and educational choice.

Discussion

As mentioned earlier, Siddiq et al. (2016) noted that the majority of the present assessment tools were developed to measure digital competence for lower level students; therefore, these authors

encouraged researchers to develop tests for primary and upper secondary level students. This study and the developers of the ICT skill test accepted this challenge. The ICT skill test is specifically



developed for upper secondary education students. The vast majority of tasks are, therefore, quite demanding, as the test is targeting satisfactory item level discrimination power between high and low performers aiming to expose potential uneven digital skills.

The variability of digital skills among upper secondary education students is one of the main findings of this study. At the same educational level, some students were not able to solve any of the presented assignments, while the most capable students successfully solved almost 90 percent of these tasks. The average performance level on the ICT skills test for Finnish upper secondary school students was relatively low, as these students had mastered on average only one-third of the skills being tested. This result is in line with the considerations of van Dijk and van Deursen (2014), who criticised the overestimation of young people's digital competences. The results also stress the need to focus on integrating digital skills into upper secondary level teaching, rather than simply relying on the assumptions that students already possess these skills when they transition from basic education to upper secondary education.

On average, the results of this study indicated that male students outperformed female students by a slight, but still a statistically significant margin. However, when the gender differences were analysed separately based on current educational choices and fields of future study/work intentions, gender had no prominent effect on the digital skills of the students. This finding was confirmed by regression analyses, wherein gender proved not to be the significant predictor of students' digital skills. On the contrary, current educational choices and the specific field of future study/employment intention had a notable impact on students' digital skills. Particularly the intention to work or study in ICT or other STEM fields in the future appeared to be associated with the current level of digital skills.

Among Finnish general upper secondary school students, current attendance in advanced syllabus studies in mathematics predicted higher scores on the ICT skills test. In turn, among vocational upper secondary school students, their current attendance in the culture or natural sciences predicted higher performance, while attendance natural resources and environment, tourism, catering and domestic services, or social services, health, and sports were associated with lower digital skills. The dominance of educational choices over gender, therefore, was in line with the previous results of van Deursen et al. (2011) according to which, among the common explanatory variable candidates, education was the most significant predictor of digital skills.

However, unlike what van Deursen et al. (2011) assumed, the cause of this particular observation is probably not the equalisation of education in terms of gender distribution, because as the results of this current study indicated, the gender distribution in students' current educational choices and future intentions was notably

unequal. Among the highest performing natural sciences students, the under-represented female group succeeded at least as well as males did, while in turn, in the lowest performing female-dominated fields, male students possessed digital skills that were as weak as those among females. These results indicate that students with higher digital skills and an interest in the ICT sector drift toward particular study programmes at the upper secondary level. Thus, the actual cause of uneven digital competence originates in the previous level of education.

This phenomenon places extra pressure on basic level education, as it should ensure greater equality in digital skill development for all students. As van Deursen and Mossberger (2018) remind us, the potential benefits of digitalisation are accompanied by widening inequalities for those who are not well prepared. If the digital divide among young people cannot be moderated during their common basic education, these uneven opportunities accumulate further during their upper secondary education studies and may then cause serious inequality in prospects for future labour market entrants and digital citizens. The under-representation of females and girls in the STEM fields, particularly ICT, also calls for further educational actions to reduce the existing gender gaps in these well-employed sectors (e.g. Dass et al. 2015). As Cheryan et al. (2016) argue, girls should be offered early experiences with technology, digitalisation, and the professional possibilities they hold as their unwillingness to apply to these fields tends to develop at an early level of education. The same is most probably true with technology non-savvy boys. For this reason, earlier interventions aimed at reducing digital inequality should be scheduled in early stages of common basic education.

Age was noticed as a factor that predicted the level of digital skills among students of both school types. The positive effect of age was even higher among Finnish vocational upper secondary schoolers, who improved their skills during the upper secondary level studies to the extent that they closed the skills gap that existed between general and vocational upper secondary school students by the beginning of their upper secondary level studies. Instead, the development of digital skills among general upper secondary education students was found to be more diminutive. This observation is interesting, as the previous assumption was that vocational education is not as effective as academic education, in this case general upper secondary education, in terms of outcomes for including such skills (see Brunello & Rocco 2017). These findings also lead one to turn more attention to the curricula. Fenwick (2011) argued that government-led reforms in curriculum, assessments, and schooling are aimed at improving national productivity and social well-being. In general, the conceptions about future citizenship and the crucial skills citizens will need in a future society are manifested in curricula (Olson et al. 2014).

The Finnish national core curriculum for general upper secondary education seeks to deepen students' abilities, which are generally learned at the basic education level. Then these students



can use, learn, and interact with digital technologies in the future (FNBE 2016). In Finland, the Matriculation Examination at the end of general upper secondary school is the only examination that can be considered as a national, high-stakes examination. Indeed, it may have a strong impact on students' later opportunities. Currently, this examination is undergoing digitalisation, and all of its sub-tests should be digitalised by year 2019. (Pollari 2016.) Understandably, this change has had a significant impact on the teaching, as teachers are now pronouncedly focusing on ensuring that their students have the needed skills to cope with the new examination.

In contrast, in common parts of the vocational upper secondary education curricula, the goal is to offer students experience in the technologies that will be used in their profession and support the versatile use of computer technology as both a professional and a citizen (FNBE 2012; FNBE 2011a). The goals for digital skills

in the core curriculum for vocational upper secondary education are more oriented toward students' future professions and their adult life. They are more instructive and, with all probability, more motivating for these students, and indeed that focus may cause a definite observed increase in digital skills. However, this issue needs to be more carefully examined in the future.

In general, the results of this study highlight the importance of recognising the need for teaching digital skills at all levels of education. These skills should not be viewed as a sideline of or an "extra" to more important educational goals, nor should the schools assume that all young people already have sufficient digital skills for the future. Instead, it is important to recognise the necessity of digital competence both in the work life and a civic society and work harder to promote both the equality of these skills and exploitation of the many opportunities that are available in the future.

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APPENDIX 1

Item	Description
Basic operations	Participants must pair a keyboard shortcut with a correct action and choose a correct type of computer memory for the present education situation.
Information seeking	Participants have four cases wherein they have to choose a correct source/channel, out of three offerings on where to seek further information on a given topic. After this action, they are presented with a list of search engine results and asked to choose relevant items related to a given scenario.
Information networks	Participants are given four network usage scenarios and must pair them with correct data transmission technologies and then match the correct descriptions to the computer network-related concepts.
Word processing	Participants are asked to edit (bold, italicise, underline, and/or highlight) a given sample text.
Spreadsheets	Participants are asked to fill a spreadsheet table with given information, bold a header row, and sort the table in ascending order.
Presentations	Participants are given a general user interface view of presentation software with essential sections marked. The task is to pair a correct name with the right section of this view.
Social networking	Participants have to pair correct social networking services with four service descriptions, define the meaning of social networking service, and choose four items out of nine that relate to the security of social networking services.
Communication	Participants have to fill in the receiver fields (carbon copy, and blind carbon copy) of an email, add an attachment according to instructions, then identify the types of information that can be used to identify Internet users.
Information security	Participants have to choose correct statements for secure network communication and choose from alternatives those that would relate to the information security of computers in an Internet cafe abroad.
Image processing	Participants have to select correct image processing tools for cropping an image and make the person appearing an unrecognisable image. Afterwards, participants have to choose the correct image processing using related statements from given options and choosing the correct file formats for vector graphics.
Video and audio processing	First, participants have to choose those methods that can be used to edit video footage from a single camera and then choose a right answer to the question: "Which one of these alternatives is related to lossy audio compression?"
Cloud services and publishing	In the first step, participants have to choose which of the given statements about Cloud services are true. In the second step, they must choose the correct YouTube-video sharing option that enables limited sharing even to those who do not have an account on YouTube. The third step is a continuation question: "Can we now be certain that this video does not circulate to the rest of the Internet for outsiders to see [...]?"
Software purchasing	Participants have to choose what aspects need to be considered when evaluating the information security of mobile applications and also choose the correct definition of personal data protection from four offered alternatives.
Installation and updates	In the first step, participants choose whether a statement is about an installation or an upgrade; in the second step, they choose whether that same statement is related to an update or to an upgrade.
Elementary programming	Participants have to write, per instructions, a maze traversing script that leads from a starting point to the end. Afterwards, they are presented a short pseudo-code and have to write the value of a particular variable after the given code has completed.
Database operations	Participants have to form an SQL-query, based on given instructions and a simple database diagram, and then choose the right definition for the concept 'NoSQL database'.



Web programming	Participants are given three files (HTML, CSS, and JavaScript) to use to create a website and the view generated by these three files. Participants then answer four multiple choice questions to edit the simple web page view and the dependencies between the given files.
Programming	This programming task requires the participants to place lines of Java code in the correct places based on given comment sections.

Appendix 1. ICT skills test items and their descriptions.

APPENDIX 2

	Female Students		Male Students		t	p
	M	SD	M	SD		
Advanced syllabus in mathematics	13.41	4.97	14.34	6.43	-2.783	.005**
Basic syllabus in mathematics	11.48	4.79	11.30	5.94	.479	.632
Culture	15.59	5.34	17.72	5.09	-.987	.382
Natural sciences (ICT)	26.65	.35	19.78	6.67	1.424	.170
Natural resources and the environment	7.69	5.57	8.35	4.50	-.236	.815
Tourism, catering, and domestic services	8.59	4.70	8.90	4.89	-.305	.761
Social services, health, and sports	9.40	5.52	12.33	6.36	.224	.823
Technology, communication, and transportation	11.77	5.65	12.34	5.24	-.639	.523
Social sciences, business, and administration	12.51	5.53	12.20	6.34	.203	.840

** p < .01

Appendix 2. Digital skills by educational choice and gender.

APPENDIX 3

	Female Students		Male Students		t	p
	M	SD	M	SD		
Health and welfare	11.75	4.92	12.62	6.52	-1.468	.868
Engineering, manufacturing, and construction	12.03	5.47	12.14	6.18	-.139	.110
Business, administration, and law	11.90	5.44	12.23	6.06	-.574	.567
Arts and the humanities	13.43	5.16	13.48	6.29	.074	.941
Natural sciences, mathematics, and statistics	15.03	5.28	16.65	5.63	-2.077	.039*
Education	11.19	4.83	11.93	6.23	-.802	.424
Social sciences, journalism, and information	13.09	4.95	13.96	5.67	.871	.385
Services	10.71	5.09	10.65	5.82	.129	.897
Information and communication technology (ICT)	16.07	5.70	17.74	6.58	-.911	.364
Agriculture, forestry, fisheries, and veterinary	11.08	5.44	9.07	4.76	1.664	.101

* p < .05

Appendix 3. Digital skills by future study/employment intention and gender.

NARRATIVE REVIEW:

Welfare Technologies in Eldercare

by Susanne Frennert and Britt Östlund

Background: The Scandinavian concept of welfare technology appears to be one of the answers to meeting the care needs of the growing elderly population in Scandinavia. Welfare technologies need to be adopted if they are to have an impact on older people's quality of life. However, while this may seem obvious, there are numerous examples of technology that have limited uptake despite being based on sound engineering.

Objectives: This paper reviews the use of technology in eldercare and describes the determinants of the successful implementation of technology in eldercare. The review aims to summarise and critically evaluate the key success factors, controversies, and dilemmas associated with technology use in eldercare.

Method: A narrative review method is used to analyse the literature. The application of a narrative perspective to review the literature on technology use in eldercare enables a broad understanding of controversies and dilemmas related to the use of technology in eldercare, as well as the key success factors of implementing and using technologies in eldercare.

Result: The review yields 71 publications related to the key success factors, controversies, and dilemmas associated with the use of technologies in eldercare.

Discussion and Implications: The results of the review show that technology in eldercare is promoted to enable seamless, efficient, safe, and patient-centred care; however, technology may be contributing to making eldercare more fragmented, time-consuming, technology-centred, and risky. Technology in eldercare seems to be only as successful and suitable as the organisational culture, infrastructure, work practices, and management practices allow them to be.

Keywords: eldercare, technologies, digital transformation, welfare technology, home care

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Introduction

In the last five decades, medical innovation has increased life expectancy and decreased mortality (Larsson and Szebehely 1989). As a result, the proportion of people 70 and over, in the population is increasing rapidly (Garmann-Johnsen and Eikebrokk 2017, Hofmann 2013, Bygstad and Lanestedt 2017, Nilsen et al. 2016, Peek et al. 2017, Milligan, Roberts, and Mort 2011). Compared to previous generations, most people are living longer and healthier lives. In Scandinavia many will live an average of 20 years after the usual retirement age of 65 (Bygstad and Lanestedt 2017). This generation has experienced fundamental changes and improvements to the standard of living, medical treatment, welfare systems, and accommodation throughout their lives (Peek et al. 2014). Compared to previous generations, many people now have higher education degrees, and the final years of their lives are expected to be meaningful and stimulating (Wildevuur and Simonse 2015). It is believed that people will demand to have greater control over and say in the management of their healthcare in general and eldercare in particular, which directly affect their well-being (Bouwhuis, Meesters, and Sponselee 2012, Gomersall et al. 2017). Although the fact that people are living longer is a positive development, many older people will live with at least one chronic disease (Yusif, Soar, and Hafeez-Baig 2016). Old age also increases the risk of falling, which can, in turn, lead to injuries and, in the worst cases, death (Hawley-Hague et al. 2014). As former friends pass die and family ties become looser, old age may increase the risk of loneliness and social isolation (Sjölander and Scandurra 2015).

The future welfare society will face challenges due to the upward pressure on public expenditure; this is partly a result of the demographic development of an increasingly aging population and partly a consequence of citizens' increasing expectations of higher welfare quality (Kierkegaard 2013). It is suggested that an aging population increases the need for healthcare services and, in particular, eldercare (Murray et al. 2011, Doughty et al. 2007). At the same time, there are fewer young people to provide and finance these services (Garmann-Johnsen 2015). Many countries are suffering from a shortage of home-care professionals, as well as, doctors and registered nurses (Öberg et al. 2017). Discourse around the matter of the aging population and shortage of care professionals suggests that digitalisation and technology will resolve these problems by making healthcare more efficient and strengthening citizens' resources related to self-management, self-care, participation, and independence (Ertner 2016, Stokke 2016, Hinder and Greenhalgh 2012). Digitalisation and technology have been portrayed as a means to increasing quality of life, including for those who are aging at home (Procter et al. 2016, Mostaghel 2016). It is argued that technologies can contribute to an increased quality of life and better services while also improving the well-being and working environments of care personnel and having positive effects on the private sector, especially in regard to the development of welfare technology products and

know-how, which can lead to new sales and open up export possibilities (Garmann-Johnsen and Eikebrokk 2017).

Several initiatives exist in regard to the use of technology in eldercare. Numerous technologies are promoted in eldercare (van Hoof et al. 2011, Pritchard and Brittain 2015, Garmann-Johnsen and Eikebrokk 2017, Petit and Cambon 2016, Pols 2017, Peeters, Wiegers, and Friele 2013), including telehealth services, telecare, smart devices, monitoring technology, personal alarms, ambient living technology, and welfare technology (Hofmann 2013). All of these are said to enable a safer, healthier, and more active lifestyle for older people, thereby maximising their independence, quality of life, and well-being (Milligan, Roberts, and Mort 2011, Sánchez, Taylor, and Bing-Jonsson 2017). It is suggested that monitoring and surveillance technologies (Peek et al. 2014), as well as pendant alarms, smoke alarms, and fall detectors and sensors (Sánchez-Criado et al. 2014, Bouwhuis, Meesters, and Sponselee 2012, Gomersall et al. 2017) can be used to enhance safety, while it is suggested that information and communication technology (e.g. teleconferences, telecare, mobile phones, and portals) can improve social connectedness (Åkerberg, Söderlund, and Lindén 2017), and devices such as blood pressure meters, glucometers, and weighing scales can improve health and increase activity levels (Peine and Moors 2015, Gherardi 2010).

In Scandinavia, the term that is used—welfare technology—is a policy concept that was launched to promote digitalisation (Bygstad and Lanestedt 2017). Welfare technology is described as the knowledge and use of technology that can maintain and/or increase the feeling of safety, activity, participation, and independence for a person (any age) who has or is at increased risk of having/developing a disability (Hagen 2011, Kolkowska et al. 2017, Modig 2012, Hofmann 2013, Bygstad and Lanestedt 2017, Kilbourn and Bay 2010, Corneliussen and Dyb 2017, Östlund et al. 2015). The vision of welfare technology suggests that technologies will enable more person-focused care, reduce the risk of falls and social loneliness, and increase coping and self-care management while enabling older people to live in private homes (ibid.). It is also suggested that welfare technology will become a profitable business venture, giving rise to avant-garde Scandinavian innovations (Kilbourn and Bay 2010).

Assistive technology (AT) is also a concept that is found in the literature on the use of technology in eldercare (Bryant et al. 2010, Lilja et al. 2003, Joyce et al. 2016, Doughty et al. 2007, Saborowski and Kollak 2015). According to one source, AT "provides a means to circumvent barriers, subsequently increasing activity and participation" (Pape, Kim, and Weiner 2002, 5). Another source defines AT as "an assistive device which is qualified to prevent, support or balance restrictions that result from a disability, and to support participation" (Saborowski and Kollak 2015: 135). Ambient assisted living or smart homes are said to be "intelligent systems



of assistance for better, healthier, and safer life in the preferred living environment” (Gomersall et al. 2017: 193). The descriptions and definitions of welfare technology illustrate a wide-ranging perspective that indicate no restriction to a specific technology or technologies. The concept incorporates a heterogeneous group of welfare technologies (Hofmann 2013) related to AT and ambient assistive living. The discourse around welfare technology implies that the increased use of technology will be a win-win for society (Dugstad et al. 2015, Fleming, Mason, and Paxton 2018), as it targets older people, who have a higher risk of falling, developing chronic diseases (e.g. dementia), and suffering from social isolation, depression, poor well-being, and/or poor medication management (Yusif, Soar, and Hafeez-Baig 2016). The consequences or qualitative outcomes of the use of technology from the user’s perspective—that is, safety, participation, and independence—and not the technology per se are what matter. However, these kinds of definitions and descriptions can result in technological black-boxing and a lack of attention to the complexity of technology adoption and innovation (Latour 2005b). In this context, technology is evaluated against the standard of living and the user’s feeling of well-being (Groot-Marcus et al. 2006).

It is difficult to stipulate goals and criteria for the care and well-being of the elderly. The focus often shifts to the technology that is used and the effectiveness of the solutions in regard to meeting the target measurements (Bouwhuis, Meesters, and Sponselee 2012). The caregiving process and the evaluation of the technological solution thereby become codified into certain units that can be measured, and these measurements become standards (ibid.).

Ideally, the focus should be on the application of the technology rather than on the single technology itself. It is not rational to isolate a technology from its context of use and the stakeholders involved (Latour 2012). A single technology does not work in isolation but as part of a socio-technical system, and each instance of technology is interwoven with organisational and social processes (MacKenzie and Wajcman 1999, Orlikowski 1992, Feldman and Orlikowski 2011). The consequence or qualitative outcome of technology use from the user perspective is often affected by materiality (the material and design in which the technology manifests itself), the application/service that the technology provides, the context of use, and the human-technology interaction, which refers to how the user interacts with the technology (Lie and Sørensen 1996). The process is a multi-faceted relational structure between role, line-of-action, practice/routine, and artefacts (Faraj and Azad 2012). Social norms and values often link the state of what is considered “good” or “bad” technologies, as well as “good” or “bad” standards of living and well-being (Hofmann 2013).

This is not the first literature review of the field of technology and older people. Several other sources (Östlund 2004, Peine et al. 2015, Joyce, Loe, and Diamond-Brown 2015, Peine and Neven 2018),

including books, provide an overview of the research, theory, and practice of older people and technology use (Graafmans, Taipale, and Charness 1998, Domínguez-Rué and Nierling 2016, Prendergast and Garattini 2015). However, the related literature that has been produced in recent decades does not reflect a closer understanding of the importance of the eldercare organisation, in which the older people in need of care reside. It is not that eldercare organisations are completely non-existent. What is missing, however, is an analysis of how eldercare organisations, upon which older people who are in need of care depend, affect the elderly’s everyday use of technology. This review discusses the configurations of technology in regard to eldercare.

The definition and delineation of welfare and eldercare technologies are challenging. It is impossible to draw any sharp boundaries between technology in general and what can be described as welfare technology or eldercare technology. However, the technologies that are the focus of this review are those that are adopted for purposes related to health, well-being, and the home care service of older individuals in eldercare. Eldercare is complex and involves multiple actors, routines, and working practices (Trydegård and Thorslund 2001, Szebehely and Trydegård 2012, Hvid and Kamp 2012, Almqvist 2001). Eldercare practices arise from the interactions between caregivers and their co-care personnel, caregivers and care receivers, and the structures of the eldercare organisation, and they are, by their nature, routine and habitual (Nicolini 2016). In this sense, eldercare personnel reproduce eldercare practices and are carriers of eldercare practices, which are relatively stable and recognisable units that persist even after a care worker has finished carrying them out (ibid.).

In this paper, the assumption is that the self-determination of older people who are in need of home care, as well as their use of welfare technology, are strongly correlated with the eldercare organisation in which they are situated. Consequently, the author reviews the literature on the key success factors, controversies, and dilemmas regarding welfare technologies in eldercare. This is important for several reasons. First, it provides insight into what is critical in the implementation and use of technology in eldercare. Second, by highlighting the controversies and dilemmas, a nuanced view of the implementation, use, and side effects is provided, as well as ideas about what it takes to obtain desired outcomes. The intention here is not to outline and analyse all the possible ways in which technology can be used in eldercare, nor is it to review the numerous technologies that exist in this area. Rather, the review will seek to address the following research questions:

- What key success factors are mentioned in the scientific papers published on technology in eldercare?
- Are there any dilemmas and controversies related to the use of technology in eldercare?

Welfare technology introduces novel relationships between human beings and artefacts. Technology is never simply present as an

instrument but, rather, as a mediating object between human-and-human and human-and-artefact (Latour 2005a). The unquestioned acceptance of technology use in eldercare might obscure the process of normalisation—that is, the consideration of alternatives that prefigure the translation of ideas, materials, and approaches into categories of good and bad technologies in

eldercare (Fleming, Mason, and Paxton 2018). We aim to address the aforementioned research questions, to identify new ones that can serve as input for future research on technology in eldercare, and to highlight the success factors and approaches that have the potential to positively impact the implementation of technologies in eldercare.

Method

This narrative literature review article seeks to clarify the ongoing scholarly debate on technology use in eldercare, the key success factors mentioned, and the related dilemmas and controversies.

The possibilities and challenges of implementing and using technology in eldercare will be embraced by exploring up-to-date research and outcomes.

Review process

Reviews can be either systematic or non-systematic (Ferrari 2015). Systematic reviews follow guidelines such as the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA), while narrative reviews follow the Introduction, Methods, Results, and Discussion format (Ferrari 2015). The main objective of systematic reviews is to focus on a unique and specific query using detailed, rigorous, and explicit methods, while narrative reviews focus on one or more questions and articles that are selected based on inclusion and exclusion criteria. Following the PRISMA format might limit the review due to the focus on a specific query and heterogeneity in studies, and as a result, the narrative thread might get lost (Ferrari 2015). We have chosen a narrative review approach because we aim to provide a broad perspective and explore the general debates on the topic. According to Green, Johnson, and Adams (2006: 103), “narrative reviews can serve to provoke thought and controversy,” as they can present a philosophical perspective on the research area.

The narrative literature review involved the following steps:

- 1) Literature search: we performed a broad initial search. The following electronic databases were searched: Scopus, Web of Science, IEEE Xplore, ACM Digital Library, Compendex, and Google Scholar. The following keywords were used in various combinations: technology, telecare, welfare technology, assistive technology, telehealth, eHealth, key performance indicators, older people, elderly, and eldercare. We decided to conduct a broad search to ensure that we would identify as much relevant literature as possible. The number of articles that we retrieved was extremely high (N=2,700).
- 2) Selection criteria: we excluded articles published in non-scientific journals and at non-scientific conferences and those that were published before 2006. We also excluded duplicate articles, technical-focused articles (i.e. those focusing on technical stability, configurations, fundamentals of algorithms, and data structures), and articles written in languages other

than the Scandinavian ones and English. The number of articles decreased due to the exclusion criteria (Figure 1).
 3) Critical assessment: the remaining abstracts were screened to get a feel for the literature in this field. The majority of the articles were irrelevant to the research questions. Only the articles and conference papers that were relevant were selected. The screening of the abstracts reduced the number of articles to 71.

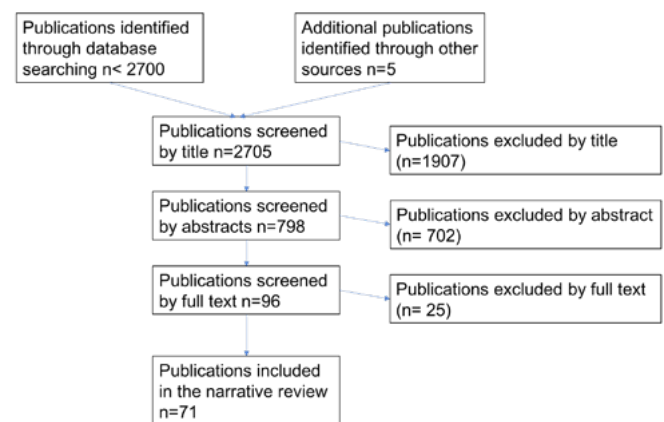


Figure 1: Flowchart of the literature selection process for the present article

4) Data extraction and analysis: the selected articles were analysed qualitatively, drawing on the central procedures used in thematic analysis (Braun and Clarke 2006, Blandford, Furniss, and Makri 2016). First, the author went through the articles, took notes, and formulated preliminary ideas for codes that could describe the article contents. Initial codes were assigned to the texts, and significant phrases or sentences were identified, extracted, and entered into NVivo (qualitative data analysis software for Mac). Various codes were compared (Graneheim and Lundman 2004). The codes were organised into the following themes: key success factors, dilemmas, and controversies.



Results

The review yielded 71 publications related to technologies in eldercare. Many of the publications addressed several of the identified

themes, which are presented below along with a discussion of the implications of the findings.

Key success factors

The growing literature on technology use in eldercare identifies the key success factors that are essential to achieving the desired goals regarding the implementation of specific technologies. The literature review identifies the key success factors that seem imperative:

- Clear goals, incentives, and strong leadership
- Infrastructure, organisational structure, and collaboration
- Economy and resources

Most of the publications included debates about more than one key success factor, and these were not exclusive but overlapping.

Clear goals, incentives, and strong leadership

One of the greatest challenges to supporting the implementation of technology in eldercare involves addressing management and leadership issues in eldercare organisations. Addressing the roles of leaders and managers, the literature review illustrates that technological change needs to be facilitated by a pronounced vision and clear goals for the digital transformation and implementation of welfare technologies (Gillingham 2017, Obstfelder, Engeseth, and Wynn 2007). It is important for care personnel and care receivers to be able to relate to the vision of digital transformation and change, and this should appeal to their sense of identity as care personnel and care receivers (Robichaud et al. 2006, Oswald et al. 2007). The roles of the managers and leaders include communicating the organisation's vision and goals to all the care personnel and care receivers involved. The vision and clear instructions need to be communicated to facilitate understanding, commitment, and encouragement to embark on the digital transformation in order for eldercare practices to change working routines and habits. A vision and clear goals might facilitate adherence to the changed practices (Garmann-Johnsen and Eikebrokk 2017). It is through the co-care personnel and care receivers—as well as their insight and their abilities to integrate new working routines and everyday practices into existing ones and contribute to abandoning old routines—that technological change will occur. A leader who is able to provide clear explanations—for example, in regard to technologies and digital transformation, which are perceived as difficult and time-consuming to learn and use— and who is familiar with the potential of technology, including in regard to eldercare practice, has the potential to enable digital transformation and the implementation of welfare technology. Leaders who are themselves involved

and participate in the digital transformation and implementation work can set examples to motivate others in the eldercare organisation to participate in and conduct development and implementation work (Shea and Belden 2015).

An enabling change context is created by leaders and managers who are visible and provide support in the daily work of care personnel and care receivers (Nordgren 2013). These leaders and managers must convey the sense of meaningfulness of care work, must interact with employees both up and down the eldercare organisation during the implementation work, and must have the ability to continuously develop teams and renew skills in the change process (Gjestsen, Wiig, and Testad 2017). Having a positive attitude and the ability to explain the profits and benefits for both caregivers and care receivers helps to facilitate the digital transformation and implementation of welfare technology. In addition, permanent feedback from the leaders and management is a prerequisite to meeting the balance between standardised approaches and individual initiatives in the working group. Through this daily feedback, the working group can pay attention to and see the benefits of the improvements and receive support during the changing work processes (Kaplan and Harris-Salamone 2009). Leaders who work with clear goals and incentives, such as measurements and performance reports, can create stimuli for co-worker and care receiver engagement in the implementation and use of welfare technology (ibid.). By highlighting successes and failures, leaders and managers can address both positive and negative issues, as well as objections from the care personnel and/or care receivers (Hinder and Greenhalgh 2012).



Infrastructure, organisational structure, and collaboration

Favourable conditions for the implementation of welfare technology consist of an organisation that has modern network technology and that provides support in form of guidelines, standards, and policies, as well as a mature infrastructure that facilitates implementation work and change processes (Garmann-Johnsen and Eikebrokk 2017, Gjestsen, Wiig, and Testad 2017). The implementation work must also be supported by follow-up work that ensures sustainability and thereby creates opportunities for continued improvement and technological change (Shea and Belden 2015, Gillingham 2017). Organisations that have a person-centred approach emphasise the importance of written policies and guidelines, as well as the importance of being devoted to providing high quality care (Obstfelder, Engeseth, and Wynn 2007). A pronounced person-centred approach might serve as a foundation for the awareness and motivation regarding the implementation of welfare technologies in eldercare organisations (Milligan, Roberts, and Mort 2011). Person-centred care might foster an innovative culture in which dialogue between managers, care personnel, and care receivers is encouraged and the professionals' and patients'/users' everyday practices and the challenges and problems related to technology use are discussed and addressed (Nilsen et al. 2016). A supportive culture and a management structure that encourages participation and interest in, as well as responsibility for, quality work simplify the implementation of welfare technology (ibid.).

Information provided through workplace meetings and scoreboards with understandable presentations of results over time

Economy and resources

To successfully implement welfare technology in eldercare organisations, financial resources are required (Garmann-Johnsen and Eikebrokk 2017). Similar to many technologies, welfare technology solutions often have relatively short lifespans (Garmann-Johnsen 2015). For many municipalities, one of the biggest obstacles to the implementation of welfare technology is the lack of financial resources (Søndergård et al. 2017). Other identified obstacles are access to broadband, lack of routines for technology introduction, limited knowledge of the benefits of technology support (underestimation of the need for continuous skills development and technical support for both care receivers and employees), lack of user involvement, and a lack of understanding of what features the user needs (ibid.). Development in the field of welfare technology can be expected to lead to increased resources; initially it requires both personal and economic effort. For the implementation to be successful, both caregivers and care receivers must perceive the development as affordable and economically justifiable (Nordgren 2013, Gillingham 2017)

increase interest and the commitment of the working group to develop and improve their daily care work. Eldercare organisations that analyse the consequences of using welfare technologies for practical everyday care work activities and that provide the staff with adequate equipment are more likely to change their eldercare practices (Sävenstedt, Sandman, and Zingmark 2006). An eldercare organisation is considered accommodating when the organisational structure enabling the development of the skills and utilises the skills of the care personnel in the planning of the labour force to ensure that the right person is at the right place at the right time. It is important to underscore that care personnel need to have the requisite skills and abilities to ensure the implementation of welfare technologies (ibid.).

The eldercare organisation must address the care personnel's knowledge, their everyday work, and their efforts to better understand eldercare practice in order to facilitate the implementation of welfare technology (Nilsen et al. 2016). Controversies need to be handled through social negotiations that occur in an open and dynamic teamwork relationship (Obstfelder, Engeseth, and Wynn 2007, Shea and Belden 2015, Gillingham 2017). As indicated, effective policies and innovation strategies are needed to support the successful evolution of technology in eldercare (Bygstad and Lanestedt 2017); otherwise, there is a risk that local initiatives and projects will never move beyond the project phase or that technology procurement will be biased (Stokke 2017). Concern has been raised about the disproportionate amount of time that is spent on projects that never scale up (Gillingham 2017).

The above key success factors indicate the areas that need to be considered and understood for the successful implementation and adoption of technology in eldercare to occur. External funding is often needed to start innovative projects (Andreassen, Kjekshus, and Tjora 2015). Innovation projects can contribute to challenging and rearranging current practices, which, in turn, generate enthusiasm and engagement (Andreassen, Kjekshus, and Tjora 2015). However, an excessive number of projects can generate tiredness and disengagement, as care personnel simply want to continue carrying out their everyday care work (Öberg et al. 2017).

The implementation of organisational change and welfare technology may resemble the construction of a house. The logic is that a house-building project begins with the construction of the foundation. It is only after the foundation has been laid that the erection of the walls and construction of the ceilings can take place. When implementing welfare technology, it is important to understand the present situation and identify the critical problems



(Kierkegaard 2013). The identified problems must be addressed as a whole and from a systemic perspective before considering which technology or technologies might be used to tackle the problem at hand; otherwise, there is a risk that the implementation will increase fragmentation and create multiple points of inputs (Öberg et al. 2017). The problems and challenges need to be well-defined, which requires looking at the effects of a particular technology, as well as the local and social contexts within which it will be deployed (Trydegård and Thorslund 2001). Which organisational, social, and material values will be affected by deploying a particular technology? What consequences will this have on the core care values? Who will do what? Once these issues are defined, one must consider whether there is a network infrastructure in

place to support the implementation and adoption? If none exists, the development of this infrastructure must be the starting point before even considering the implementation of technology in eldercare (Garmann-Johnsen and Eikebrokk 2017, Gjesten, Wiig, and Testad 2017, Gillingham 2017). The change work must be based on a consensus and overall view of the expected results and outcomes, process tools, working processes, and operational support. Collaboration between internal actors (management, co-care personnel, and care receivers) and external actors (e.g. other municipalities, technology developers, higher education institutions, care receiver organisations, and work unions) is important, as this contributes to the more efficient use of resources and skills (Kierkegaard 2013).

Dilemmas and controversies

The use of technology in eldercare has not been without controversies and dilemmas. It has the potential to change the status quo in eldercare. The recognition of dilemmas and controversies highlights the complex situation of eldercare and technology's fundamental dependence upon the interplay between situational and contextual factors in care situations. What follows is a discussion of how technology impacts care work, care relations, and responsibilities, as well as its influence on the private sphere of the home and care recipients (Mort et al. 2015, Nordgren 2013, Lenca et al. 2017, Milligan, Roberts, and Mort 2011, Stokke 2016, Peine and Moors 2015).

Impact on care work

The promise of technology use in eldercare is the shift in the way in which care work is conducted and the increased levels of flexibility, autonomy, and creativity (Pols 2017). The literature review shows that the implementation of technology to support the home care of older people created added work, novel work tasks, and the need for the technical competence to install and handle the technologies (Mort et al. 2015, Stokke 2016). For example, in a Norwegian study on tracking devices (GPS), care personnel needed to ensure that the device was fully charged and that the care recipients wore the device when out and about (Stokke 2016). This kind of task differs from traditional caregiving and might deskill care personnel and have a negative impact on the care given (Coeckelbergh 2013). On the one hand, this might result in a loss of skills, such as the empathy and reciprocity that are required to deal with the extensive experiences arising in different care situations. On the other hand, an increase in the amount of technology used in elder care means that the care personnel need technical skills (Ivanoff, Iwarsson, and Sonn 2006). Concerns have been raised that technology use makes eldercare biometric-oriented, disease-focused, and technology-driven (Wildevuur and Simonse 2015). Another worry is the amount of money that is invested in technology compared to that invested in care personnel. The governmental initiatives to invest money in technology might result in the degradation of the work of care

personnel, as these initiatives might be interpreted as a request to replace care personnel with technology and could be perceived as a suggestion that care work is not important and can be carried out more cheaply, more effectively, more efficiently and more precisely by machines, teleoperators, and family than by care professionals (Saborowski and Kollak 2015). Monitoring technology use at home changes care workers from nurses into teleoperators (who answer if an alarm is triggered); teleoperators assess the home situation and decide which actions need to be taken and who needs to be involved (Mort, Roberts, and Callén 2013). Furthermore, it is argued that monitoring technology for older people may change the perspective of care from person-centred to family-centred—that is, the family having the responsibility of handling the technology while supervising the monitoring of their relative (Sánchez, Taylor, and Bing-Jonsson 2017).

People's sense of identity is imbued into their professional work—that is, what they do and desire to do (Brown 2015). Their identity is drawn from their role in the organisation in which they work. Technological change and digital transformation will most likely affect care personnel's sense of identity and impact their work processes. Technologies can be seen as both tools and a catalyst for change. Regarding professional identity and the shift in care work, it has been highlighted that occupational therapists need to have more knowledge and a better understanding of technology, as one of their many roles is to promote, prescribe, consult, and co-coordinate the implementation of technology for the elderly (Ivanoff, Iwarsson, and Sonn 2006). In addition, other care personnel who are in the position to transmit know-how and knowledge about technology to older people are thereby important catalysts who need to have the requisite training, competence, and knowledge regarding available and useful technologies (Saborowski and Kollak 2015). The lack of time and/or skills among care personnel, as well as insufficient training, bad design, poor usability, and old and unreliable infrastructure, have been put forward as reasons for the low uptake of technology in eldercare (Öberg et al. 2017, Saborowski and Kollak 2015, Peek et al. 2014).



Impact on care relations

Technology in eldercare is closely related to self-management (Mort et al. 2015). As such, care recipients are responsible for and in charge of their health and should strive to prevent its deterioration (Nordgren 2013). It is anticipated that health self-management will be conducted at home in the same way that it has been done at hospitals and in primary care by measuring biometric and behavioural data (Greenhalgh et al. 2013) despite the differing context and cultural situation.

As indicated, welfare technology has the potential to increase social interaction with relatives and friends (Kolkowska et al. 2017, Modig 2012, Hagen 2011). However, a study by Sjölander and Scandurra (2015) shows that social interaction via social media did not increase as much as expected and requires the older people to already have large social networks with which to communicate and from whom to receive motivational messages and photos. It is suggested that older people's adoption of technology in eldercare is not only a technical matter of the compensation or reduction of physical or mental ability but is also a question of personal goals, as well as maintaining roles, dignity, and self-image (Jensen 2014, Yusuf, Soar, and Hafeez-Baig 2016, Greenhalgh et al. 2013). As such, the appearance, design, and suitability to the physical environment, as well as self-image, are prevalent (Peek et al. 2016, Hawley-Hague et al. 2014, Greenhalgh et al. 2013). Other important factors are usability and reliability. High quality usability and reliability support the older individual's feeling of being in control and being able to handle the technology independently; as a result, his or her dignity and self-image in relation to technology is strengthened (Hawley-Hague et al. 2014, Peek et al. 2016). Moreover, family members, friends, and care professionals have a significant influence on older people's adoption of technology (Peek et al. 2017), especially if they offer guidance, training, and support (Peek et al. 2017, Bouwhuis, Meesters, and Sponselee 2012). Welfare technology is presumed to have a positive impact on relatives, as it might remove some concerns, provide peace of mind, and reduce their burden, because technology can help the older relative to remain safe and enable him or her to reach someone if there is a need to obtain help (van Hoof et al. 2011, Pritchard and Brittain 2015, Stokke 2016).

Self-management, self-responsibility, and self-care might increase some elderly individuals' feelings of independence, while others might feel uneasy about the technology and the lack of social contact (Stokke 2016, Sánchez, Taylor, and Bing-Jonsson 2017). Some will refuse to use technology such as pendant alarms because they do not want to cause trouble, they do not want visits from care personnel, or find the technology stigmatising (Stokke 2016). Technology that has been designed for remote monitoring is likely to lead to reduced home visits by care professionals and, as a result, may negatively impact the mental well-being of care recipients who are lonely and have few other social ties (Milligan, Roberts, and Mort 2011). If the system triggers an alert or an alarm,

a teleoperator contacts the elderly care recipient to evaluate the situation. The calls are often scripted to follow a certain procedure, and the teleoperator often has no former care relationship with the care recipients; rather, he or she knows the recipient's name and about his or her care situation as a result of information on the computer screen (Garmann-Johnsen 2015). It is suggested that these kinds of check-up calls may dehumanise care situations due to the strict protocols, brief care relations (Pritchard and Brittain 2015), and limited effectiveness (Garmann-Johnsen 2015). Reservations have also been raised about the goal of using technology in eldercare to support the care recipients' independence. Independence might be important for people who are in good health and are socially well-connected, while safety and close social contact with care personnel are valued by older people who suffer from illness, as well as physical and mental disabilities (Nordgren 2013).

Shift in responsibilities

Welfare technology raises ethical questions concerning security, reliability, confidentiality, legal obligations, technology acceptance, and adoption, among other issues (Sánchez, Taylor, and Bing-Jonsson 2017). While there is a governmental push to develop and implement technology to be used in eldercare, there are numerous unanswered ethical questions, as well as a lack of laws and regulation, national infrastructure, and standards (Garmann-Johnsen and Eikebrokk 2017, Gjesten, Wiig, and Testad 2017, Pols 2017); this situation has a negative impact on the municipalities' manoeuvring spaces. The results of a Norwegian study on the implementation of assistive living technology in primary eldercare have shown that the lack of guidance from national authorities regarding financial, legal, and technological aspects had a negative impact on the uptake of new technologies (Gjesten, Wiig, and Testad 2017). The results of a German study on care professionals who had the role of promoting, prescribing, consulting, and co-coordinating the implementation of technology for older people showed that their main source of information came directly from the manufacturers of the technology (Saborowski and Kollak 2015). In this case, there is a risk of seduction or preferences for a certain technology due to the manufacturers' sales capability, availability, and/or charisma, which may overshadow any objective evaluation of the care organisation or care recipients' needs and the primary goal of procuring a certain technology.

Technology use in eldercare opens up discussions, as well as multiple positions and views, with a focus on the aging population, technology, and modern aging. Citing Blaschke et al., the promises of technology in eldercare are "improved quality of life, extended length of community residence, improved physical and mental health status, delay the onset of serious health problems and reduce family and caregiver burden" (Blaschke, Freddolino, and Mullen 2009: 641). This appears to be a win-win situation for all the actors involved. However, older people, their relatives, their caregivers, and welfare



technology do not function like the pieces of a puzzle that can be joined together to form the whole. Rather, due to their diverse purposes and materialities, they produce various versions that have different elements attached. For example, it is argued that care personnel sometimes act as gatekeepers, preventing older people's exposure to new technology (Sjölander and Scandurra 2015, Hinder and Greenhalgh 2012, Sjölander et al. 2017). However, this is not due to negligence but rather to misguided help given to the elderly (whom they perceive as uninterested in new technologies) with a view to protecting them and is based on an underestimation of their abilities to learn to use new technology (Sjölander and Scandurra 2015). Care personnel have also expressed their fear that information communication systems could negatively affect the closeness and intimacy that embody genuine care situations, threatening the relationship between the care personnel and the care recipient and promoting inhuman care (Siegel and Dorner 2017, Öberg et al. 2017, Sävenstedt, Sandman, and Zingmark 2006). Reservations have also been raised about the quality of care provided by communication technologies, which, for example, limits the care personnel's ability to observe the events unfolding around the care receivers and to notice effects that are not readily revealed (Hout, Pols, and Willems 2015, Roberts et al. 2015, Öberg et al. 2017). Furthermore, there is a worry that replacing communication technologies with physical visits could increase loneliness and social isolation among older people who are in need of care (Siegel and Dorner 2017, Hout, Pols, and Willems 2015, Sävenstedt, Sandman, and Zingmark 2006). Conversely, many care personnel believe that communication technologies might contribute to more frequent social contact and the development of more caring relationships with relatives, friends, and care personnel (Sävenstedt, Sandman, and Zingmark 2006), which reflects the diversity in care personnel's opinions and expectations regarding technology use by older people.

Ambivalence was found in the literature regarding expectations among older people regarding technology use (van Hoof et al. 2011, Bouwhuis, Meesters, and Sponselee 2012, Roberts et al. 2015, Milligan, Roberts, and Mort 2011, Pape, Kim, and Weiner 2002, Pols 2011, Stokke 2017). On the one hand, the pendant alarm that is attached to an emergency response system is often presumed to provide safety and security. On the other hand, older people expressed concerns that they might forget to press the alarm in case of an emergency, or they worried about the time it would take for the care personnel to reach them (van Hoof et al. 2011). Reservations about being dependent on modern technology and worries about power outages, unstable Internet connections, and telephone failures were raised in the literature (van Hoof et al. 2011). False alarms or low reliability also evoked feelings of insecurity and unease (van Hoof et al. 2011, Bouwhuis, Meesters, and Sponselee 2012) and might result in non-use (Pritchard and Brittain 2015, Hawley-Hague et al. 2014). The non-use of alarm pendants has been justified by the fact that the technology fosters

less autonomy and a lack of control while making older people feel disabled and stigmatised (Pritchard and Brittain 2015, Mort, Roberts, and Callén 2013, Peek et al. 2014, Hawley-Hague et al. 2014). The non-use of technology among older people is explained by Cook et al. (2016) as resulting from the following factors:

- Lack of knowledge and awareness regarding the available technology
- Lack of familiarity with the technology
 - Not knowing anyone else who is using the specific technology or having no previous knowledge of how to use a similar technology
- Lack of perceived usefulness
- Negative attitudes and perceptions of the technology available
 - Poor usability, such as difficulties changing batteries, are one factor that may lead to non-use. Other factors included difficulties filling medication reminders, the question of whether using the technology can make care recipients feel dependent, and the matter of having to rely on care personnel, relatives, or friends

In contrast to the non-users, the users often had previous knowledge and awareness of the available technology, which they perceived as useful, and they saw the benefits of using a specific technology (Cook et al. 2016). Similar results have been obtained in other studies (Peek et al. 2014, Hakobyan et al. 2013, Åkerberg, Söderlund, and Lindén 2017). Furthermore, it is suggested that older people will use technology if it is affordable, accessible, and usable and it supports independence, security, and privacy (Mostaghel 2016, Hawley-Hague et al. 2014, Pape, Kim, and Weiner 2002, Kolkowska et al. 2017). Likewise, it is implied that technology adoption is dependent on the older individual's perceived need for the technology, his or her interest in technology, and his or her willingness to invest in technology (Peek et al. 2016). Individual training and guidance have also been shown to increase the adoption and use of technology (Bouwhuis, Meesters, and Sponselee 2012). In the current research, the understanding of the responsibility for and use of technology in eldercare is interpreted as being down to the individual's—that is, the caregiver's and the care receiver's—behaviour, motivations, values, beliefs, and capabilities. If and when this script becomes active—that is, the successful implementation and use of technology are seen/judged on a dyadic and individual level—the danger is the underestimation of the social and organisational components of technology implementation.

Impact on the private sphere

Traditionally, the private sphere of the home is the realm of home life that is without interference by government, medical, and social institutions. This private sphere, however, fluctuates and evolves if the tenant needs home care or other institutional help. Traditional



home care means that services and healthcare are delivered at home, while telecare offers care from a distance. Sensors, cameras, or webcams are installed at home and can collect data around the clock. The technology can collect data and detect anomalies (Sánchez, Taylor, and Bing-Jonsson 2017). This might provide a sense of security for the care recipients, as well as reassurance for their relatives; however, it also raises questions about who has access to the data that are collected, how the information can be used and stored, and what kind of data should be collected (Procter et al. 2016). Furthermore, one cannot help but ask what kind of care can be rationalised by sensors, figures, and data.

Another question is how health data will affect the care receiver—that is, will the digital devices collect health data and enable

the care receiver to know how he or she feels and whether he or she is in good or poor health? Can it give him or her advice on how to maintain and improve his or her health? Will care receivers become more aware of their health and body signs or will they become simply passive and trusting of the digital device? (Lupton 2014) Furthermore, monitoring devices can be perceived holding their users hostage or granting them freedom and security. For example, GPS trackers can offer a sense of security by ensuring that someone else knows the location of the individual who is being monitored; however, it can also be restricting if the care receiver knows that the alarm will go off if he or she leaves a certain area (geo fencing). In addition, the care recipient might feel watched due to knowing that someone can find out where he or she is at any given time.

Concluding Remarks

It is suggested that user-centred design could help and support the evolution of technology use in eldercare (Hakobyan et al. 2013, Sánchez, Taylor, and Bing-Jonsson 2017). Design that is based upon an understanding of older users, their tasks, and their environments and that is driven by user involvement is believed to more likely result in the use of technology that responds to the psychosocial and occupational needs of the users (Gomersall et al. 2017), if the users are rightly involved (Joyce et al. 2016). Low-hanging fruits are easily identified by user-centred design. For example, bedroom sensors made for illuminating the floor on the way to the toilet can be activated when sleepers turn around in the bed or there may be light sensors in the bathroom that switch the lights off if there is no movement (Bouwhuis, Meesters, and Sponselee 2012). However, issues such as organisational resistance, a lack of clear goals and strategies, weak leadership, dysfunctional organisations, and a lack of resources and financing might be more problematic to address. Rectifying these might require improved technical know-how, change management, national guidance, and regulations. This also raises questions about power relations: Who has the power to affect technological change in eldercare organisations? Who can influence what in which situations?

This review raises questions regarding what the working practices of eldercare organisations means in relation to the uptake of technology by older people who are in need of care in their everyday lives. Eldercare organisations might be affected by or might themselves affect these older people's use of technology and their possibility of partaking in an increasingly digital society. It might be that eldercare organisational structures are particularly oppressive with regard to technology change. Technology and its value might be contributing to subordination in eldercare organisations. The subordination of technologies might be considered irreversible within the framework of present eldercare organisations. Modifications might need to be made to

the existing work processes and organisational structures. It is easy to believe that the implementation and use of technology in eldercare is about technology per se. However, this review has shown that the successful implementation and use of technology is primarily about developing new working methods and organisational structures that are made possible by new technology and digitalisation. A fixation on the technology itself might risk the successful implementation and use of technology in eldercare. The implications of not considering eldercare organisations' impact on older people's technology use might be grave. Such ignorance might prove to be a serious obstacle to the achievement of an inclusive digital society and the equal participation in society of older people in need of eldercare.

Technology is fluid, has diverse and sometimes unexpected effects, and may change the expectations and aims of care (Mol 2008). As a result, it is important to acknowledge that technology in eldercare cannot be seen as a neutral tool that can be introduced to achieve a special effect (Stokke 2017). Technology is not prescriptive and deterministic in its ability to solve problems that have the same basic shape. The role of technology in eldercare depends on how a specific technology is designed, the context in which it is used, cultural habits, and the user's skills and knowledge. Technology can both enhance and degrade the older person, as well as help or hinder care personnel in regard to their provision of good care. Technology use in eldercare is thought to enable seamless, efficient, patient-centred, and safe care; however, it might make eldercare more fragmented, time-consuming, technology-centred, and risky. The result of this literature review shows that the successful implementation of welfare technology is down to a trait of the entire eldercare organisation and that the level of technology implementation and usage is not down to the individual's traits. Technology in eldercare might be only as prosperous and fitting as organisational culture, infrastructure, and management practice allow it to be.



The organisational culture, infrastructure, and management practice might need to be progressive rather than regressive, active

rather than passive, bottom-up rather than top-down, innovative rather than conforming, and enterprising rather than sedentary.

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Contribution of author

Susanne Frennert independently planned and carried out the literature review. Professor Britt Östlund critically reviewed the first draft and added valuable comments. Two anonymous reviewers, reviewed the manuscript and gave insightful

comments and suggestions, which have been assimilated in the final manuscript. Professor Britt Östlund has contributed with reading and minor revision in a preliminary version as well as financing the work.



LEARNING TO BECOME A SCIENCE TALENT

A case study of the emergence of the knowing subject in a talent development program at the Mærsk McKinney Møller Science Centre in Denmark.

by Jesper Stilling Olesen

The article focuses on the concept of talent and its enactment in a science talent program. The article investigates how students become a particular kind of knowing subject through their participation in a science talent program at the Mærsk McKinney Science Centre in Denmark. Drawing on concepts from new materialist studies (Latour 1993; Blok & Ellgaard Jensen 2009; Fox & Alldred 2017) the article explores the relationship between the possibilities for distribution that are offered to the participants, and the ways in which the participants respond by centering and decentering within the talent network (Mialet 2008, 2012). The study contributes to our understanding of, how the increased focus on talent development in many national educational systems influences basic preconceptions of what a science student is and how the knowing subject in society should treat science, by looking into the micro-politics of talent development. The study is based on a small-scale ethnographic fieldwork at a science camp of three days. Since it is a case study the findings account only for enactments of science talent within the confines of this particular science camp.

Keywords: talent development, educational subjectivity, becoming, science education, new materialism.

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Introduction

In recent years, the term 'talent' has increasingly been used in relation to educational programmes for children and young people who are considered to have special abilities or a particular gift for certain subjects. The term originates from the worlds of sport and the arts, which both have a long-standing tradition of regarding students as 'talent', learning as 'talent development' and places of learning as 'talent-development environments'. Since the beginning of the new millennium, the concept of talent has expanded into the Danish school system; and Denmark now has well-established talent programmes in primary and secondary schools as well as youth-education colleges. This is particularly true of science, where there has been a widespread willingness to support the care of students with special abilities. In 2011, the Nordic Council of Ministers made a survey of the work of developing natural science talents in the Nordic countries (Daugbjerg et al. 2011). The survey showed that Denmark distinguished itself in two areas. Firstly, by obliging upper secondary schools to accommodate particularly skilled students with special offers in, among other things, natural sciences. Secondly, by establishing a permanent center for talent care in the natural sciences at Mærsk McKinney Møller's Science Centre in Sorø (hereafter Science Talents). Since then, the science-based talent management has become even more widespread and rooted in the National Center for Learning in Nature, Technology and Health under the name of Astra. Astra manages the overall Danish strategy to promote learning in science at all levels of education, including talent development under the auspices of Science Talents.

In connection with the survey in 2011, the Nordic Council of Ministers called for an overall discussion of what is meant by a

science talent. Obviously, it was thought to be important in clarifying which students were the target audience for existing talent programs. But in the light of the fact that every time a new talent development program is created, there is made room for more science talent, the right question may not be who the talented students are, but how the programs provide new students with talent and what kind of talent do they produce? With the continued development of talent care in the natural sciences it is therefore, relevant to examine, what understandings of talent inform the programs, how they are transformed into practical pedagogical courses and what effects they have for the participants as knowledgeable subjects in the short and long term? This article makes a contribution to clarifying the talent concept by examining how science talent is enacted in a specific talent development program. Based on a case study of a talent development program held on Science Talents in 2012, I explore what it is like to become a science talent by assuming the position of the knowing subject offered by the talent program. I would like to understand why some students choose to inhabit the social position while others refuse to let themselves become the version of a science talent suggested by the programme. This research interest calls for processual studies of the interaction that takes place in talent development programs between students and the range of socio-material actors made available for the participants. This study draws on theoretical inspiration from new materialist studies, which states that any subjectivity including that of talent is an effect of various heterogeneous actors working together as an alternative to the more common assumption that a talent is an inherent quality of a gifted person (Mialet 2008 & 2012; Clark/Keefe 2014; Skrubbeltrang, Nielsen & Olesen 2016).

The investigation's theoretical approach to the study of talent

As the French philosopher Mialet states in her studies of scientific geniuses (Mialet 2008 & 2012) the rationalist tradition builds on the assumption that the driving force of knowledge is inscribed in the subject. Therefore, new knowledge has for a long time been seen as the product of ideas, which derives from particular gifted individuals with a unique mental capacity. From this viewpoint, the main task of a talent developer is to identify the talent and separate these people from those with intelligence that is more ordinary. Over the recent decades, this viewpoint has been coupled with the idea that talent is something that can be acquired. Ericsson, a Swedish-American psychologist, is one of the strongest proponents of this perspective. In his theory of "deliberate practice", he argues that talent only becomes elite in their fields via early specialisation and many years of dedicated training (Ericsson, Krampe and Tesch-Römer 1993). A great deal of the recent international literature about talent development in schools is thus based on an understanding of talent as something that can be acquired. This literature focuses largely on which

pedagogical initiatives are best when it comes to stimulating gifted children. Talent development is consistently treated as a question about didactic methods and developing teaching plans adapted to gifted children (e.g., Renzulli and Reis 1985; Renzulli 1994; Freeman 2004; Rasmussen 2010). This way of understanding talent and how to best develop it has a characteristic trait, which is that it is situated in an autonomous and self-reliant individual. Talent comes from inside a person and regards solely its cognitive capacities and engagement in developing these skills, but it can be encouraged and nurtured via initiatives that are usually called 'talent development'. This conception's lack of social contextualisation has been criticised by Rasmussen & Rasmussen (2015). On the basis of a Bourdieu-inspired case study, they develop a talent typology with four types of talent that are linked to the students' socioeconomic background. They argue that talent programs tend to recruit certain types of middle class talents, demonstrating the necessary form of social capital, thereby contributing to deepening social inequalities in the education system.



In this article, I will draw on a different understanding of the knowing subject based on concepts that derives from what has become known as the new materialist studies (Fox & Alldred 2017). Many of the early science studies that have inspired new materialism by e.g. Bruno Latour and James Woolgar showed that scientific knowledge is not simply a product of a rational individual's mental processes; rather, it is a fundamentally social and material process (Latour and Woolgar 1979; Latour 1987). These studies demonstrated that scientific practice does not differentiate itself from other practices; it is a socially, materially and historically situated form of life. Furthermore, the relationship between the individual, the social and material conditions is not expressed as a hierarchical relationship of subordination and superiority. On the contrary, the relationship is expressed using a principle of generalised symmetry between the actor and the network (Latour 1993). This means that human agency is not placed at the centre of the study of talent development (Blok and Ellgaard Jensen 2009).

Thus, when studying talent, one must investigate interactions between subjects and socio-material actors of all kinds: technology, materiality, discourses, bodies, feelings and so on. How talent comes into existence in a particular talent programme depends on the actors that are made available to participants, how the participants interact with them, and how this transforms all of them. In addition, in keeping with the principle of symmetry, talent should not be regarded as a stable and unambiguous phenomenon instead it should be studied as variable ontologies (Mol 1999); this means that talent is something that emerges in certain events wherein the knowing subject is assembled as talent. One might say that talent is something that comes into existence as it is being formed in relation to particular practices (Bruun Jensen 2010) i.e. a talent programme. Clark/Keefe considers in a study of college students' identity development precisely identity as a fluid entity, as a continuous becoming embedded in socio-material assemblages (Clark/Keefe 2014). She wants to get away from what she calls closure-seeking and normalizing discursive practices and instead inspired by Braidotti, she follows students in their nomadic movements through various assemblages (Braidotti

2011 Cit. In Clark/Keefe 2014). Parallel to her research interest in how it is to be in the process of becoming this investigation asks how it is to become a science talent by assuming a social position offered by a natural science talent programme.

Mialet, who has studied the emergence of geniuses, offers some useful concepts to understand talent as a gradual process of doing (Mialet 2008 and 2012). On the basis of two studies of researchers who are widely considered to be geniuses, she claims that their reputation is partially due to their capacity to build, maintain and navigate within a network in a specific manner, so that the network is centred around them. Mialet suggests that the knowing subject should be understood as being simultaneously distributed in a network and centred around an individual. The two geniuses she studied are both capable of occupying a distributed-centred position by exerting a strategic influence on the narratives, materialities and ways of acting that make up their networks. Taking centring into consideration is not the same as returning to a human-centred ontology, in which the self-sustained individual relates rationally to his/her surroundings. Rather, it is an opportunity to discern how, based on the principle of generalised symmetry, the participants relate within and to the ways that the talent programme operate through them. Unlike the geniuses of Mialet's studies, participants in a talent program may not feel comfortable with the way the network works through them. It is therefore necessary both to look into the extent to which participants choose to distribute themselves in the talent network and whether they occupy a centered or more peripheral position in relation to the program's offer of becoming a science talent. Using the approach outlined above, I analyse how the participants come into being as knowing subjects at Science Talents. I do so by focusing my attention on how a practice is established to create new connections between projects, participants and supporting actors, and how this invites participants to constitute themselves and their projects in a different way than they would at school. Throughout the analysis, I explore the relationship between the possibilities for distribution that are offered to the participants, and the ways in which the participants respond by centring and decentering within the talent network.

Presentation of the talent programme

Science Talents was established in 2009 as a science centre that provides a framework for developing the scientific talent of young people between the ages of 12 and 20. Talent development is carried out by providing courses and inspiration for teachers at upper- and lower-secondary schools, through teaching and camps for talented youths, by facilitating networks for talent and by encouraging dialogues and debates about talent management for young scientific talent. Every year Science Talents host part of the science-talent competition "Young Researchers", which is Denmark's largest science-talent competition for primary and secondary schools as well as youth-education colleges. The competition is organised

by an association called Danish Science Communication, which is funded by several private companies as well as the Danish Ministry of Children and Education and the Ministry of Science, Innovation and Higher Education.

In 2012, when this study was conducted, more than 1,500 projects entered into the competition. A little less than 100 projects were accepted for three regional semi-finals, which were reduced to 24 senior projects that were selected by a jury for the final at Aarhus University on 30 April. The students whose projects were selected for the final were invited to attend an innovation camp at Science



Talents – a three-day residential programme held on 13–15 April 2012. Here, they had the opportunity to participate in various

activities in order to develop their projects and prepare them for the final.

Methods

The study was conducted as a small-scale ethnographic fieldwork at the Innovation Camp which took place at the Mærsk McKinney Science Centre in Sorø. 31 students representing 22 projects took part in the event. Most of them were in their third year of upper secondary school either stx (the standard upper secondary choice) or htx (which offers a technical specialization). I chose the camp as the empirical field because numerous socio-material actors involved in assembling the science talent were present in this single site. In accordance with the program, the camp can be divided into a number of sub-events: lectures, consultations with experts, individual work with the projects, presentation of project development in plenary. I was present throughout the three days the camp lasted and I was granted access to all the activities by the organizers. Of course, it was necessary to ask each of the participants for access to their individual consultations with the experts. However, the students I asked all allowed me to sit in on these sessions. In view of the fact that I undertook the fieldwork as a single researcher it was impossible to cover all the activities that took place at the camp. In particular, during parallel sessions I had to make choices about which participants to follow. The empirical material I have produced consists largely of field notes from lectures (3), consultations with experts (8), informal conversations with participants (9) and plenary sessions (4). In addition to the field notes I have collected a small amount of written material (announcement of the event, program for the camp, list of participants, handouts etc.) and e-mail responses from nine students to a questionnaire I send out to the participants two weeks after the camp. In the fieldwork, priority has been given to the investigation of the connections that are drawn between the participants and the heterogeneous actors made available to them over the course of the camp. This has been achieved by following a few groups of participants through all stages of the program: when they listened to lectures, met with experts, did group work and told about the progression of their projects at the plenary sessions. This narrow focus on a few projects gave a valuable insight into what these particular group members encountered, how they interacted with other actors, whether they

made new connections and eventually transformed their projects and was affected as knowing subjects. The themes of the five key projects were:

- 1) Generating energy from motion
- 2) Seaweed as a sunscreen agent in sun lotion
- 3) Organic light emitting diodes
- 4) Enzymatic synthesis of aspartame
- 5) Einstein's special theory of relativity

The first project turned out to be the key project of the study. I attended all their consultations, I met with them several times for informal talks, and two of the three group members responded to my e-mail questionnaire. I observed the other projects at one consultation each and had informal talks with all of them. Two of them answered my e-mail. Because of my methodological priority of following some participants through all stages of the program, the study does not claim to represent how all participants have been affected as science talents at the camp. All though they have all listened to the same lectures, which present particular images of how to become a science talent, they may interpret, negotiate and position themselves in various ways in the talent assemblage. Furthermore, the Innovation Camp that I chose as the empirical field for this study represents only some of the activities that takes place at Science Talents. The camp's strong orientation towards enterprise and innovation may not be as prominent at some of the other courses offered by the institution. Well aware that the knowing subject is likely to vary from talent program to talent program and from student to student, the present study offers an insight into the principles of how a science talent assembles and how particular assemblages affect how the knowing subject relates to knowledge, school and the wider community.

The analysis is divided into two parts: 1) An analysis of how talent is assembled discursively at the camp. 2) An analysis of how the participants enact natural science talent.

Part 1: Discursive assemblage of a natural science talent

The programme at the innovation camp was comprised of lectures, consultations with experts, group-work with a focus on the participants' own projects and presentations in plenum. In this section of the analysis, I focus on the lectures, which discursively created specific connections between the participants, their projects and scientific knowledge in a network of numerous other

actors. The lectures constituted the participants and their projects in ways that were different from their schools. By following the three steps that were presented in the introductory lecture, I show how the participants were invited to consider themselves as either entrepreneurs or basic scientists, and their specialisation projects as something other and more than 'merely' a school exercise.



Three steps to become a science talent

The introductory lecture, titled "From idea to exit", was delivered by one of the organisers of the innovation camp, who presented himself as someone who could see the idea within the idea. According to him, a 'good' idea must contain at least the following two elements: it must be unique knowledge, and there must be a market for it. The latter means that the idea must solve a problem for a particular group of people, and that it can be converted into a marketable product. The development of an idea into a marketable product involves a number of other people, as well as the entrepreneur him/herself. Therefore, it is essential from the very beginning that the participant be able to describe his/her concept in order to convince others that it is a good idea. To do so, one must have a business plan that describes the idea and one's plans for developing it. Then one must realise the business plan; i.e., work on developing the idea to the point at which it may be handed over to other actors. The lecturer called this 'choosing a good exit for the project'.

The lecturer addressed the participants as though they were already dedicated entrepreneurs with a shared ambition to start their own businesses and get rich from their inventions.¹ For most (but not all) of the participants, being the boss of their own company was according to the informal talks I had with the participants later at the camp still a distant idea. The lecturer introduced criteria for judging a 'good' idea that were radically different from the criteria associated with how knowledge is generally practiced at school. For instance, he did not say that the participants should have in-depth and thorough knowledge of a subject; rather, he said that they must have 'unique' knowledge.

The knowledge that is valuable at the camp is not the knowledge that is described in textbooks or scientific journals. On the contrary, valuable knowledge is that which no one else has access to, and which one may eventually be able to publish in a scientific article after one has patented his/her idea. In addition, the value of knowledge is not measured in terms of what it contributes to developing an academic discipline; instead, it is assessed based on what it is worth in the commercial marketplace. Therefore, one might have unique knowledge, but if there is no market for it, then in principle it is worthless. The point is that knowledge in and of itself is not worth anything. From the viewpoint of an entrepreneur, it must be linked to other actors, such as manufacturers, patents, investments, etc. From the viewpoint of a scientific researcher, knowledge must be linked to research colleagues, heads of research programmes, grants, etc.

The third assumption that the lecturer dispelled is that a good idea will disseminate itself. He repeatedly emphasised that it is important to practise explaining what one's idea is about. Through these explanations, a good idea becomes connected to the actors that are necessary for it to become a product, or for it to lead to a research career. This applies to both prospective entrepreneurs and scientific researchers: they must create a narrative about their ideas and be capable of relating this in a convincing manner. Thus, in the camp's introductory lecture, it is possible to identify three steps for becoming a science talent:

- 1) They should focus on what is unique about their project
- 2) They should become capable of explaining why the project is relevant and interesting
- 3) They should develop a narrative about the project to mobilise key external actors (whether in the marketplace or in the research field)

The first speaker did not present the three steps as a procedure as such but it was implied in the lecture and in the overall program for the camp that the participants could improve their projects by following those lines. In this sense, the first speaker encouraged the participants to take certain actions to improve their projects and the following speakers sketched out in details how to do it. If we use the concepts of distribution and centring to consider the three steps, the first step refer back to the participant him/herself; a centring, as the talent elucidates the value of the project and his/her own knowledge capital. The second and third steps point outwards, towards other actors: a distribution of the project to increase its value.

Unique knowledge is valuable knowledge

At this point the science talent appears as an entity assembled by the subject as 'entrepreneur' with a project with potential value for some body based on a unique knowledge.² This particular assemblage of the knowing subject is developed further in the lectures. These elaborations disclose how relations to external actors transform accordingly.

Several different actors helped the participants to identify the unique knowledge in their projects. The key actor in this process is a patent lawyer – the founder and administrative director of a patent bureau – who changed how participants saw their own projects. She explained that a patent is a means to protect the unique knowledge of a project by prohibiting others from producing, marketing, selling or using it during the patent period. This means that the participants must regard their projects as

¹ The article could have embraced the issue of race and class, or taken an intersectional approach. I am aware that this would increase the value of the analysis, although due to limited space and despite the relevance of gender in the history of entrepreneurship, I have chosen not to examine these issues here.

² The notions of 'entrepreneur' is not a predefined concepts with a specific ontological meaning. It should be understood as a notion of a particular kind of science talent that is about to unfold in the field. The notion is launched by the first speaker and further developed in some variety by the following speakers. For the participants 'the entrepreneur' comes to represent a subject position they are encouraged to enter and from where they can enact science talent properly.



unique knowledge as soon as they start to consider whether their ideas can be patented, whether there are existing patents in their subject area and how they should protect their ideas until they are granted a patent.

Other actors at the camp also emphasised the importance of protecting the projects' unique knowledge. Several times during the competition, I heard about how the winners of 'Young Researchers 2011' missed out on the opportunity to patent their idea. They had made a little gadget called 'bolt strips' that could be used to assemble flat-pack furniture (e.g., from IKEA) without using tools. They had the device on their stand so that the judges could see it. Afterwards, they learned that showcasing their idea at the competition was considered making it public – in principle, their idea became public property. As a result, they were unable to patent it and may have missed out on significant profits. One of the previous year's winners came to the camp one evening to share his experiences with the 2012 participants. He showed them pictures from the 2011 competition and confirmed the story about the unplanned disclosure. His story affected both the organisers and the participants, who did not want to repeat the same mistake.

The idea of unique knowledge (in this case, from a market perspective) contributes to how relationships form between the participants and the actors they hope to collaborate with in developing their projects. However, one problem is that companies they contact to find out whether they would be interested in producing the invention may steal their idea. The solution to this is to have a 'non-disclosure agreement', which was mentioned both in plenum and in the individual consultations. There is also a potential problem with regard to the relationship between participants and any consultants who are brought in to develop the idea. No matter how small their contribution, they become a stakeholder in the final product. The patent lawyer explained that the solution is to draft an agreement wherein the consultant will transfer all of his/her rights to the inventor.

So, when the camp participants begin to view their specialisation projects as unique knowledge in this way, their relationships to external actors become problematic. In order to anticipate problems that may arise in the future, they are forced to think strategically before entering into such relationships. As a pedagogical worst-case scenario, the story about the previous year's winners was useful, as it demonstrated what can happen if one does not exercise due diligence. Unique knowledge, patents, non-disclosure agreement forms, agreements about transferring ownership rights and stories about losing rights are some of the actors that are made available to participants at the camp. They can be understood as symbolic and legal actors that help form relationships between the participants and the external actors, but they also contribute to forming the participants' self-perceptions and the ways in which they view their own projects. When these actors are linked to a school specialisation project, the relationship between the student and knowledge thus transforms into a proprietary relationship. The

knowledge produced is transformed from being a representation of the students' learning and viewpoint to being the student's property and intellectual capital. Rather than being something a teacher can use to guide and evaluate a student, it becomes something the student him/herself can use to start a business or promote him/herself as scientific-research talent; thus, the capacity to act shifts from the teacher to the student. However, not all of the camp participants considered the allocation of the capacity to act that result from centring in this assemblage to be something positive. I examine this more closely in Part 2 of the analysis.

Presentation techniques

The second step presented in the introductory lecture focused on how to communicate 'the good idea'. This was followed up on the third day of the camp with a lecture by a theatrical director who discussed how to present ideas and make contact with one's audience; her lecture had a significant influence on how the participants viewed their own projects. First, she drew a diagram of three concentric circles: in the innermost circle, she wrote "why"; in the middle circle, she wrote "how"; and in the outermost, "what". In order to make contact with the target audience, she explained, participants must get into the central circle and describe why they are doing their projects. The director said that most people make the mistake of thinking that an audience is only interested in what they are doing. But in fact, why they are doing it is even more interesting. But talking about "why" means talking about yourself: "You will give them a piece of who you are," she said. Her main message was that the participants should consider why they were investing time and energy into their projects, rather than simply presenting facts about them.

When the director's message was brought into a forum comprised of upper-secondary school students, it created a distinction between science student and science talent. All of the participants' projects were based on a topic with which they had worked at school; in other words, they were embedded in the curriculum that is traditionally used for scientific disciplines. Even though certain themes sparked their interest, it had not been necessary for them to explain why they became personally interested in the topics they chose: the school context does not require a student to consider the "why". On the other hand, at the camp, there was a clear expectation that the participants should be able to explain their choice of topic. Here, their task was to convince others that their project was both interesting and relevant, as well as being well-thought-out and well-executed. In other words, they had to assume their role as either an entrepreneur or a scientific researcher.

Learning presentation techniques introduces an emphasis on science as something that is conducted in a communicative context. Here, the project – in addition to referring to academic scientific competences – also has a sender and a receiver. Whereas the participants originally focused on their projects' reference to academic material, at this point in the camp, they were becoming



aware of its communicative function: they must inspire external actors' interest in the project, and these receivers must perceive the sender to be full of talent. Therefore, when presenting a project, they were told, it is important to improve the impression made by the sender.

Along with the participants' awareness of their unique knowledge, learning these presentation techniques helped to transform their subjectivity and equip them with the capacity to act. First, they became aware of themselves as senders of a professional message. For example, in the following quote, one participant described how the theatrical director helped to improve the participant's oral presentation: "Suddenly, I became aware of how I was standing while I was making my presentation." In general, the participants became aware of themselves as embodied

carriers of their own unique knowledge and 'the good idea'. They also realised that the way they stand and how they dress makes a difference in terms of establishing a positive relationship with the judges. Additionally, they became aware of the affective element; specifically, that they had to convince the judges (and other actors) of their projects' excellence by displaying enthusiasm. The participants were explicitly urged to invest and perform enthusiasm in their projects in order to win. One of the participants made a distinction between the expectations of them at HTX (technical colleges) and at the camp: "HTX is academic; here, it's about performing. [...] At HTX, the students aren't asked 'why' – that's irrelevant at HTX." Thus, presentation techniques produce certain affects both in terms of certain preferred emotions and in terms of placing the participant in the centre of a knowledge producing and communicating network.

Part 2: Enactments of a natural science talent

The second part of the programme offered the participant the opportunity to consult various experts with their science projects. This allowed them to enact science talent in accordance with the assemblage sketched out in the lectures. The consultations can be seen as actual extensions of the students' science projects. In these sessions they are offered the opportunity to distribute their projects in a wider assemblage while assuming the centre position as science talent themselves. I followed the same project group, which had three members, through several consultations. The group was trying to generate energy from motion, wherein the deformation of small crystals generates energy. Their project attempted to exploit these properties in laptop computers, for example, so that the battery would be recharged while a person was typing. The group had worked on the theoretical aspects of the crystals' properties in their school specialisation project.

They started by speaking to a materials expert. He asked if they knew how much electricity the crystals generated; they knew that the crystals generated around 10 volts. He pointed out that they should also find out how many amperes they could generate. The group was told that the next step in their work was to carry out a 'proof of concept'. This meant that they should measure how much electricity would be generated by deforming the crystals. This information was necessary to assess which kinds of devices they could supply with electricity. In other words, they had to work out whether their idea would be capable of solving the problem of powering a laptop computer. Alternatively, they should consider which problems it would actually be able to solve. For example, was it more realistic to talk about extending the life of the battery, or should they apply their idea to devices that require less electricity?

Throughout the consultation, the expert identified knowledge that the group was lacking, and indicated specific ways for them to obtain this knowledge – either by conducting their own experiments, or by contacting actors who possess the knowledge they

lack. They were also referred to two of the other consultants at the camp who could help them clarify a patent issue and determine how the idea could be turned into a business at some point in the future. In other words the group was advised on how to extend the assemblage and distribute their project to more experts with complementary competencies to the materials expert.

The materials expert addressed the group as carriers of an idea with limited but nevertheless unique knowledge about the energy in crystals, and they were given suggestions for how to develop their unique knowledge with the aim of determining whether or not the idea could be transformed into an actual product. In other words, the conversation was based on the premise that knowledge is not just something one has, but something that should be used to solve an existing problem.

The group's next consultation was with an expert in project management. The group members were clearly surprised that this expert was not interested in hearing about the scientific content of their project. Rather, he immediately asked about the group's division of labour: "Who was able to make decisions if the group was not together in one place? Who was responsible for communication? Who was the secretary, compiling an overview of resources and a diary to develop their shared experience?" The group members found it hard to recognise themselves in the way he addressed them. They protested: "This just started off as a school project." The expert replied: "Take your own work seriously." The group responded: "We're the only second-year [of upper-secondary school, which is a total of three years] students here, and things are already heating up. A lot more business talk is being used." Despite the group's protests, the expert stuck to his message that it was important for them to learn to manage their own resources, and to set both short- and long-term goals. "It's a matter of becoming an adult and a professional," he said. Furthermore, he thought that the group should use their project



to achieve a more exciting university career. Their project was an opportunity to make contact with relevant researchers, he said, adding that most school specialisation projects are a waste of time. Apparently, if the project was to be anything other than a 'waste of time', it should be extended with actors from a project management assemblage in order to become a resource to establish a business or make strategic contacts in the research field. In this consultation, it became clear that the group's project was considered a resource that the group members could use strategically to realise their short- and long-term goals.

Not all of the groups felt as provoked by the project-management expert's advice about professionalising their projects. Many of the participants saw themselves as being closer to assuming the role of project managers of a natural science business. This group's consultation with this expert did however create a clear distinction between how knowledge should be handled in the contexts of school and talent program as he established becoming adult and professional as the desired alternative to the subject position they in his eyes were stuck.

Negotiating subjectivities as natural science talent

I talked to the group I followed after their first two consultations. They were surprised that their project was being treated as a product that should be patented and that they should start their own company. It had started out as a school project that their teacher had said was so good that it should be sent in to 'Young Researchers 2012'. One of them said, "It would be fun, and there were some great prizes. And suddenly, here we are!"

Their statements show that, at that point, they were not willing to sever the ties to their original school network. Instead, they were trying to extend the school network with the 'competition' actor without necessarily having to transform the project into a product or a business; to that end, they were able to use the guidance of the materials expert. They explained that he gave them concrete advice about i.e. how they could develop their idea in order to do well in the competition. At this point in the group's narrative, they distinguished between the competition and the idea of starting their own business; this is in contrast to the narrative that placed the business as a long-term goal that was an extension of the competition, which was a short-term goal.

Consequently, they categorised the project-management expert, along with several of the other consultants, as relevant to participants with projects that were at the final stages of development. In other words, the group members were building an assemblage, which, according to Latour (2005), should be understood as a dynamic union of heterogeneous actors, consisting of the competition 'Young Researchers 2012', plus the materials expert and other consultants who could improve their performance

in the final; an assemblage in which they are involved as 'students' and their project as 'a good school project'. On Saturday evening during the presentations in plenum, the group members confirmed this assemblage when they explained that, earlier that day, they had clarified the relationship between theory and the application of their idea, and they had decided to focus on the theoretical dimensions of their project in the final. Thus, by making a distinction between the theoretical and practical aspects of their project, they separated themselves from the business component and the impending subjectivities of entrepreneur and self-employed business owner. However, the group members did not object to the market logic by indicating that the marketplace is just one possible network among many others that were not mentioned at the camp, and thereby made visible as conditions of possibility for an alternative way of developing their project and the formation of themselves as a different kind of knowing subject.

After the competition's final, I had contact with this group again when they responded to a mail that I sent to all of the camp participants. In this mail, I asked them, among other things, what would happen with their project in the future. This group responded: "When we have finished our exams and so on, and we start the third year, we have talked about further developing the project. We see no reason not to. We will look more closely at the possible applications of the knowledge we have gained in relation to the project." By this stage of the process, the group members had become more willing to work on applying their theoretical knowledge. Even though, during the camp, they resisted being enrolled into an assemblage that would turn their project into a potential business and themselves into entrepreneurs, this no longer seemed to be threatening. This may be because they are now willing to market their knowledge, or because they have found ways of making their knowledge available to non-capitalist stakeholders. However, in their response to my questions, there were several indications that their project is being transformed according to the steps that were presented at the camp. For example, one of them wrote, " ...The project has become much more important, and I am much more passionate about it now than I was at the beginning when it was just an idea. The whole process – from the idea to the practical execution – was really exciting." They also wrote, "What started as a specialisation project quickly became much more serious." They obviously now consider their project to be something other and more (serious) than an academic exercise, and they have adopted aspects of the terminology used by the project-management expert when he encouraged them to take themselves and their project seriously. The group members have apparently begun to transform their project from a school project to an innovation project in which they can assume a central position as professional entrepreneurs as they learned at Science Talents.



Assuming central or peripheral positions in the Science Talent network

The members of the group I followed are not the only ones who had issues with the talent network that was outlined at the camp. All of the participants encountered different types of challenges and had different considerations about what is involved in becoming a science talent.

For some of them, it was relatively easy. This was the case for two participants who were working together on a project to use seaweed as a sunscreen agent in sun-lotions. In their response to the questions I mailed them, they articulated their own development by saying that they had become better at presenting their project. They also felt as though they were being taken seriously, which inspired them to work on their project even more. They thought that the consultants seemed genuinely interested in helping them, and that they worked with them in a different way than their teachers at HTX; the consultants helped them to visualise the alternative possibilities for their project. In contrast to the group described above, this group had no problem with transcending the student role by talking about themselves as entrepreneurs and using the discursive actors they encountered at the camp. Furthermore, they said that one of the consultants, a patent lawyer at a university, had offered to get them in contact with another lawyer who could help them to protect their project. He could get them an hour of consultation for 1,000 Danish kroner (about 175 US dollars or 135 Euros). This was now a matter of distribution by investing real money into the project – not just the points they had used to bid for time with the consultants at the camp. In this way, the project's status had changed from being a school project, where the most important thing was what they learned in the process, to becoming an innovative project that they could invest in to make a future profit.

Another group, who was working with organic LED lights, had also accepted an offer to transform their idea from a school project into an innovation project. Their specialisation project was originally an exercise in Design and Production. It had changed in the respect that they had added something personal in order to consider the "why" (i.e., why they had become interested in the idea), which they said had not been relevant at HTX. In other words, their project that originally was entangled in a school assemblage was brought into contact with certain emotions of enthusiasm and dedication. They emphasised that the consultants at the camp had treated them professionally and that they were serious about their project. The words 'professional' and 'serious' can be seen as markers for the position that they expect to assume at the centre of the talent network. The enrolment of these new actors placed themselves in a position as science talents who personally vouched for the projects relevance and value as investment object.

There were also participants who refused to enact science talent in the way it was assembled at the camp as a market-oriented entrepreneur or an authoritative basic researcher. This was the case for

one participant who was working on a new way to make artificial sweeteners. He said that his project had not moved forward, so for him, the premise remained unchanged and he focused only on the 'Young Researchers 2012' competition element. What he gained from the camp was that he had been able to repeat his aspartame experiment in one of the laboratories at Science Talents. It was not difficult to spot the unique aspects of his project (i.e., a new and easier way to produce aspartame), but he did not make it the object of strategic consideration – perhaps because he had not identified the "why" of his project. During the semi-finals, one of the judges called him a "great craftsman" in the laboratory. By the end of the camp it had not changed. Apparently, he preferred to remain in a peripheral position of the talent network promoted at the camp.

Another participant found herself marginalized in the talent network offered at the camp. This was the case for a participant who was working on Einstein's special theory of relativity. She found it difficult to develop her project in connection with the actors that were available at the camp, because she was working with a scientific theme that utilised a perspective based on the history of science. With her project, she aimed to understand why it was Albert Einstein who had a breakthrough with his theory, despite the fact that another scientist had already proven the same things in a different way. She felt that her project was on the periphery of the camp's definition of 'science' as an actor that is relevant in the marketplace; she felt that this definition, to a great extent, was orientated towards products and industry. She was not interested in gaining a profit from her project, and she felt it was difficult to make it more technical. She was not using theories from the natural sciences, but rather those from philosophy of science and history. She did in fact enact science talent by speaking with two consultants at the camp: one helped her improve her presentation, and the other put her in touch with a well-known science historian, several of whose books she had read.

The difficulties this participant encountered in relation to establishing a new assemblage with her project were not linked to her refusing the premise that she should centre herself in an assemblage and create new strategic connections. Rather, it was because the professional framework at the camp was too narrow to encompass her project, although one might say that making contact with the science historian could help her improve her position in a relevant domain.

However, the irony is that this participant experienced the turn of events as a tragedy. She was fascinated by science's use of deductive methods, which she considers beautiful, but the nature of her project took her away from these methods and into the realm of the history of science. Her example shows how the projects themselves become actors in the networks, they can either take participants in a direction they want to go or lead them astray towards unwanted becomings: hard core scientific researcher vs. humanist science historian.



The micro-politics of science talent programs

One of the things the talent concept draws from the world of sport into the field of education is the popular notion that talent is a simple question of a particularly high level of competence within a given field. In view of this understanding, a talent program constitutes a neutral continuation of the teaching taking place in the general school system. In talent programs, it is assumed that scholarly subjects are taught only at a higher level and it is often phrased as if talent programs simply address students who have the ability and desire to learn more. The Danish sociologist Inge Kryger showed in connection with a study of women in elite sports already in 1999 that athletes belonging to the elite have a completely different practice in training and competitions than those at the levels below (Kryger Pedersen 1999). They do not just do the same. They do it differently. This study of the innovation camp on Science Talents shows, in continuation of Kryger's point, that talent programs do not just build a level on top of the school's learning. The study shows that they rather establish a parallel social practice with other criteria to assess and use knowledge (Latour & Woolgar 1979; Knorr-Cetina 1981).

At the camp, the students participated in a social practice where they should take certain actions to become a science talent. They should find the unique knowledge in their projects and explain why they found the projects interesting and incorporate these insights into the way they approached other actors; and the answers to why they found their projects relevant should ideally be accommodated within the market logic. By entering into this particular social practice, some of the participants gradually transformed their student subjectivity into a subjectivity as market-oriented entrepreneur. The analysis has shown that the special version of talent they enacted at the camp meant that the participants personally vouched for their projects as they learned to associate some particular feelings of enthusiasm and commitment, and seriousness and professionalism. During the innovation camp, the participants' school projects transformed to a valuable commodity they had to protect and treat strategically when they met with actors in the community. In turn, these actors became either associates or competitors in the market place. The knowledgeable subject became a strategically thinking subject, aware of how they can use and make knowledge profitable.

The networks that sustain the geniuses described by Mialet (2008, 2012) are primarily different from the networks that constitute Science Talent in their degree of branching and stability. In a number of ways, the geniuses' networks function as well-oiled machines or "black boxes" (Latour 1987) that fade into the background and allow them to appear as autonomous subjects who think, speak, give lectures and write books (Mialet 2012). These networks are tailored to the geniuses' professional and personal

needs. In contrast, at the camp, there is a wide gap between the individual participants and the network. At the camp, generally the participants are the ones who have to adapt to the network. The study also showed that not all participants are willing to do so. Like Clark/Keefe (2014) points out in her study about how college students experience their own becoming the participants' considerations concerned in different ways what it would imply for them to become a science talent. They asked themselves if this was the kind of talent they would like to be? Did they feel comfortable in the role of the entrepreneur who was starting up his/her own business? Was that what they wanted to do with their projects? Where would this knowledge practice bring them and their projects? Most participants found the offer attractive and centered themselves in the network, and some, was positioned or positioned themselves more marginally in the talent network, such as the good craftsman or the misplaced science historian.

Even though most participants seemingly thrived at the camp it is striking that among a group of students with shared interest in natural science, some students become marginalized due to the way talent is assembled at the camp. Marginalization has a decisive influence on these participants' benefit from the talent program, as they can (or will) only use a limited part of the learning offer that is compatible with how they want to enact science talent and what their projects afford. Since the camp is only on for three days the consequences of this marginalization probably does not pose at big problem for those participants who are unable or unwilling to center themselves in the network. Nevertheless, the case tells us that it is important to keep in mind that the practiced talent subjectivities do not become too narrow when the national education systems continue the expansion of talent programs. It is important that the expansion is based on relatively spacious talent definitions or that it expands with a variety of different programs that allow more types of talent to gain existence.

In view of the special position that Science Talents have achieved in the Danish as well as in the Nordic context of science education, as the only permanent place for science talent management, it is important that Science Talents speak to a diversity of understandings of what a natural science talent can be and how it can be developed. On a more general level, it must be noted that it is not sufficient to assess national talent programs on whether there are qualified offers for the particularly skilled students. This study shows that one must also take into consideration the micro-politics of talent programs. This means that we must look to how they contribute to a subtle transformation of students' understandings of what knowledge is, what is considered valuable knowledge in society, how it should be handled and how students come to understand their own role as knowing subjects in society.



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WHAT IS THE MEANING OF SHARING: INFORMING, BEING INFORMED OR INFORMATION OVERLOAD?

An explorative study of implementing an Enterprise Social Media Platform in a public organization

by Halvdan Haugsbakken

In recent years, several Norwegian public organizations have introduced Enterprise Social Media Platforms. The rationale for their implementation pertains to a goal of improving internal communications and work processes in organizational life. Such objectives can be attained on the condition that employees adopt the platform and embrace the practice of sharing. Although sharing work on Enterprise Social Media Platforms can bring benefits, making sense of the practice of sharing constitutes a challenge. In this regard, the paper performs an analysis on a case whereby an Enterprise Social Media Platform was introduced in a Norwegian public organization. The analytical focus is on the challenges and experiences of making sense of the practice of sharing. The research results show that users faced challenges in making sense of sharing. The paper indicates that sharing is interpreted and performed as an informing practice, which results in an information overload problem and causes users to become disengaged. The study suggests a continued need for the application of theoretical lenses that emphasize interpretation and practice in the implementation of new digital technologies in organizations.

Keywords: enterprise social media, sharing, public organizations, Norway

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Introduction

In the last decade, many private and public organizations have started to take great interest in Enterprise Social Media Platforms (ESMPs) (Leonardi, Huysman, & Steinfield 2013). ESMPs, a term that implies an expansion of Enterprise 2.0 (McAfee 2006), refers to a platform used for internal communication in organizations. ESMPs contain a range of features that are used to share and organize information, such as tagging systems, user profiles, search engines, follower features, discussion boards, and group features. Known examples of ESMPs are Yammer and Facebook@work. The platforms are assumed to bring a range of benefits for organizations and for the organization of work processes. These benefits can include enhancement of the quality of internal communications and workflows. A central practice related to the successful use of ESMPs is active engagement by users or employees through the sharing or co-creation of content, although the workplace principle is not always easy to put into practice.

Since the end of the 2000s, several large Norwegian private and public organizations have introduced ESMPs to their employees. The incentive for their acquisition is motivated by various goals. For example, they can reduce internal organizational barriers, enhance organizational communications, and cut down on time spent sending e-mails. In this way, one can attain a greater overview of organizational activities and the competencies of employees. In this regard, ESMPs are presented as a solution that can contribute to solving traditional management challenges that are faced daily by public organizations. In the wake of this development, discourses focusing on the importance of sharing in organizations emerge. Top and middle managers stress the sharing of work and engagement via ESMPs as means of bringing about organizational change and unity and

the use of digital technologies in work life. Surfing on the top of such management discourses is an emphasis that employees embrace a "sharing culture." Such developments substantiate the importance of analyzing the meaning of sharing through social constructionist research perspectives regarding the use of technology in organizations.

In 2012, a Norwegian County Authority decided to upgrade its intranet to become an ESMP, an effort initiated by the top management. The goal was to simplify the worksurface because the employees previously worked across separate forms of ICTs. A further objective was to transfer work practices from e-mail and local storage to the newly acquired platform by sharing. Although the technical implementation of the ESMP was successful, the top management found that employees were not sharing work as intended. By using a practice perspective on technology and the organizing of work and related research on Enterprise Social Media (Orlikowski 2000; Orlikowski & Gash 1994), this paper questions how a group of employees working in the County Authority interpret the meaning of sharing and put it into practice through the ESMP. The use of a practice perspective indicates that employees face challenges in interpreting the meaning of sharing. Sharing is interpreted and performed as an informing practice, which results in an information overload problem and disengaged users. In order to tackle the research question, the paper is divided into different parts. The following section addresses the scholarly discussion upon which the study is based. Thereafter, the research strategies used to complete this study are outlined. The research findings are subsequently presented, before the research results are discussed in relation to the relevant research horizon. The final part concludes the paper.

Theoretical perspective

Sharing has emerged as a significant social action performed by billions of social media users worldwide. In general, sharing brings with it a range of claimed unintended consequences (Merton 1936), and can be defined as a practice that originates in reconstituting dynamics and reciprocal relationships between the material properties of social media and social action. As such, it has affected the organization of social life. For example, what people share on social media draws media attention and is predicted by traditional media as having positive and negative effects on our well-being. The sharing of experiences can create community awareness on civic matters that are important to society, but also accusations of egocentric behavior. We also see that ongoing online socialization may lead to new mediated practices such as phubbing and digital detox. Phubbing is defined as the act of ignoring a person's surroundings through the use of a cellphone, which is deemed an impolite action. Digital detox is understood as a period in which a person stops using electronic connecting devices such as smart

phones and tablets. These indicate that the organization of communicative practices in the digital sphere can become unmanageable and chaotic. Although research on social media and sharing has proliferated, organization researchers have yet to fully frame the impact of sharing on organizational life.

In consequence, such dynamics call for the development of a research perspective that discusses the meaning of sharing in organizations by use of ESMPs, especially where sharing assumes a different role than that intended. This argument is valid for several reasons. Surprisingly, organizational scholars who study knowledge-sharing processes by use of knowledge management systems (for example) claim that what is actually shared by users on platforms for the sharing of work has yet to be adequately framed (Ardichvili, Page, & Wentling 2003). In particular, a knowledge gap seems to exist regarding the formation of sharing processes and how this is related to emergent properties coming from the use of



recursive technology in work processes (Kosonen 2009). Instead, the knowledge management research stream has examined pre-defined assumptions of sharing (Chen & Hung 2010; Wasko & Faraj 2005) and conditions that prevent the sharing of knowledge in virtual communities (Ardichvili 2008; Ardichvili, Maurer, Li, Went Ling, & Stuedemann 2006; Ardichvili et al. 2003).

With the advent of ESMPs in organizations I argue that there is an urgent need to formulate and facilitate a new and much broader research agenda. This has been seen in organizational research, which has introduced new definitions of platforms and has criticized existing definitions of social media for their shortcomings. An example of a new definition is Enterprise Social Media, which is defined as: "web-based platforms that allow workers to (1) communicate messages with specific coworkers or broadcast messages to everyone in the organization; (2) explicitly indicate or implicitly reveal particular coworkers as communication partners; (3) post, edit, and sort text and files linked to themselves or others; and (4) view the messages, connections, text, and files communicated, posted, edited, and sorted by anyone else in the organization at any time of their choosing" (Leonardi et al. 2013: 2). This definition is a modified version of Kaplan and Haenlein's (2010: 61), who define social media as a "group of Internet-based applications that build on the ideological and technological foundations of Web 2.0, and that allow the creation and exchange of User Generated Content."

Current definitions of social media are criticized for failing to adequately explain organizational processes (Treem & Leonardi 2012). To accommodate these limitations, we find an emerging body of research studying ESMPs that uses a social constructionist research lens on technology and the organization of work (Leonardi & Barley 2010). This research stream has (among others) developed an affordance perspective (Gibson 1986) to grasp the impact of ESMPs in organizations. Affordance (Gibson 1986) stresses the advantages of technologies. It argues that technologies can be perceived as beneficial in performing activities without paying attention to what an object "is," that is, to ask what it can afford (Treem & Leonardi 2012). The focus on perception means to put emphasis on an object's utility, and affordance provides the possibility of understanding action potential and the capabilities of a technology, and how it can be linked to processes in organizations (Treem & Leonardi 2012). The affordance lens is used to place greater emphasis on the meaning of materiality, which is said to have diminished in value as other concepts dominate the research agenda, such as sociomateriality (Mutch 2013). Affordance is linked to critical theory, which is deemed as providing new innovative ways of addressing the relationships between materiality and immateriality (Leonardi 2013). A critical theory approach assumes the existence of multiple realities that operate interchangeably and independently of one another, with the implication that actors and objects are self-contained entities that influence each other through impacts or social interaction (Leonardi 2013).

In contrast, sociomateriality (Orlikowski 2007), which draws on influences from Actor-Network-Theory (Callon 1986; Latour 1987, 2005), has emerged as an alternative sub-research stream to understanding the impact of social media in organizational studies. Sociomateriality, which assumes that "materiality is intrinsic to everyday activities and relations" (Orlikowski & Scott 2008, 455), provides an alternative approach to understanding the meaning of technology and therefore what the potential consequences of social media might entail. Orlikowski argues that previous understandings of materiality in management studies were framed around an ontology of separateness (Suchman 2007), in which one theorized that the material and the immaterial are separate entities and realities (Orlikowski 2010). Sociomateriality instead argues that they should be seen as linked, equal, and inseparable, which means addressing a relational ontology. Therefore, future organizational researchers with an interest in social media could study technological artifacts "symmetrically to the humans, and as equivalent participants in a network of humans and non-humans that (temporarily) align to achieve particular effects" (Orlikowski 2010, 135). In this regard, Orlikowski and Scott (2014) apply a sociomaterial practice perspective in one of their latest research works on valuation regimes. They demonstrate that online evaluations of hotels performed by users on social media have drastic impact on the domestic travel industry (Orlikowski & Scott 2014).

However, an important argument running through the above literature is the requirement for more theorizing. Current research focuses on a particular platform or features, leading to a claim that researchers are incapable of making inferences about the consequences of the material for organizing (Leonardi et al. 2013). Current definitions of ESMPs are too application-focused and overlook the social dynamics and reciprocal relationships between the material and the immaterial (Leonardi et al. 2013). Treem and Leonardi (2012) argue that this causes scholars to fail to possess sufficient terminology to explain the ways in which ESMPs can influence social behavior and to generalize matters to organizations across contexts. Here, the affordance lens offers researchers the possibility of making interesting analyses regarding the ways in which ESMPs influence organizational processes such as socialization and power aspects in organizations. Research has suggested various affordances that ESMPs can give for organizational processes. For example, Treem and Leonardi (2012) suggest that ESMPs can enable four affordances: visibility, edibility, persistence and association. A case in point highlighting the meaning of a singular affordance is Treem and Leonardi's (2012) argument that the affordance visibility is seen when employees use an ESMP to make their behavior, knowledge, preferences and commutation network visible to others. They argue that actions like posting updates, showing a list of friends and writing personal profiles are beneficial and enable the visualization of work to third parties. Leonardi (2014, 2015) illustrates this point by showing that work interaction on an ESMP platform is pivotal for knowledge work and for the transfer of knowledge in a large organization. Based on a study of a financial service in the United States of America, Leonardi shows



that the use of a company's ESMP assists third-users to enhance awareness of meta knowledge, as one learns about the competencies of co-workers and the matters on which they are working. ESMPs can be used to make accurate interferences of people's meta knowledge and the sharing of co-workers' communication activities, and communicating via messenger software can offer innovative products and avoid the duplication of work. In a related study, Leonardi and Meyer (2015) develop the above claim in a study of a communications business unit in a telecommunication unit. Leonardi and Meyer test out a set of hypotheses and instances of knowledge transfer to show that when knowledge workers are exposed to communication activities on an ESMP, internal communication can be enhanced.

Beyond these works, researchers have theorized affordance in two other principle directions. First, we can identify works that conceive of affordance at a conceptual level. Second, researchers develop the term empirically through case study designs. An example of the former is a study by Majchrzak, Faraj, Kane, and Azad (2013), who demonstrate how ESMPs have four affordances to inspire engagement of visible knowledge conversations in organizations. These include met voicing, triggered attending, network-informed associating and generative role-taking. For example, met voicing would mean that an ESMP has the action capability to enable users to react to others' presence, profiles, content and activities. Ellison, Gibbs, and Weber (2015) develop a collective affordance and affordances for organizing, and explore the role of organizational affordances in light of the fact that organizations become distributed entities. The affordance lens needs to be broadened beyond the context of individual uses, which has been seen in many analyses. Ellison et al. (2015) note that the affordances of ESMPs can include concepts such as social capital dynamics, identity formation, context collapse and networked organizational structures. Fulk and Yuan (2013) argue that ESMPs have the affordance to solve organizational challenges and represent a preferable platform for organizing knowledge sharing in comparison to older knowledge management systems. Fulk and Yan argue that by combining transitive memory theory, public good theory and social capital theory, ESMPs have the affordance to deal with three associated challenges in the sharing of organizational knowledge. These include knowledge of the location of expertise in the organization, motivation to share knowledge, and the development and maintenance of relationships with knowledge providers. In considering work that uses the affordance lens for cases from organizational life, however, Vaast and Kaganer (2013) explore how organizations react to employees' adoption of ESMPs. Based on a sample of corporate policy documents, Vaast and Kaganer find that organizations view ESMPs as more of a risk than an asset. Oostervink, Agterberg and Huysman (2016) have undertaken a study connecting enactment to the affordance lens, as affordances are enacted in practice and institutional forces in an organization can shape how ESMPs are used by employees. Oostervink et al. point out that

the institutional logics of a corporation and employees' professional expertise shape the knowledge that employees share on ESMPs. Although the affordance of visibility and associability are assumed to enhance knowledge sharing in organizations, Gibbs, Rozaidi and Eisenberg (2013) find the opposite effect. They performed a study among a group of engineers and noted that engaging EMPSS create contradictions in workplace interactions. For example, constantly remaining accessible and open to other suggests that one is a hassle, thus causing employees to feel that they need to hide certain behaviors from others. Based on this finding, Gibbs et al. (2013) have suggested that scholars theorize affordance in terms of dichotomies, not singular affordance concepts. They establish three affordances with which users interact when they use an ESMP. These include visibility-invisibility tension, engagement-disengagement tension, and sharing-control tension.

Organizational researchers have also explored ESMPs from other angles. Research shows that employees are receptive to ESMPs in certain organizations: those that make and sell the technology, being IT companies and organizations with the resources to research the technology in large projects. In this regard, IBM's Beehive project is groundbreaking. One can read in numerous research papers the ways in which Beehive has been implemented and tested on IBM employees, as researchers have documented basic user behaviors. Researchers have focused on an entire ESMP (Ehrlich, Lin, & Griffiths-Fisher 2007) or on features such as tagging systems (Thom-Santelli, Muller, & Millen 2008) and user profiles (Dugan et al. 2008). Beehive research papers often use a social capital perspective (Steinfeld, DiMicco, Ellison, & Lampe 2009) to establish links between ESMP uses, and connecting strategies constitute a recurring theme. Researchers have identified that IBM employees use Beehive as a platform to expand their professional networks, using it to communicate with colleagues across organizational levels (Wu, DiMicco, & Millen 2010). IBM employees undertake a range of search and retrieving practices (Jennifer Thom-Santelli, Millen, & DiMicco 2010) and use Beehive as a knowledge repository (Thom-Santelli, Millen, & Gergle 2011). Other case studies on ESMPs in organizations other than IBM exist, but have yielded limited insights. They show that employees use ESMPs to streamline their online behavior to work practices and organizational affiliation (Zhang, Qu, Cody, & Wu 2010). Researchers have examined the challenges of adopting an organizational ESMPs. It is not uncommon to come across findings that highlight how employees continue to prefer to communicate via e-mail and chat software, and silently monitor news streams (Lüders 2013; Pettersen 2014, 2016). Consequently, one finds a pattern that a core group adopts SNS and maintains network activities, while a larger group uses 'older' forms of ICTs.

Therefore, the research horizon described appears limited and somewhat inchoate. Scholars have predominantly focused on the material properties of ESMPs and have contributed through



experimental theorizing. Absent from the research literature is the specific role that interpretation and practice take in employees' recursive use, with ESMPs a crucial aspect of work processes. Moreover, it appears that the research field has yet to adequately frame whether sharing can take on a different role than that intended, and what it means when technology is used differently in an organizational setting. This means that the research field can advance a research lens focusing on situations and enacting with emergent properties that come from the use of recursive technology, hence placing clearer emphasis on what people do with an ESMP. Thus, one can use a practice perspective on technology (Orlikowski 2000). A practice lens on ESMPs can also be used to fill a knowledge gap regarding the formation of knowledge-sharing processes in the use of ESMPs, facilitating our understanding of the unintended consequences of technology use in organizations. Here, Orlikowski and Gash's (1994) technological frames can be of assistance. Technological frames are defined as: "that subset of members' organizational frames that concern the assumptions, expectations, and knowledge they use to understand technology in organizations. This includes not only the nature and role of the technology itself, but the specific conditions, applications, and consequences of that technology in particular contexts" (Orlikowski & Gash 1994, 178). The concept can enable us to frame how individuals and social groups in organizations alike

make sense of a technology to determine their actions, allowing us to move beyond conceptualizing a technology's mere value and perception among users. Technological frames problematize the 'taken for granted' notions of a technology and can facilitate an understanding of how individuals and groups in organizations develop particular assumptions, expectations and knowledge of a new technology in an organizational setting. Orlikowski and Gash (1994) have illustrated technological frames in their study of the implementation of the groupware Notes in a consultant company. The researchers interviewed the implementers and adopters, grouping them into 'technologists' and 'users.' 'Technologists' was used to refer to technology staff, whereas 'users' comprised the organization's consultants. Orlikowski and Gash demonstrated a large set of differences in terms of expectations and actions, which they attributed to differences in technological frames. For example, the technologists viewed Notes as an enabler for information sharing, electronic communication, document management, and online discussion, which they believed could contribute to collaboration. The users' interpretation was different, viewing Notes' electronic e-mail features as a potential substitute for existing communication technologies such as fax and telephone. The technologists therefore framed Notes as a collaborative technology, whereas the users used it as a means for individual and personal communications.

About the case and methods

Norway is divided into nineteen large administrative units, called counties, and roughly 350 municipalities. Each county is governed by a County Authority (CA), rendering this form of governance the first form of subdivision in the country. The CA where the data for this case study were collected consists of a political structure, an administrative body, and welfare units. The political structure is an elected body consisting of the County Council, the County Executive Board, the County Principal Standing Committees, and the County Mayor. The County Council is supported by an administrative body, the County Administration, which implements and administers policies. The County Administration is organized into eight administrative units and an executive secretariat board. Other welfare units also exist, which play a role for citizens and produce services. Among others, these consist of high schools, libraries, dental services, and transportation. A large body of the CA workforce includes high school teachers, and in total the CA contains approximately 2,800 employees.

The study made use of an explorative qualitative research strategy. This approach was used to facilitate an in-depth investigation of the ways in which public employees working predominantly in the County Administration used the ESMP and interpreted sharing in an organizational setting. The study is primarily based

on qualitative research interviews. Written documentation was collected, but is not used as part of this paper and is thus excluded from the data analysis. However, the research design started with an informal approach to employees in the CA who had been responsible for the public procurement and implementation of the ESMP. They agreed to be part of the explorative qualitative study and recruited the informants. Eight informants were recruited, and they worked in different departments and holding positions, predominantly as advisors in the County Administration. The criterion for selection was that they were all users of or involved in the implementation of ESMP. In sum, eight semi-structured qualitative interviews with the use of a guide were completed. The interviews were undertaken one-to-one, meaning that only the researcher and the informant were present in the interview setting. Each interview lasted approximately one hour and focused on two main themes related to sharing: previous user sharing experience on social media, and how the individual used the ESMP to organize the sharing of work. Each interview was recorded using a digital audio recorder. The data were collected over two periods, from August to September 2013 and in February 2014. The study was based on informed consent and the informants were anonymized. The background of the informants is displayed in Table 1.



TABLE 1

Gender	Number	Position	Duration	Date
F	I-1	Advisor	1 hour	27 Aug, 2013
F	I-2	Middle Manager	1 hour	30 Aug, 2013
F	I-3	Advisor	1 hour	5 Sep, 2013
F	I-4	Exe. Director	1 hour	12 Feb, 2014
M	I-5	Advisor	1 hour	10 Feb, 2014
M	I-6	Advisor	1 hour	17 Feb, 2014
F	I-7	Consultant	1 hour	18 Feb, 2014
M	I-8	Advisor	1 hour	18 Feb, 2014

Table 1: The background of informants.

Data analysis

This section presents the data analysis and seeks to answer the research question addressed earlier in the paper: how does a group of employees in the CA interpret the meaning of sharing? The emphasis here is on breaking down this notion by presenting four emergent themes from the open coding of the interview

Theme 1: Sharing as a facilitator of organizational change

The first theme pertains to expectations of sharing as a facilitator of organizational change and represents an approach whereby top managers want their employees to work in a different way. This interpretation comes as little surprise, because the CA's top management was the initiator behind the ESMP. Sharing represents a "problem-solver" and can produce organizational belonging in the face of internal forces that may contradict unity. Certain professions, such as teachers – a large profession – are assumed to identify with the high schools in which they work and with their professional identity, rather than with a feeling of belonging to the CA. However, the motivation for implementing the social ESMP was related to disentangling a common problem with which most organizations struggle to cope today: escaping the meeting culture, e-mail overload, and the use of too many forms of IT:

There was a need to create an ESMP that considered the fact that we worked with various work surfaces. You had to open each system one at a time, just to approve an invoice. Our challenge was also to escape the 'hell of e-mail'. (I-4)

The top management aimed to simplify employees' work surface. This was related to the fact that employees worked across several

Once the interviews were completed, they were transcribed. The data analysis was inspired by an open coding strategy of the interview data. Here, the main focus was on finding emerging patterns, which consisted of grouping and comparing the informants' perceptions, user patterns, and experiences of sharing. The informants' answers were grouped into four broad themes. In order to offer the informants a voice, direct quotations are used in the data analysis.

TABLE 2

Theme No.	Name of theme
1	Sharing as a facilitator of organizational change
2	Sharing as a trigger for self-censorship and risk-taking
3	Sharing in separate digital ecosystems
4	Sharing as an individual informing strategy

Table 2: Emergent themes from the data analysis.

data. Each theme represents an adoption of the new workplace principle of sharing, and shows how individuals develop particular assumptions, expectations, and knowledge about its definition. Performing such an analysis can facilitate a clearer understanding of the meaning of sharing. The four themes are displayed in Table 2.

non-integrated ICTs and stored information in different places, making it challenging to create an overview. In response, the top management argued that a single site that could work as the central access point connecting all the employees was required. This would be realized by replacing the intranet with the ESMP. Therefore, a project group was created to work with various drafts of a new interface design, which would break an established work pattern in the CA. While the intranet was run as an internal website on which a group colleague wrote internal news stories, the new design suggested that the ESMP should be the main site opened by employees each day, with embedded sharing features and URL links to each internal IT system. In this way, the ESM would be the melting pot where everybody talked about work. Afterwards, an organizational discourse emphasizing the importance of a sharing culture emerged:

It was clear that we needed something that could enable us to work with the culture across [the organization], knowledge of each other's work. My responsibility has been to legitimize sharing in the management structure. Parallel to that, we made attempts to raise discussion about organizational culture and work processes internally. Should we establish a sharing culture,



in the sense that people can easily participate in and reinforce each other's work, or take part in reports, or take part in other kinds of things, take part in the knowledge we have, this requires a culture where [people] actively participate. (I-4)

However, translating and making sense of sharing into a manageable practice proved challenging, as it surfaced as ambiguous:

It sounds very good. It has a great positivity to it when it's presented, but not so great when you try it out in practice. At an early stage, there was a positive feel. You didn't know exactly what it was. There was this belief that we should change the work culture. (I-5)

Later, this awareness amplified as the initiators realized that the employees rarely started a work process by beginning from scratch – by creating a document in which everyone can engage, for example – but instead viewed sharing as an informing practice of circulating ready-made documents. A recurring theme was how sharing was directly linked to previous publishing habits.

The employees were accustomed to an article format, meaning that postings had an 'internal story' label attached to them. Participation involved performing simple tasks, like writing status updates, following colleagues, and updating profiles. The ESMP was an information channel where information was pushed out, not a platform in which one engaged in two-way dialogue. Furthermore, the employees fulfilled activities that required little commitment, such as posting a profile picture, writing status updates, tagging competence, or uploading completed documents. Beyond these actions there was little evidence that the users aimed to participate in activities requiring the performance of reciprocal actions:

Ninety percent of the information posted on the ESMP is not something that we've published. It's made by the organization. It has become a place where items are shared. It's divided between heavy and light documents. People share when documents are finished. You don't see many examples where people collaborate on a document, which is part of a work process. We haven't gone any further in changing work culture and the ways we work. (I-5)

Theme 2: Sharing as a trigger for self-censorship and risk-taking

The second theme emerging from the data analysis is that sharing includes a high degree of self-censorship and is associated with risk-taking. This pattern was seen among employees who use the ESMP and who were not part of the actual implementation process, who work across different departments and who are affiliated further down in the management structure. However, an interesting pattern consists of the ways in which earlier and alternative private social media platforms shape perceptions of appropriate net behavior. For example, the informants registered on social media services that became mainstream in the 2000s (the informants' use is displayed in Table 3). The data indicates that the informants had a strong passive and critical approach to participation. They saw the benefits of sharing, but demonstrated a 'reading and textbook' approach consisting of monitoring others' actions

and only frugally sharing about themselves. This molded a view that sharing was seldom regarded as a two-way communicative process between two parties:

I don't share information about what I've eaten for dinner, what I do during my evenings. I share if it is appropriate and relevant, not just one of those private things. Sometimes I post a picture of a mountain summit on Facebook. I have a pretty high threshold that the summit should be a little more interesting for others to see. (I-2)

Therefore, it is more accurate to maintain that communicative practices are based on being informed and to inform, which ignores how a goal is to engage with an equal to create knowledge. This

TABLE 3

Gender	Number	Position	Facebook	Twitter	LinkedIn	Instagram	Google Drive
F	I-1	Advisor	X	-	X	-	-
F	I-2	Middle Manager	X	X	X	X	-
F	I-3	Advisor	X	-	-	-	-
F	I-4	Exe. Director	X	X	X	-	-
M	I-5	Advisor	X	X	X	-	X
M	I-6	Advisor	X	-	-	-	-
F	I-7	Consultant	-	-	-	-	-
M	I-8	Advisor	X	X	X	-	X

Table 3: The informants' use of social media platforms.



is reflected in beliefs about socializing and the means of ascribing social media with personal labels. For example, Facebook belongs to the private sphere and is used for "scrolling after fun stuff and setting likes." LinkedIn is a "CV database," while Twitter is a medium where "one only sends URL links to news you have already read." Such beliefs hint at what is acceptable to share on which platform:

There are people who write things that shouldn't be shouted out loud. One gets the impression that, "I'm sad today". If anyone had a nice trip, which is worth writing about, then you can do it, by all means. It's easy to explain it, but when you see it, it gets difficult to say it with words. There are some things that are just a bit 'intimate', very personal stuff. It doesn't belong on social media, because it doesn't concern everybody. (I-6)

Grooming and gossiping are disregarded, and publishing of overly personal information evokes intimacy and is taboo. Instead, the informants had clear perceptions that what should be shared had to be interesting and relevant, meaning that the value of what can be shared has to be informative and of high quality. This creates boundaries delineating how one should engage on the ESMP, which are manifested in the form of distinctions. For example, the most common trait was to draw distinctions between work and non-work-related use, and external and internal use. Here, Twitter is work-related and is used because politicians interact in the Twittersphere, and it forms an arena for public debate. Some informants see Twitter as a "listening post" where one can monitor what is going on and to stay up-to-date with current events:

I use Twitter because it gives me something related to my work and because I follow public debates. So, I started paying attention to what was going on Twitter. In our department, we follow public debates. (I-8)

Consequently, one could expect that engaging on the ESMP should represent a challenge. Yet, the data suggest otherwise, as sharing on the ESMP was connected with risk-taking, expressed in the informants' views of their willingness to make a work process transparent to others. Here, the informants placed themselves on a scale from relatively open to very restricted in what they shared:

I try to set an example. When I create a document, I publish it right away. It says it's a document in progress, which we're working on. (I-2)

I don't have a problem with posting something that is not one hundred percent complete. I would have made it clear that this is 'work in progress' which I want feedback on. (I-5)

However, we also find examples illustrating the risk-taking associated with publishing work in progress. This is related to the idea

that informants assume that they can be criticized, meaning that published and unfinished work can create misunderstandings:

One thing is that some of us find it a bit uncomfortable to share things that are not finished, because then we get criticized. It becomes uncomfortable when it's not completed. If things are just published and not finished, it can cause more harm, because it creates sanctions on something that it was not intended to be. We have specific discussions within our work areas, documents concerning the management side and on the political aspects, which we publish. When things are at a certain stage, a working document, it is not intended that everybody should see it. If there are many who use it, they can abuse it in a number of contexts. (I-2)

The data also show that informants seek 'approval' from their closest manager to publish content on the ESMP. Rather than deciding independently, for example, as the basis for sharing a document, informants enforce a quality-safety practice where they ask permission from an authority in the management structure:

Things that are unfinished and not approved can create panic when it is a different figure from what you think is going to be on paper. If we begin to rewrite the CA's economy and everyone can read that, there will be something new to most people. Many people absorb it, even when it is wrong. It creates a lot of 'storm' in your organization if it is not correct. I can take an example from the corporate governance program, which has an indicator called 'financial statements and budgets', which shows how much of a deficit/surplus we have to date. It is an indicator that gets its numbers straight from our accounting system. When we updated the financial system, the indicator 'froze' itself in Corporater and showed figures from November 2013. This is a completely wrong figure. We have notified about that on the ESMP, but still I keep getting phone calls that the figures are wrong. (I-6)

Another informant gave a similar example:

If I am to work on a case, I want to have the final answer before I publish it. I can give you an example, which applies to the CA's dental clinics. When they want to send over a thing, in the process, things that go to debt collection arrive on my desk. I have not posted anything during the process because I wanted my manager to look at the draft along with other managers. It's the way that I work, the way I think: the routine should be completed before any dentist gets access. Considering that you want to have a unified management involved, they have to see the final result first. Then time passes, and we have a routine: we end up with draft C and D, until we finally land on something. (I-7)



Theme 3: Sharing in separate digital ecosystems

The third theme from the interview data illustrates the ways in which informants adopt social media services and construct knowledge-sharing processes that form part of a work process. Thus, it makes sense to state that the informants create separate digital ecosystems that are used when they perceive that the ordinary ICTs provided by the CA are insufficient to performing their work, which influences employees to look for alternatives, a technology-adoption that occurs 'under the radar' of the IT department.

Looking at particular practices, an informant explained how they combined Dropbox and Google Drive as part of a work process that was used to complete the organization of a public procurement. In several cases, the CA works together with the neighboring municipalities. As part of the process, the CA assumes the lead role as the public buyer and lead organizer, meaning that the CA acts on behalf of many municipalities to achieve greater benefits for all. This work requires collaboration with colleagues in other municipalities. In that regard, one can expect that colleagues in different municipalities have diverse needs and competencies, hence many persons voice different opinions and needs. This will lead to long e-mail exchanges and numerous attached documents, with the effect that one quickly loses the overview. Instead of sending back and forth large numbers of e-mails with large documents attached, the respondents used Dropbox or Google Drive to increase the efficiency and economy of the work process for everybody:

We created a Dropbox account because we don't have the same e-mail system or share the same case management system. And it's challenging. You don't get Dropbox solutions on the PCs here. The IT department thinks it's unsecure, [lacking] information security. We need tools to do our job, so we ended up defying that a bit and we downloaded the software to our PCs. Sometimes it happens that we use Google Drive when working with external partners. I used Google Drive to share documents more efficiently than by e-mail, before they get too large. (I-8)

Another practice is how Facebook groups are used either as information repositories or for external communication with particular groups who use the welfare services provided by the CA. Here, one does not find examples of practices that demonstrate knowledge sharing between several parties, but merely how Facebook groups are used as public bulletin boards, where online sharing again represents an informing practice. For instance, an employee was a representative in one of the CA's worker unions and interacted with representatives from other CAs. In the process, they created a Facebook group that enabled them to stay in contact and inform one another:

It was part of a different role, which was part of a task I had here in the CA. I had contact with others with the same role in other CAs. We used the Facebook group to share information that was more or less of the same nature. It was a way to share knowledge on issues of health and safety at work. (I-1)

Another public employee explained how they created a Facebook group to communicate with a group of citizens the CA serves directly, students in high schools. The Facebook group was created on the assumption that students would contact the CA there; given that students are in the social media landscape, they concluded that the CA also needed to be present in a similar capacity. After some years of use, the Facebook group has roughly 300 'likers,' but expectations have not turned into reality. Relatively few requests from students have been seen. Instead, it has turned into more of a public bulletin board where information is posted:

It runs every day. We don't get many requests. We publish when we have specific information. We were unsure whether it would be an active user channel. I think it's going to become that in the long run. We intend to continue to use it and improve its uses, and even get more users. (I-3)

Theme 4: Sharing practice as an individual informing strategy

The fourth theme emerging from the analysis demonstrates how the employees turn sharing into individual informing strategies, which arguably fulfill a goal of complying with an overall objective to share on the ESMP. The fourth theme additionally demonstrates the challenges associated with performing sharing in an internal organizational setting, and translation problems connected with practicing sharing as a two-way communication act, given that it again becomes an informing and pushing strategy of camera-made information to an audience that does not respond. This is illustrated by scrutinizing a particular feature deemed as being important for creating the conditions for sharing on the ESMP, so-called

'rooms.' Rooms can best be described as Facebook groups or information repositories that operate as spaces for cooperation. Within them, users can upload and download documents, follow people, and receive messages about recent activities. The rooms have members and were grouped according to the CA's department structure and across departmental borders.

In considering particular overall user experiences, the data show that the informants adopted the rooms. They registered members and followed rooms, uploaded documents and so forth, such that it was common to follow between two and five rooms. Afterwards,



the informants experienced challenges, illustrating the disadvantages and benefits associated with sharing. First, the informants created rooms and registered members who worked in the same department or in the same field as themselves. Second, the findings indicate that upload documents consisted of re-published information that was already stored in other places. A lack of data exists that shows that employees created new documents and began to co-write them in real-time; rather, they uploaded approved and ready-made documents that were only read for notification purposes. This indicates that sharing is an informing practice to a large audience, which does not invite a two-way communication process. Third, all informants reported that little interaction (such as participation and reading discussions) occurred in the rooms. In sum, users framed the rooms as information repositories rather than as sites for collaboration. Thus, we see the pattern that employees with super-user status – users who enjoyed an administrative role in the rooms – tried to stimulate increased engagement, which represented an outcome of a lack of responses to their informing practices. In order to reach the top management goal of sharing, super-users adopted particular roles and strategies to promote participation, which in turn illustrates the challenges pertaining to sharing.

In reviewing these practices, it can be noted that one super-user would adopt an 'online gardener' strategy and attempt to encourage co-workers to engage in the rooms she administrated. This is not dissimilar to an automated e-mail notification feature, which is generated following a period of interactivity in a knowledge repository. She assumed the role of a sharer and pusher of information, which consisted of sending friendly e-mail reminders when she uploaded new documents:

I send an e-mail to everyone who has an interest in the room and then I share information with them that it's posted on the ESMP. Then I invite them to follow the room, because there is information there that is relevant to them. I say that it will only be posted there. That I've done for about a year. (I-1)

This means informing across multiple channels, turning sharing into a practice of double in-forming. Afterwards, the user questioned the value of sharing and was uncertain about the extent to which her efforts were worthwhile, a thought shared by another informant:

I note that there are not many who follow the rooms, after many invitations and reminders to others who I think might have an interest in it. And the thoughts come. Do we spend unnecessary time on posting information that people do not read anyway? (I-2)

This raises the question of whether the room members post material and use the rooms as intended. For example, after uploading, an informant also received phone calls to ask if the same documents could be sent by e-mail:

I often get the question, if I can send them an e-mail when there is new information in the rooms. We have decided on that—no, we don't send an extra e-mail. We put it out there, and then people must seek it out themselves. I feel that people don't pay attention to all that is posted in the rooms. They would have paid attention if we had sent it in an e-mail. But we have made a conscious choice on that. I think that people read it if they get an e-mail because it's a direct message aimed at them, rather than having to search for the information themselves. (I-2)

This experience shows the start of a disengagement regarding sharing, as it vanishes and becomes overtaken by other assignments whose completion is deemed more important:

We have two rooms. I post a lot of information in them. I try to ensure that new information is posted. But I do not use the opportunity to follow other rooms on the ESMP, for example, as I had hoped and thought I would. It disappears into my daily work life. When I need information, I don't find it with the search mechanisms that we have today as we had with the intranet, although there is more information out there now. But now, I think it is harder to find information. (I-2)

Informing over a long period of time creates an awareness that attached to sharing is an embedded information overload problem. This is illustrated by repeatedly performing an informing practice wherein users redirect information that is stored elsewhere. For example, while information is stored locally on hardware or in a local folder, such information is exposed and redistributed multiple times in the rooms. Hence, making information available to create transparency led to other consequences:

The intention with the ESMP was that we should move away from local storage of information in our own local folder structures. Everything was to be stored on the ESMP. I'm skeptical of it, because it is such a vast amount of information that it makes it difficult to identify what is relevant. We end up with huge hits when we search, and we spend a lot of time on finding out what is relevant. And when we do not have the rigid old structure, which we had under the intranet, we spend a lot of time looking among all the hits we get. I think we would have wanted it to be a little stricter on what should be stored. Things should be deleted, if they are considered [ir]relevant. I'm also skeptical that we use the ESMP as a primary storage source for everything. I'm also concerned because we could forget the formal filing and procedural rules that we have to deal with. When we publish on the ESMP, we think we preserve it forever, and that's not right. There are some formal things that make me skeptical. The most concerning thing, however, is that it has become such a huge volume of documentation. And when it comes to relevant and non-relevant information on individual characteristics, I am a bit skeptical of that Facebook style of writing status updates. I think it's nice to have colleagues, but it's more interesting knowing how we are



professionally connected. We are a large organization. If all of us post information that we were sick, and that we are looking forward to the weekend, there is a limit to how much of that information I want to see. I think it takes another turn and we're moving towards that side. That part I'm not thrilled over. I'm one of those who think that when I'm at work, I'm at work. People can tell me interesting things that are useful or fun for me to learn at work. I don't want a lot of private information, which I'm not related to. (I-2)

Exposure to excessive information instigates users to enforce a personal filter mechanism and to return to old work habits such as using e-mail. This results in the creation of distance from knowledge formation processes and the prevalence of disengaged users:

In the start, when it was brand new, I tried to make use of any opportunity, which was not in the intranet. We had the possibility to create rooms. I did that and invited people. I joined other rooms. But, afterwards, I failed to follow up all that. In neither of the rooms I administer now, did I manage to develop anything. I'm rarely there and don't check the rooms that I am a member of. (I-3)

This user saw the rooms as an opportunity to improve conditions for interaction with the high schools with which she has frequent contact as part of her work. Much of the daily contact consists of sending general information. Instead of sending all of this information via e-mail, it could be transferred to the rooms, but she did not manage to uphold the goal of sharing:

I haven't had time to prioritize the room. They come far down on my priority list. My workday is packed with to-do tasks. To sit down to try to use the possibilities and communicate in the rooms has instead led me not doing that. Now, I don't bother checking notifications from the rooms I administer or follow or what my colleagues have written in their status updates. I skip that very fast and I go directly to check my e-mails. (I-3)

This pattern of disengagement was seen in another experience. An informant explained that the challenges of generating engagement were related to aspects of the user interface itself. For example, it was difficult to ascertain whether the rooms were used by others as no panel to show numbers of visitors existed. The male user argued that the information shared in the rooms was

already available and ready-made in other spaces, which meant that it was stored by co-workers in their e-mail inboxes. However, other matters drew attention:

The challenge with the ESMP is that there are too many rooms. It's almost like we have a room for each employee. You have to click on a link to get to somewhere. And then you have to go back again and click on a new link again, so it will be many rounds, just to get hold of the information you're looking for. (I-6)

Although a number of the informants were uncertain as to the extent to which their sharing in the rooms was of benefit, another user shared a quite different opinion. A female user working with accounting explained that the rooms represent a type of 'manual.' She was an active user and saw the benefit of retrieving and finding information that had been shared by others.

For example, I'm working in the accounting system and I find out that I need to get hold of a manual or retrieve information on an account. I go on the ESMP. There, I locate documents or things that are written about the case I'm working on. I'm a member of all the rooms that have something to do with accounting, a factor allowing me to know what we've posted and what others ask about. (I-7)

The rooms are beneficial in different ways. For example, they are information depositories, where one can find quick answers, as they narrow down the need for searching. Alternatively, she would have to search for the same information in larger web-based databases.

Since they exist, they are easy available. They are part of a knowledge you can easily use. They are there if you need to be reminded about something. For example, in accounting, there are clear definitions, clear rules for use; there's a clear date of notice for certain things. Things that are not so relevant one day, I often get information about in advance. But then I get questions from colleagues working in other departments, who ask about a deadline. What date is set as a deadline for the final reporting? Now, I know where I can quickly get and give an answer back on that. It's not necessarily that I have that knowledge in my head, but now I have good knowledge of where the answer is located. (I-7)

Discussion

Orlikowski and Gash (1994) utilized a practice and interpretation perspective to conjecture that Notes can be interpreted in diverse ways, revealing differences in intent and actual use. Their analysis highlighted the notion that implementers see Notes as a tool for organizational change and collaboration, whereas end-users

interpret it as a means of individual and personal communication. Using a similar research lens with alternative empirical material – the implementation of an ESMP in a Norwegian public organization – what clues are provided that help to answer the paper's research question?



The most important finding is the contradictoriness of a top management initiative intended at simplifying employees' work surface in a public organization that seems to have had the opposite outcome in terms of end-users' use and action. Sharing, introduced as a new workplace principle, was expected to create transparency and enhance the flow of internal communication, but when the end-users attempted to translate sharing into a manageable practice – as the basis for participation in a knowledge formation process – they interpreted sharing as a complicating work practice, with the larger consequence of producing disengaged users. This is primarily related to the fact that users are not performing a sharing practice, that is, a two-way communication process whereby knowledge is created through collaboration. Rather, the data analysis shows that the users engaged in informing practices to fulfill the goal of sharing, an aspect that has been demonstrated throughout the data analysis section. This informing practice – which represents an essential ingredient in creating a knowledge-sharing process – is performed on

the premise of informing an audience and of being informed. Moreover, the informing practice is seldom the start of a knowledge process where two users exchange information to create knowledge by reflection on action, for example. Instead, sharing is carried out by re-publishing ready-made and approved official documents found elsewhere in the CA, creating an unmanageable information overload problem that encapsulates the challenges in forming a sensible knowledge-sharing process in practice. Furthermore, clues are provided regarding what is actually shared, which in this explorative case study pertains to information that is already known. Sharing proves to be problematic and is associated with risk-taking for those involved, leading to the enforcement of self-censorship and the construction of separate and private workplaces that the informants deem beneficial to completing their work. In contrast, the users institute personal filters and return to a work surface that they believe works, which in most cases is e-mail. In other words, sharing in this case study is interpreted and performed as informing or as being informed.

Conclusion

The main outcomes of this explorative case study have been an examination of the term 'sharing,' and demonstrating the challenges involved in introducing it as a workplace principle in a public organization. Moreover, when public employees attempt to perform and make sense of 'sharing' in practice, a two-way communication

practice emerges that can be misidentified and performed as a practice based on informing an audience and of being informed, hence causing an information overload problem and the prevalence of disengaged users in organizational life.

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BOOK REVIEW

STEIN PÅ STEIN

Henrik H. Svensen, Aschehaug Press, 2018

Reviewed by Anne Hope Jahren, Wilson Professor, University of Oslo at Blindern

Henrik H. Svensen's newest book *Stein på stein* (Aschehaug Press) is about digging for the past, in every sense: as a geologist, as a son, as a father, as a person. It is by far the most personal of the author's literary offerings, which include *The end is near: About natural disasters and society* (2006) and *Bergtatt: The history of the mountains and the fascination of the elevated*, which appeared in 2011.

Stein på stein is a geologist's quest to find the reason for the greatest crisis the Earth has ever known: the "Permian Crisis," a massive extinction that occurred 252 million years ago and obliterated more than ninety-percent of all life on Earth. To take the liberty of a modern metaphor, the Permian Crisis effectively wiped the Earth's biological hard drive clean, and everything – everything – both in the sea and on the land had to start over. Almost every organism we know of, save for a few scrawny horsetails on land and some odd shells in the ocean, evolved from scratch during the last 252 million years.

This leaves the intrepid geologist Svensen with two burning questions: What was the earth like before this crisis? and What caused this devastation? During the 252 million years since the Permian Crisis, most of the rocks that existed then have been lost to us forever: across the intervening eons, they have broken down and been recycled into sand, then melted or re-cemented into younger rocks, both chemically and physically unlike whatever they used to be. Thus a geologist's quest for the Truth of the Permian Crisis

is more like the story of Don Quixote than an episode of Sherlock Holmes, it is as much or more about what motivates him to stay the course than it is about what he finds along the way.

Nevertheless, Svensen imparts all there is to be known about this great moment in Earth's History, describing state-of-the-art findings and hypotheses with the simplicity, humility and grace that earned him the Norwegian Research Council's Dissemination Award in 2017 (Forskningrådets formidlings pris). But more than that, Svensen shares with us his moments of vulnerability while searching for answers – ranging from the intellectual confusion that comes from too many valid hypotheses to the physical misery of spending days in the field carsick and thousands of miles from home. But throughout the book, as a literal backdrop for the action, is a vision of nature: a view from a mountain top, a stone in your hand, a wall of rock that stands one meter in front of you. It is these fine descriptions of what the geologist sees as he works that allows the reader to fully taste the seduction of working outside, and learning to love the rocks that often mean so much but more often say so little.

At present *Stein på stein* is only available in bokmål, but hopefully, like Svensen's other books, it will soon find itself translated into multiple languages. In the meantime, my advice is to enjoy it in its mother tongue, and by doing so, celebrate your special connection to a fellow Nordmann who, like all researchers, digs for answers, and on most days, uncovers just enough strength to keep digging.



ABOUT THE COVER ARTIST

Elin Tanding Sørensen

Elin Tanding Sørensen is a landscape architect and visual artist. She is currently a PhD-fellow at the Faculty of Landscape and Society, Norwegian University of Life Sciences, and works as a freelancer with the enterprise Urban Living Laboratory. Her project is an art based doctoral study, where one aim is to fuse methods from the arts, landscape architecture, and science for the sake of arriving at visionary urban design propositions for the urban tidal zone. The project addresses the cultural and biological enrichment of urban hard surfaces through a transdisciplinary approach. The study initiates a series of living labs developed for selected sites along the Oslo Harbour Promenade, in order to achieve new understanding of the land-sea transitional area as a landscape for urban development through site-specific works. The aspiration is to shed light on the underlying forms of knowledge particular to the field of arts and landscape architecture. The study looks at eco-engineering from a landscape perspective – where landscape architecture can be a critical tool for re-envisioning ‘new urban tidalscapes’. The methodological approach is hands-on – taking place as an exchange between long-term observations and 1:1 fieldwork including underwater studies with diverse, constructing

landscapes by means of technical drawings (AutoCAD), clay models and sketches (by hand), and digital 3D models. The aim is to arrive at an increased understanding of how new urban tidalscapes may be designed and developed, and by this extend the city’s ‘green infrastructure’ into the sea.

Ålegras (*Zostera marina*), glassmaneter (*Aurelia aurita*) / Oslofjorden.

Digital collage: Elin T. Sørensen © BONO 2018. Under water photo: Jonas Thormar. (Tr. Eelgrass, Jellyfish / The Oslofjord). Featured on the Cover of this issue is one example of Sørensen’s visual work. Sørensen describes that Jellyfish are some of the world’s oldest multicellular organisms that can communicate and have a sense of direction, despite not having a brain. She stresses the problematic dichotomy between humans and nature systems, and the Cover picture presents a suggestive integration of the two.

To learn more about **Elin T. Sørensen** and her work, visit her NMBU website: <https://www.nmbu.no/prosjekter/node/35003> and the Community initiative Kongshavn Bad: https://www.facebook.com/pg/Kongshavn-Bad-209657369813892/posts/?ref=page_internal