Healthcare professionals learning when implementing a digital artefact identifying patients' cognitive impairment

Ann Svensson and Linn Gustavsson
School of Business, Economics and IT, University West, Trollhättan, Sweden

Irene Svenningsson
*Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden and
Department of Primary Health Care, Region Västra Götaland,
Gothenburg, Sweden*

Christina Karlsson
Department of Health Sciences, University West, Trollhättan, Sweden, and

Tina Karlsson
Primary Health Care, Färgelanda, Sweden

Abstract

Purpose – This paper presents findings from a qualitative study of healthcare professionals' practice, where learning is taking place when a digital artefact is implemented for identification of patients' cognitive impairment. The use of digital artefacts is increasing in various workplaces, to include professionals in healthcare. This paper aims to explore the following research question: How is the professional learning unfolding in patient-based work when a digital artefact transforms the practice?

Design/methodology/approach – Various data collection methods are used for this study, consisting of dialogue meetings, interviews and a reference-group meeting. Thematic analysis is used to inductively bring forth the themes of the collected data.

Findings – Professionals' knowledge and experience are of vital importance in learning and changing work practices. Together with their ability to reflect on changes, their knowledge and experience constitute the prefiguration when the introduction of a digital application brings about indeterminacy in the work practice.

Originality/value – This paper makes a contribution to practice-based research as it consolidates previous research and identifies professionals knowledge and learning in a healthcare context. This can be used to further explore and advance the field, as well as to establish the evidence-based importance of transforming practices based on implementation of digital artefacts.

Keywords Learning, Healthcare professionals, Digital artefact, Cognitive impairment,
Practice research, Sociomateriality

Paper type Research paper

1. Introduction

This paper presents findings from a qualitative study of healthcare professionals' practice, where learning is taking place when a digital artefact is implemented for identification of patients' cognitive impairment. Learning and engaging in work activities that offer rich learning experiences are increasing as the digital transformation continues in society (Billett and Choy, 2013). Almost all work today is being reconfigured in relation to digital technologies (Orlikowski and Scott, 2016). The use of digital artefacts is growing at various workplaces, including for professionals in healthcare. Digital artefacts could be used to increase the quality of healthcare services provided by the healthcare sector for health-related issues, e.g. remote glycemic control and follow-ups at a distance for patients with chronic diseases, and for patients' psychological issues, e.g. depressive complaints and anxiety. Identifying cognitive impairment in patients is one of the working areas of healthcare professionals where digital artefacts have been introduced (Bloniecki *et al.*, 2021). Emerging digital artefacts imply increased challenges at work, where the ways of working are transforming. Learning is therefore needed to sustain and develop skilled professional capacities in response to digital transformation in the society (Gjellebæk *et al.*, 2020).

Professional expertise is woven into practice and changes as practice unfolds. Learning emerges through changing practice (Hopwood, 2016). Learning is progressing when learners are active in the engagement and when they use their expertise and experiences in the work setting in practice (Billett and Choy, 2013). When introducing digital technologies, healthcare professionals need to change aspects of their work to meet the constraints and provisions of the material characteristics to appropriately use digital tools in their practice (Leonardi, 2013). Studies have shown that nurses perceive that digital tools make their work more efficient and that patients become more involved in their care (Huter *et al.*, 2020; Schoultz *et al.*, 2022), so they are often positive about the use of digital tools. However, it is also apparent that interactions between the healthcare professionals and patients become challenging when communicating via digital tools (Hedqvist *et al.*, 2022). Moreover, new digital tools initially contribute to increased work intensity (Gough *et al.*, 2014).

In this paper, we take a practice-based and socio-material perspective, implying that knowing and doing, thus learning, are seen as entangled and emerging in the work practice (Gherardi, 2011, 2017; Hopwood, 2016). It is assumed that the social and material (human beings and digital artefacts) exist as separate entities that interact and have emergent impact on each other as an entanglement of technology, work and knowledge (Orlikowski and Scott, 2016). The concept of socio-materiality can be used to connect all the elements in practice that continually assemble and reassemble in emergent and indeterminant ways (Fenwick, 2015; Gherardi, 2017; Hopwood, 2016). The socio-material interactions influence and reconfigure what is emerging in reality, which then shifts understanding and makes learning possible (Hopwood, 2016; Mol, 2010; Orlikowski and Scott, 2016). Thus, we adopt a performative approach in this paper. The healthcare professionals are considered learners, and the learning emerges through the professionals' interactions in the entangled practice as experiential or informal learning. Thus, the learning is ongoing in the healthcare professionals' work. The work is changing by specific materializations through the digital artefact that is implemented in the work practice of identifying patients' cognitive impairment.

Learning emerges in action, where materials tend to be ignored as part of the human action (Fenwick, 2015). We need to understand the entanglement of the socio-materiality in

the learning processes as the professionals learn, and how this transforms when implementing a digital tool in the practice. From a theoretical standpoint, we need to understand more about how digital tools mediate the work practices in healthcare (Nelson *et al.*, 2017). Therefore, it is important to analyse the ways in which specific materializations are consequential, such as how, when, where and for whom/what the professionals' learning makes a difference. Thus, in this paper, we aim to explore the following research question: How is the professional learning unfolding in patient-based work when a digital artefact transforms the practice?

2. Theoretical approach

2.1 Professional learning at work

A practice is described as a space for multiple activities. Practices are dependent on activities to be performed to continue to exist (Schatzki, 2010). In a practice-based perspective, a practice consists of many activities, in contrast to cultural historical activity theory, where an activity refers to collective and object-oriented efforts (Engeström and Pyörälä, 2021; Engeström and Sannino, 2010). From a practice-based perspective, activities are performed in close connection with professional knowledge and learning at a workplace. As Nicolini (2012, p. 214) states, "practices are inherently contingent, materially mediated, and cannot be understood without reference to a specific place, time, and concrete historical context". According to the toolkit approach Nicolini (2012) proposes, the aim of the practice-based perspective in this paper is to provide a rich and nuanced understanding of the complex context experienced by professionals. The study of professional learning from a practice-based and socio-material perspective provides opportunities for approaching the professional practice where the social phenomena and material entities are assembled as constitutive entangled and where materiality is part of what makes up the social context where the professionals act in practice. Gherardi (2010) states that technology in practice reflects the way professionals learn the interaction between humans and technology, based on the organizational learning approach from a practice-based perspective. Thus, knowing and learning are seen as socio-material enactments (Hopwood, 2016).

Know-how, as professional expertise, is described as practical understandings by Schatzki (1996). Practical understandings include aesthetic qualities of bodily doings and sayings, together with rhythm, pace, tone and gesture (Hopwood, 2016). Also, rules are prevalent in the professional practice as principles and instructions for professionals that make sense for them to follow when carrying out their actions. Norms, traditions and ethical aspects, together with beliefs and emotions, also encompass the relational and normative aspects, which mediate the way in which rules shape practices.

Practices are not determined in advance, as they are emergent. Nothing determines what professionals exactly do before the activity is done. Stability and change are rather constantly co-occurring, and professional learning is going on as they work (Schatzki, 2013). Emergence is key in workplace learning, from practice-based and socio-material perspectives. This includes the fact that the knowledge needed is impossible to specify to carry out professional work in the transformative nature of practice where digital artefacts are implemented. This implies that professional judgements and interpretations are going on in practice when appropriating digital artefacts into their work (Hopwood, 2016). Decisions are made based on experience and learning from reflections on previous actions. Professionals are increasingly required to not only apply or enact knowledge but also to learn, produce knowledge, and share new knowledge that is not separated from

materiality (Jensen *et al.*, 2012). Thus, professional learning is inherently interlaced with practice.

Knowledge and expertise within healthcare professions are more or less stable, with specific characteristics based on their professions that are embedded in their workplace practices and artefacts (Hopwood, 2016). Changes in relationships between people and digital artefacts are an example of where learning becomes emergent and new knowledge is created. Learning consists of changes in the professionals' knowledge and has impact on the ways professionals interpret or act in their practices (Edwards, 2005). In learning, professionals have a sense of purpose or intentionality in their enactments in practice (Billett and Smith, 2014). Moreover, learning is required in practices where knowledge and expertise are of vital importance. Hence, learning is essential in a professional practice where new forms of knowledge emerge in action, such as in implementation of digital artefacts.

2.2 Activities in practice for professionals' learning
Professionals need to be involved in activities in practice to know how to work and to learn in practice (Nicolini, 2011). Activities are related to practice, and they are governed by the same practical understandings, general understandings, rules and teleoaffective structures (Hopwood, 2016).

Practical understanding is denoted by the know-how that enables people to carry out activities that make sense in their practice. The practical understanding reflects dimensions such as rhythm, pace, tone, gesture and aesthetic qualities of bodily doings and sayings. General understanding refers to recognizing and agreeing that a particular practice is evident and to manners of conduct. The relatively stable professional knowledge base, together with what it means to act professionally, are also included in the general understanding. Rules are denoted by formulations, principles, precepts and instructions within a professional practice that direct professionals to perform some activities and not others. Rules define normatively what makes sense for professionals to do. However, rules do not determine what happens, whether they refer to explicit and specific articulations or to more implicit and diffuse norms and traditions. Teleoaffective structures refer to normative ends, purposes, projects, beliefs and emotions in practice. Questions of what is right or what one ought to do are shaped by teleoaffective structures. However, there are not uniformed singular collective structures shared by a profession; rather, they guide the professionals in their understanding and their intention to perform activities.

Learning is affected by prefiguration and indeterminacy, as stability and change have an impact on professional learning in different ways (Hopwood, 2016). Prefiguration refers to how practices and arrangements make particular courses of action, for example, easier, more difficult, simpler, more complicated, shorter, longer, ill-advised, promising of ruin or gain, riskier or safer and more or less feasible. Inherent in a practice are certain qualities that imply what makes sense to do. Prefiguration is a central quality of practices and a key to understanding how practices prevail. Indeterminacy denotes that nothing determines what a professional does before the act is performed. Whatever leads to or causes a certain action is not fixed until the moment of its performance. Practices are thus given a future openness as a possibility to act on emergence. Practices are thus not determined in advance but rather as the practical activities emerge. Practices are, in certain ways, quite stable; however, changes emerge constantly. This environment enables professionals to learn as their work proceeds.

3. Empirical context
One working area for healthcare professionals is how to identify cognitive impairment in patients. Traditionally, this is done through interviews, physical tests, and personal

meetings with the patients. Lately, however, different digital tools have been introduced, providing help with collecting data, performing tests and identifying different factors that would otherwise be difficult to identify. These tools can also measure and provide comparable data over time, as well as being an early alternative for patients waiting for a physical appointment. Below, the working environment details on cognitive disabilities and the context of how professionals make use of these tools are described.

3.1 Cognitive assessment

Memory disabilities or cognitive disorders can stem from many different problems but present similar symptoms. Perceived memory problems are therefore often first assessed by having conversations with the patient and their relatives to try to get a general picture of the patient's problems, their home environment and their general medical status. This can be done at a local primary healthcare center or at a specialist clinic. Analogue or digital cognitive tests can be used to identify cognitive problems.

If it is suspected that a person is suffering from dementia, such as memory problems or personality changes, a dementia assessment should be done. According to the current analogous routines in healthcare, this can usually take 4–6 weeks. The dementia assessment is divided into two parts: basal dementia assessment and extended dementia assessment. In the dementia assessment, it is primarily a matter of excluding other cognitive diseases that can cause the patient's symptoms.

Medical history, a structured interview with relatives, a structured assessment of functional and activity ability and an assessment of physical and mental conditions are all different parts of the basic dementia assessment. In the basic assessment, an X-ray examination should be done, primarily to rule out other causes of the symptoms, but it can also provide guidance in the diagnosis. The basic assessment also includes various cognitive tests, including the memory test MMSE (Mini Mental State Exam) (National Board of Health and Welfare's national guidelines for dementia, 2017). If the patient's symptoms are difficult to assess or if they concern a younger and/or highly educated patient who does not have clear impairments in the cognitive test, it is supplemented with an extended dementia assessment.

3.2 The digital artefact for cognitive assessment

The design of the digital tool for this study started in 2016 with the aim of improving the quality of screening for mild cognitive impairment and for dementia. The digital screening tool integrates several elements that are part of the basic dementia assessment, the analogue "pen and paper" based tests. The digital test is composed of 16 different items assessing various aspects of cognition and is administered via mobile devices. The digital screening tool has been tested clinically at the cognitive clinic at Karolinska University Hospital in Sweden, where the tool was considered a viable cognitive screening instrument for mild cognitive impairment and dementia (Bloniecki et al., 2021). The digital tool is now being implemented and tested in most regions of Sweden.

The tool is provided as an application on a tablet or via a mobile phone. It can be used individually by the patient in their homes or together with assessing healthcare professionals at the healthcare clinics. If used at the healthcare clinic, the professionals can support the patient in using the tool, thereby avoiding digital illiteracy interfering with the actual tests. Based on the test, it should be possible to predict if the patient suffers from a cognitive impairment or not. The tool can help indicate that the professionals should look for other reasons for the symptoms, like depression, alcohol problems or other medical

diagnoses. Hence, the tool helps to guide the professional in deciding the next steps and how to proceed to help the patient in the best way.

4. Research method

The overall aim of the digital tool is to screen and make assessments of patients' cognitive problems. Professionals' learning in workplace practice is studied as it unfolds. The study has taken its departure from a work practice through the practitioners' narratives about their work practices and from one of the co-authors' own participation and work in the practice. The socio-material focus is on a specific work practice that is transformed, when a new digital tool is introduced.

We have focused on how practical knowledge has come to be used and how the professionals rely on knowledge to bring practice forward, thus the process of learning experienced by the professionals has been of importance to the study. We have recognized how the professionals have described their acting in their situated practices and how their judgements have changed their working practices. The professionals' conceptualization of the digital artefact and their negotiations of the material and the social in changing their work practices have been collected in the study (Gherardi, 2017). As this research has an interest in questions of individuals' learning as professionals, it focuses on the doing and the materiality, where practice, knowledge and learning are mutually constituted (Hopwood, 2016).

In this study, we have combined data from dialogue meetings, interviews and a reference group meeting with 15 experts (experts as physicians, nurses, researchers and systems developers, all with knowledge related to the context of digital assessment of cognitive impairment) to try to get an understanding of the use of the digital tool and the ongoing learning in the workplace to see how the practice is changed and adapted. This is to follow a toolkit approach that Nicolini (2012) advocates, where the dialogue meetings were of an ethno-methodological character, providing rich data from practice "as it happens" and getting close enough to the activities at hand. To get an articulated view of the practice, we also collected data from other sources, including the interviews and the reference group meeting. This is also to increase validity and robustness of the study by using different qualitative methods to supplement and support the validity of the empirical material. Six dialogue meetings were held where practical experiences of the tool were discussed. One of the co-authors, a nurse working with assessing cognitive problems within patients at a primary healthcare center, was present to describe their practical experiences and to get close to the practice according to the practice-based perspective. Also, the manager and one or two developers from the company responsible for the digital screening tool participated to give a technical viewpoint on the tool but also to take feedback for future improvements. The authors attended those dialogue meetings to observe and listen, but also to discuss usability, knowledge transfer, and how the tools could be used. In between the dialogue meetings, the nurse, as a co-author, tested the digital screening tool practically with her patients, where she also observed the patients when they were using the digital screening tool. She first conducted analogue "paper and pen" tests according to her normal routines and then afterwards tested the digital screening tool, which she observed. The nurse used the digital screening tool for 15 patients.

In parallel with the dialogue meetings, formal interviews were conducted with the nurse (the co-author from the health care center) and with five other professionals working at other healthcare organizations where cognitive assessments are conducted. The interviewees were selected from the user group testing the digital screening tool at different clinics scattered in Sweden based on those professionals who told the developing company that they are interested in being included. The interviewees have used the tool for at least three months when the interview was conducted. They have different occupations or roles, but

they all use the digital tool for cognitive tests and assessments in their work (see Table 1). The experience of this type of digital tool for cognitive assessment is generally quite low in the group, but everyone has worked with other digital systems and tools and is therefore relatively used to digital tools in general.

The interviews took approximately 30–40 min each and were tape recorded. One of the researchers also attended a 3-h reference group meeting, where different experts, researchers and practitioners discussed the outcomes from the tests of the digital screening tool and other aspects that could be of importance for assessments and for the further development of the tool.

The notes from the dialogue meetings and the reference group meeting were read several times. The interviews were transcribed. Then an inductive thematic analysis method has been used (Braun and Clarke, 2006) through close adherence to data (Eisenhardt and Graebner, 2007). Five themes were identified (see Table 2) and used to sort and order the information from the collected data. The researchers read, reread and discussed the notes and the transcripts in comparison to the analysis present in the themes to gain a deep understanding of the data. The themes emerged through step-by-step analysis linked to the aim of this research (Carroll and Swatman, 2000). We have used a qualitative perspective when analyzing the data, and therefore no quantification or numbers of statements are given.

All data analysis was done iteratively in a circulated process of developing understanding of data. The findings were finally approved by the co-author, who is a nurse actively working with cognitive assessment of patients. Our findings are therefore a combined representation of knowledge from interviews, practical use, dialogues and meetings.

5. Findings
Our findings are structured based on the themes from the analysis: describing general thought on digitalization, reflections on use for cognitive assessment and lessons learned, the tool as a guide for sorting and early detection, and professionals' views on patients'

ID	Role	Organization	Gender
1	Physician (PhD student)	Primary health care center	Male
2	Nurse (researcher)	Primary health care center	Female
3	Nurse (included in the dialogue meetings)	Primary health care center	Female
4	Physician (researcher)	Medical research center	Male
5	Nurse	Cognitive clinic	Female
6	Physician	Cognitive clinic	Male

Source: Authors' own work

Table 1.
Professionals who were interviewed

Themes	
1	Prerequisites for digital development in the workplace
2	Prerequisites for cognitive assessment by digital tools
3	Experiences from use of digital tools for cognitive assessment
4	Identified difficulties in usability of digital tools
5	Identified improvements when using digital tools for cognitive assessment

Source: Authors' own work

Table 2.
Themes identified in interviews

needs. Those themes are shaping the professional learning in the patient-based work when a digital artefact transforms the practice of cognitive assessments.

5.1 General thought on digitalization in the workplace

The professionals are used to working with digital technology in general, and their overall attitude is positive. They believe technology can contribute to efficiency and enable many things in life. However, when the technology is to be used in healthcare contexts, the professionals want to learn through their individual assessments whether the technology is appropriate and if it will work in collaboration with patients. They need to consider and assess how digital tools should be used in their practice in relation to each patient, what data it collects and how that data could and should be used so that it really creates value for users and for society. The purpose of the technology must be critically examined to see if it means an improvement or if it instead leads to increased stress levels or complicates the work.

Some professionals say that the introduction of technology in healthcare is too slow and that it would be possible to do much more, but that it also creates greater demands on their engagement in learning. Other professionals think that digitalization must come at a reasonable pace and that not everything should be digitalized at once. This person points out that the aim or the reason for digitalization must be clear and well communicated, and continues that digitalization must also be in line with the tasks and working methods used so that technical stress is not created for the employees or the patients. The patient must always be put in focus when it comes to the use of technology.

The professionals would like to see a more centralized development and control of digital technology in healthcare operations. Some feel that a large part of the development today is based on their own initiatives and depends upon enthusiasts that drive the development. The organization is positive about technological development, but on a personal level, it is up to the individual to learn and cope with the digital transformation. The focus of the central organization is instead administration and the practical medical healthcare, not how to develop work practice, professional learning or new assessment methods or tools for this.

5.2 Reflections on use for cognitive assessment and lessons learned

Several of the professionals believe that technology is crucial in the process of finding early dementia diseases or early cognitive disorders, especially in younger people and people who are highly educated. Those patient groups are particularly difficult to assess. In these cases, the "paper and pen" assessment often does not show any memory reduction, while the application does. The nurse in the dialogue meetings reflects:

> But I've also had those who have been a little bit around their 70s where it's given a clarifying picture, where I've seen that the basal test is not enough. As highly educated people make it through the basal test without remark, but they themselves feel that it is something that has changed. Then I got a clearer picture of it in the digital.

These patients "fall between the cracks" with the "paper and pen" assessment, and the patient is not followed up until one or two years later, which could create a lot of worries for the patient. With the digital assessment, the professionals learned that they could be more confident in their assessments. It is more difficult to get away with cognitive impairment in the application. The patient must be able to answer the questions by understanding and following instructions, which is difficult if the patient does not remember them. The digital assessment tool could then replace or speed up the youngest patients' path through the healthcare system. One of the interviewed physicians reflects on this matter:

"At the health center I worked at, the occupational therapist was not on site so you had to send a referral to get a cognitive assessment and there could be different waiting times and then the application had a value also to speed up that process". Another interviewee continues that though "[…] It is extremely much more time efficient and less resource intensive. An occupational therapist with a cognitive assessment can take an hour or so. Here it happens in parallel".

Those who early on experience a concern for a cognitive impairment but who may also have a mental illness, and if it is difficult to understand what the cognitive impairment is due to, could benefit quite a lot from the tool the professional states.

It was concluded in the reference group meeting that the digital tool seems to be a very good complement to being able to learn more about the problems of patients who are difficult to assess. The interviewed professionals also believe that the use of the application would facilitate their learning in assessing cognitive impairment through providing formality. The patient fills in and answers questions in the application, and the professionals get quick feedback. This will also facilitate the professionals' learning when they can get all the collected information at the same time. Professionals in both the interviews and in the reference group meeting believe that a great benefit of the tool is that cognitive assessments can be standardized. The tool provides objective and quantifiable measurements that can be followed up, from which information the professionals can learn a lot. The tool can then support the assessment regardless of how knowledgeable the general practitioner is about dementia, and each professional can learn and develop their knowledge. This can increase the quality of the initial investigation step. The tool can be used as a first screening tool, to raise the lowest level of knowledge about cognitive assessments. However, based on some of the professionals' experience, it can be stated that the actual use of the application and the ability or habit of Information Technology (IT) of the patient can make it difficult to assess whether the patients can perform the tests completely by themselves. The answers may need to be interpreted based on the patient's general condition, relative experiences and IT habits.

Based on just a referral, interviewed professionals think it is difficult to assess how severe the cognitive impairment is. If professionals have more information from the beginning, they think they could make better assessments. Including the anamnesis and other rating scales in the tool also means a reduced workload for the healthcare professionals. If the method of using a digital tool for cognitive assessment could be used more widely, then the professionals can get a more formalized and standardized way of working. All patients would then receive the same healthcare regardless of where they live, as there are now quite large differences. However, it can be difficult for patients to use the application independently, especially if they are not used to digital technology or have visual and hearing impairment. If such a patient performs the test under the professionals' supervision, they can observe how the patient handles the technology in general and the application in particular, which is therefore recommended in some cases. The professionals can then observe how well the patient solves the tasks in the digital tests. This also provides a situation where the professionals have an opportunity to learn about the patient and his/her cognitive status and whether and how the assessment of the patient can benefit from using the application. The nurse in the dialogue meeting expresses: *

Those who are 65-70, or 60 to 70 you could say, around there, there I could also get some information just by seeing how they handle things that they've done, and see if they do it without problems as well.

Hence, the fact that the test is performed at the healthcare unit facilitates. It gives further information about the patient when the professional can observe how the patient, for example, manages to use the coffee machine or finds his/her way back to the waiting room. One interviewed nurse comments on this:

[…] that one also meets the patient and does an investigation, it is quite a lot that consists of observing the patient, how they respond, how they behave and looks awake, eyes, motor skills and all sorts of things that disappear when they sit in front of a tablet just so that it becomes more difficult to get a whole view of the patient.

When the professionals are given the opportunity to use their reflected experience-based knowledge, or "clinical view", in combination with the digital tool, it creates possibilities for a more holistic view of the patient, and their learning therefore increases. Because of this insight, the interviewed professionals think they would get a better basis for assessing cognitive impairment when a patient is referred to the clinic and the tool is used under supervision.

However, it is important that the professionals use the application in several different ways in practice to learn how to use it and for which patients it is suitable to use, as emphasized in the reference group. The application is considered a good complement to the basic investigation to strengthen and confirm the assessment by the professionals. Using the application also facilitates the ability to follow up on the disease process as the tool provides objective and quantifiable dimensions.

Professionals who were interviewed believe that they need to think person-centered and make sure which patient they have in front of them. Knowing that they have made as good an assessment as possible and that they can report to a specialist physician for the further assessment or treatment is important, and that the patient can also feel safe with the assessment is satisfactory for the professionals. It is important for the professionals to learn how the patient experiences things and how the patient feels about the tests and the assessment. This means that the professionals learned that they could not replace the basic "paper and pen" assessment with the digital one for the frail elderly. It is very important for patients to feel that the result is reliable. Patients may not trust the person as the professional, but when a digital test is done by the patient him-/herself, and they quickly get information based on what they fill in by themselves, the digital tool can help show that there is no sign of cognitive disease. It is also important that patients get the experience of being heard and seen early by the healthcare professionals if they need further assessment.

The tool could then be described as a better pedagogical tool for the patient to understand and learn from their own experience, as well as a way to communicate different symptoms and reasons for them. It was emphasized in the reference group that it can be calming for the patient to get explanations and learn about their experienced symptoms and worries. The professionals also perceive the patients' relatives as positive towards the tool, as they feel more involved and can be more informed about the process.

5.3 The tool as a guide for sorting and early detection
Interviewed professionals emphasize the use of the application as a first sorting tool to get a first picture of the patient. This can then form the basis for priorities and how to proceed with the investigation. The screening by the application streamlines the assessment and sorts out those who are not in need of further assessment for cognitive impairment.

In many county councils, there are long queues, and it takes a long time before a patient can carry out a cognitive impairment test. It also looks very different in different county councils what type of healthcare is offered for patients with cognitive problems. Some county councils have full-scale memory clinics and specialist teams, while others work in completely different ways. One interviewed physician expresses the use of the tool like:

[. . .] the big majority who anyway search help with these problems do not actually have a cognitive disease, instead there are many other underlying causes and then it will replace some of the tasks that they are forced to go through otherwise.

An application like this, which is assessed in this study, could create a quick first assessment by meeting healthcare professionals or at the patient's home, where the patient can experience being examined and investigated at an early stage. The patients who clearly show the need for cognitive impairment investigation can then be prioritized first, and patients who show memory difficulties but for other reasons can be offered other help. One of the interviewed physicians states:

But above all, I believe that it is a streamlining both for the health center, when it comes to prioritization, and so streamlining for the patient, that they can more quickly get clear answers to their problems and concerns.

This indicates that the use of the tool would decrease the number of patients who are in need of further assessment and thus also decrease both the workload for the healthcare professionals and the cost of the assessments.

Professionals interviewed also claim they learn that the digital tool could be used as a screening tool in collaboration with the psychosocial team. The psychosocial team often admits patients to the specialists when they think they have cognitive impairment. The "paper and pen" assessment and the digital assessment can be a complementary when professionals need to discuss with other professionals, and everyone can then learn from the very same information and get the same picture of the patients' problems.

Professionals in the reference group think that the tool can be used for learning about early detection of dementia, and above all to learn about monitoring disease progression. The tool can help to identify cognitive impairment and clearly identify which patients are benefiting from disease-modifying treatment. If professionals can learn to better detect dementia and its progression, it will be possible to provide more accurate information about the prognosis, what interventions need to be put in place, and when they are needed for a patient. One of the interviewed physicians reflects:

The goal with this is then to be able to catch the patient early [. . .] eh [. . .] before they have their diagnosis [. . .] and preferably before [. . .] a cognitive investigation.

The tool can make it easier to catch patients early, actually before they have a diagnosis, i.e. before a cognitive investigation. The tool should also help so that patients can be followed over time. It has been obvious from the reference group meeting that today there is a large knowledge gap in professionals ability to identify where patients are in their disease progression and to measure their care needs, especially in their early stages. There is a fairly large heterogeneity in that group, and if professionals could learn to map the needs of this group with support of a digital screening tool, these patients' quality of life and their situation could be a little better. The situation of relatives could also be improved.

The tool could also be used as a complement to healthcare. Those people who do not have any cognitive problems but who are still worried could do such a test by themselves, as the application offers this. Then that group can be filtered out, which can save time that otherwise the healthcare system would have had to put in. For professionals, it is especially important to make follow-ups of the patients' cognitive impairment progression, interviewees claimed. It is the change over time for this disease that is important to follow, as there is such a large variation. It can be very

difficult after a single meeting with a patient to determine if the cognitive function is normal, but if professionals could have follow-ups, the accuracy will be much better. With the tool, the professionals could learn about those patients who are served by treatment at an early stage before they end up in a situation where their cognition is impaired.

5.4 Professionals' views on patients' needs

Patients who have not had any cognitive impairment have been asked to try the application and to fill in questionnaires about what they have liked about using the digital tool, interviewees told. Most patients thought it was fun and easy to do the test, and none of them thought it was difficult.

The interviewed professionals feel that most patients have been positive about using the digital tool. The patients convey that they feel that they get quick feedback. Relatives are very positive, as they are often the ones who initiate the investigation, and they can be in the background when the tests are performed by the patients. The relatives can become a little more involved, especially when it comes to the relatives' survey in the digital tool, as the nurse in the dialogue meetings claimed. It is a question of whether the digital application can be handled by older people, and perhaps then by people with cognitive illness. Most people are starting to get more and more technically proficient, and those who have not developed dementia or cognitive disease but who are worried are 50–60 years old, and they are quite proficient today in terms of technology and will be all the more so.

Professionals interviewed believe that in many cases, it is noticeable if the patients have technical problems when they take the test. If the patients have technical problems, the professionals will still meet the patient and can learn about the patient and his/her cognitive problems. The majority who have taken the test have not had any technical problems, so it has not been an obstacle, some interviewees claimed. The majority of those who do the test do not have signs of cognitive disease, but there is very much else that is picked up by the digital tool that is valuable to learn for the patients, their relatives, and the professionals to prevent and treat.

Some of the professionals interviewed have learned that it has been a bit problematic for patients who have used the application at home, with difficulty getting into the application. When the patients have been to the clinic, they have been able to get some help. Patients can sometimes read a little carelessly and discover afterwards how to do the tasks in the digital test. Sometimes patients have thought that they have been ready when only a part has been completed in the application.

6. Discussion

Values, ethics and a sense of good are shared by the healthcare professionals in this study. Hopwood (2016) also claims this is important for the healthcare professionals' learning. Using the practice-based perspective also allows us to shed light on new opportunities for acting and learning in a more informed and multi-faceted way in this healthcare practice (Nicolini, 2012).

In appropriating and using the digital application, the healthcare professionals meet several challenges; however, they do not express feeling uncomfortable with the digital tool as in Huter *et al.* (2020) study. They need to learn what the digital application provides to identify patients' cognitive impairment. The professionals' learning is challenged when their work routines are changed. The interweaving of the socio-material characteristics of the work practice produces new flexible routines when the digital application is providing

the healthcare professionals with certain opportunities for learning. This will also include learning to create new flexible work routines to produce a desired outcome. The way the digital application affords opportunities for learning and how the professionals elect to engage in learning the digital application will have an impact on the outcome (Billett, 2001). The healthcare professionals therefore develop and learn new ways to conduct their work in a flexible way. The learning implies changing the professionals' ways of working. They learn when integrating a digital application into their practice.

Prefiguration and indeterminacy can be used to illustrate stability and change in the healthcare professionals' learning in practice (Hopwood, 2016). The use of the digital tool permits learning about new working methods at different organizational levels. A nurse, who works rather independently from the physician that has to make the final decision, has many prefigurative aspects to consider. For instance, the nurse has to try their hand and to not proceed in new routines too quickly to follow what the patients can handle and endure. The nurse meets different situations directly and has to arrange the practice to the best of the patients. At the same time, the new routines are indetermined, as different patients react differently from each other, and the nurse would have to adapt their work to the specific situation. This will also give the nurse more knowledge about the disease, as the introduction of the digital application will also test what the patients can handle in terms of understanding and interaction with a new tool. The professionals learn to understand what is important in meeting the patient to make a diagnosis. In this way, the professionals get to learn how much help the patient needs when using the digital assessment application. Therefore, the professionals also get insights into which kinds of patients are suitable to be tested at home individually and which should have a nurse by their side. The professionals could also get a sense of what accounts for gains and losses in new ways of working where patients' self-investigation can be done at home, and this is valuable in the further assessment of each patient. Considering a team who is using the application, they have opportunities to discuss their joint activities, and each professional then does not need to grasp the whole situation when using the application to assess the patient's cognition. However, professionals learn individually as their work proceeds. They learn around how a digital application can be used as a supplement and what are considered as disadvantages and advantages, respectively. They learn to understand and interpret results of the digital assessments based on the digital application, compared to the previous work routines. They also learn how the application cannot or should not be used and how to make the professional assessments. The findings also show that professionals learn about their own way of working through reflection and doing their work and that they gain organizational insights about the process of managing cognitive impairment in general.

The digital cognitive tests make it possible for the professionals to act, reflect and consider what qualities make sense for early detection and longitudinal follow-up of people in the risk group of cognitive impairment as well as in establishing diagnosis, for the best of their patients. Prefigurative aspects are thus important in socio-material enactments, where changes emerge constantly (Hopwood, 2016; Gherardi, 2010). Professionals' knowledge and experience, and their joint reflections, are therefore of vital importance in changing work practices.

7. Conclusions
Introducing a digital application in the healthcare practice implies many challenges for healthcare professionals. Learning is emerged in the situation where the professionals

have many prefigurative aspects to consider, but their work practices become more indetermined when the digital application is introduced. They need to learn in a flexible way when they are meeting patients in their work practice and integrating the digital tool when screening patients for cognitive impairment. The learning also happens as a combination of being able to use knowledge based or practical experience and how to connect that to new experiences with the digital tool. The professional must learn how the collected data should be used and interpreted in comparison to the more traditional pen-and-paper methods. They also need to adapt to the changes based on characteristics of the patients, combining practical and theoretical knowledge with the present work situation and the individual patient's unique context. This is also related to the socio-material perspective, where knowing, doing, and learning are entangled and are emerging in the work practice. The healthcare professionals have patients with a disease that has certain characteristics as a kind of stability in their work, but the professionals should receive support from the application for a more secure diagnosis that causes a change in their work practice.

It can be concluded that this type of digital assessment application could change the work processes when it comes to early detection and detection of patients that are difficult to assess by traditional methods like paper-and-pen. It could also change the work processes when the queue for the clinic is long. The application could then be an alternative for patients to start with while waiting, which could reduce stress in the clinic when having something to offer in the waiting period.

The medical professionals have, through use of the application, also learned new ways to sort and categorize patients since the tool provides a streamlined data collection, also over time. However, the professionals need to trust their own abilities and their knowledge and experience, and it is also important that they reflect and exchange experiences with each other as a stability in their work practice to achieve learning indeterminately, which should provide good quality of care. It can be concluded that digital applications in combination with practical experiences in the physical meeting and personal communication create a better ground for a good diagnosis.

References

Billett, S. (2001), "Learning through work: workplace affordances and individual engagement", *Journal of Workplace Learning*, Vol. 13 No. 5, pp. 209-214.

Billett, S. and Choy, S. (2013), "Learning through work: emerging perspectives and new challenges", *Journal of Workplace Learning*, Vol. 25 No. 4, pp. 264-276.

Billett, S. and Smith, R. (2014), "Learning in the circumstances of professional practice", in Billett, S., Harteis, C. and Gruber, H. (Eds), *International Handbook of Researching Professional and Practice-Based Learning*, Springer, London, pp. 733-757.

Bloniecki, V., Hagman, G., Ryden, M. and Kivipelto, M. (2021), "Digital screening for cognitive impairment – a proof of concept study", *The Journal of Prevention of Alzheimer's Disease*, Vol. 8 No. 2, pp. 127-134.

Braun, V. and Clarke, V. (2006), "Using thematic analysis in psychology", *Qualitative Research in Psychology*, Vol. 3 No. 2, pp. 77-101.

Carroll, J.M. and Swatman, P.A. (2000), "Structured-case: a methodological framework for building theory in information systems research", *European Journal of Information Systems*, Vol. 9 No. 4, pp. 235-242.

Edwards, A. (2005), "Let's get beyond community and practice: the many meanings of learning by participating", *The Curriculum Journal*, Vol. 16 No. 1, pp. 49-65.

Eisenhardt, K.M. and Graebner, M.E. (2007), "Theory building from cases: opportunities and challenges", *Academy of Management Journal*, Vol. 50 No. 1, pp. 25-32.

Engeström, Y. and Sannino, A. (2010), "Studies of expansive learning: foundations, findings and future challenges", *Educational Research Review*, Vol. 5 No. 1, pp. 1-24.

Engeström, Y. and Pyörälä, E. (2021), "Using activity theory to transform medical work and learning", *Medical Teacher*, Vol. 43 No. 1, pp. 7-13.

Fenwick, T. (2015), "Sociomateriality and learning: a critical approach", in Scott, D. and Hargraves, E. (Eds). *The Sage Handbook of Learning*, Sage publishers, London.

Gherardi, S. (2010), "Telemedicine: a practice-based approach to technology", *Human Relations*, Vol. 63 No. 4, pp. 501-524.

Gherardi, S. (2011), "Organizational learning: the sociology of practice", in Easterby-Smith, M. and Lyles, M.A. (Eds), *Handbook of Organizational Learning and Knowledge Management*, 2nd ed. Wiley, Chichester, West Sussex, pp. 43-65.

Gherardi, S. (2017), "Sociomateriality in posthuman practice theory", *The Nexus of Practices*, Routledge, London, pp. 50-63.

Gjellebæk, C., Svensson, A., Bjørkquist, C., Fladeby, N. and Grundén, K. (2020), "Management challenges for future digitalization of healthcare services", *Futures*, Vol. 124, p. 102636.

Gough, R., Ballardie, R. and Brewer, P. (2014), "New technology and nurses", *Labour and Industry: A Journal of the Social and Economic Relations of Work*, Vol. 24 No. 1, pp. 9-25.

Hedqvist, A.-T., Svensson, A. and Larsson, L.G. (2022), "Nurses' experiences of person-centered care planning using video conferencing", *Nursing Open*, Vol. 10 No. 3, pp. 1879-1888.

Hopwood, N. (2016), "Sociomaterialism, practice theory, and workplace learning", *Professional Practice and Learning*, Springer, Cham, pp. 53-115.

Huter, K., Krick, T., Domhoff, D., Seibert, K., Wolf-Ostermann, K. and Rothgang, H. (2020), "Effectiveness of digital technologies to support nursing care: results of a scoping review", *Journal of Multidisciplinary Healthcare*, Vol. 13, pp. 1905-1926.

Jensen, K., Lahn, L. and Nerland, M. (2012), "Introduction – professional learning in new knowledge landscapes: a cultural perspective", in Jensen, K., Lahn, L. and Nerland, M. (Eds), *Professional Learning in the Knowledge Society*, Sense Publishers, Rotterdam, pp. 1-24.

Leonardi, P.M. (2013), "When does technology use enable network change in organizations? A comparative study of feature use and shared affordances", *MIS Quarterly*, Vol. 37 No. 3, pp. 749-775.

Mol, A. (2010), "Actor-network theory: sensitive terms and enduring tensions", *Kölner Zeitschrift Für Soziologie Und Sozialpsychologie*, Vol. 50 No. 1, pp. 253-269.

National Board of Health and Welfare's national guidelines for dementia (2017), available at: www. socialstyrelsen.se/globalassets/sharepoint-dokument/artikelkatalog/nationella-riktlinjer/2017-12-2. pdf (accessed 12 July 2023).

Nelson, S.B., Jarrahi, M.H. and Thomson, L. (2017), "Mobility of knowledge work and affordances of digital technologies", *International Journal of Information Management*, Vol. 37 No. 2, pp. 54-62.

Nicolini, D. (2011), "Practice as the site of knowing: insights from the field of telemedicine", *Organization Science*, Vol. 22 No. 3, pp. 602-620.

Nicolini, D. (2012), *Practice Theory, Work, and Organization: An Introduction*, OUP Oxford, Oxford.

Orlikowski, W.J. and Scott, S.V. (2016), "Digital work: a research agenda", in Czarniawska, B. (Ed.). *A Research Agenda for Management and Organization Studies*, Edward Elgar Publishing, Northampton, MA, pp. 88-96.

Schatzki, R.R. (2013), "The edge of change: on the emergence, persistence, and dissolution of practices", in Shove, E. and Spurling, N. (Eds), *Sustainable Practice: social Theory and Climate Change*, Routledge, London, pp. 31-46.

Schatzki, T.R. (1996), "Practiced bodies: subjects genders, and minds", in Schatzki, T.R. and Natter, W. (Eds), *The Social and Political Body*, The Guildford Press, London, pp. 49-77.

Schatzki, T.R. (2010), "Materiality and social life", *Nature and Culture*, Vol. 5 No. 2, pp. 123-149.

Schoultz, K., Svensson, A. and Emilsson, M. (2022), "Nurses' experiences of using AsthmaTuner – an eHealth self-management system for healthcare of patients with asthma", *Digital Health*, Vol. 8, pp. 1-7.

Further reading

Eisenhardt, K.M. (1989), "Building theories from case study research", *Academy of Management, The Academy of Management Review*, Vol. 14 No. 4, pp. 532-550.

Corresponding author
Ann Svensson can be contacted at: ann.svensson@hv.se