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REPRESENTATIONS OF PRACTICE – DISTRIBUTED SENSEMAKING USING BOUNDARY OBJECTS

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ABSTRACT

Aim/Purpose	This article examines how learning activities draw on resources in the work context to learn.
Background	The background is that if knowledge no longer is seen mainly as objects, but processes, how then to understand boundary objects? Our field study of learning activities reveals the use of pictures, documents and emotions for learning in the geographically distributed Norwegian Labor Inspection Authority
Methodology	The study is a qualitative study consisting of interview data, observation data, and documents.
Contribution	Contribute to practice based theorizing.
Findings	Three ideal types of representing practices have been identified, i.e., 'Visualizing', 'Documenting' and 'Testing'. All three are combined with storytelling, sensing, reflections and sensemaking, which point at the importance of processes in learning. The article also add insights about how emotions can be an important resource for boundary spanning – and sensemaking – by creating the capability of reflecting upon and integrating different knowledge areas in the in-practice context.
Recommendations for Practitioners	Look for boundary objects within your field to promote online learning.
Recommendation for Researchers	Study boundary objects in work context to understand learning.
Impact on Society	Role of objects in human learning.
Future Research	Focus on how emotions can be used for online learning.
Keywords	learning in organizations, network of practice, sense making, learning as practice. boundary objects

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INTRODUCTION

Boundary objects are regarded as sense making tools that facilitate knowledge sharing and even knowledge creation, in particular in distributed organizational settings (Benn, Edwards, & Angus-Leppan, 2013). Individual and collective learning that cover both the explorative and exploitative sides and that integrate action and reflection is a challenge for both researchers and practitioners. Practice based approaches have addressed important issues such as the contextual, social, and personal sides of practice, knowledge, learning, and innovation (Brown & Duguid, 1991; Gherardi, 2009; Gherardi & Nicolini, 2001; Schatzki, 2001). How learning can take place, be facilitated, or hampered within self-organized communities of practice (CoPs) or fields of practice have been researched and theorized. The last decade also learning across units within or across organizations has received increasing attention. As part of that, different 'bridges' have been suggested in order to facilitate learning, such as brokers, boundary objects, and diverse interactions (Wenger, 2003), and relational qualities, such as appreciation, trust, support, care, identifying, involvement, and dialogue (Hislop, 2009).

Practice based approaches have contributed with increased understanding of learning, not least in different self-organized communities within organizations, and has focused on craft/task based activities, professional activities, expert/creative activities, or virtual activities (Amin & Roberts, 2006) and shared physical context. This paper contributes with increased understanding of learning in distributed organizations. Distributed organizations are ones whose internal activities are geographically dispersed (see Duarte & Snyder, 2006). More specifically the study contributes to the understanding of how boundary objects and online contexts can be used where employees lack a shared physical daily/weekly presence. The main research question explored and described is: *How can representations of practice serve as boundary objects facilitating learning?*

The paper is structured as follows. Core theoretical concepts and assumptions are briefly elaborated as a frame, before describing the methodology and context. The main findings of three ideal types of representing practices are then introduced, described, and briefly compared. In the last section the main categories are summarized and discussed, before suggesting implications for future research and practice.

LEARNING AS PRACTICES

PRACTICE BASED LEARNING

Learning and knowing can be studied through exploring "what people do, and how they do it" (Orlikowski, 2002, p. 271). Further, one can argue as Brown & Duguid (1991, p. 11) that "Learning is, therefore, a process of giving meaning to, or seeking to understand, life experiences". We assume that practice and learning are holistic, i.e., include broad versatile dimensions and different levels (explicit and more implicit, tacit and disguised levels). Also different notions of time tend to be involved, such as reflections, sense making, and narrating *in-action* as well as *on-action*. According to Gherardi (2009 p. 41) practice is collective when it is shared and when "actions are regarded answerable to norms of correct or incorrect practice, to criteria of aesthetics taste and to standards of fairness". Further one can argue that learning as social practice and accomplishment depend upon different relational structures and relational qualities (Eide, 2007; Hislop, 2009; Wenger, 1998).

Communities of practices (CoPs) are often seen as informal, organic, self-organized units of activity: "produced by its members through their mutual engagement…that tend to escape formal descriptions and control" (Wenger, 1998, p. 118), and "who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis" (Wenger, McDermott, & Snyder, 2002, p. 4). The elaboration of CoPs seems to assume that the members regularly work together, or as described in Orr (1996), regularly meet during lunchtime and meetings where they share work experiences. Some, however, do not have the oppor-

tunity of directly working together nor meeting regularly (daily, weekly) in other ways, since they are spread around large geographically areas. One alternative then can be to increase the interactions through the use of other media than face-to-face such as phone, email, videoconferences, and interactive ICT, as well as to try to create a community where such common focus and experiences can be shared. This might be done through networks of practices (NoPs) or managed networks of practices (MNoPs) within or across organizations.

A *network of practice*, in opposite to a channel type of network, is a community with less open structure; participation is more intensive; and it tends to involve and depend upon shared identity and professionalism/specialization that contribute to shared knowing and goals, and often shared social practices (Newell, Robertson, Scarborough, & Swan, 2009). If NoPs are created formally, they can be started by the management and given tasks by the management, but they do not have to be managed by the formal managers. Nevertheless, one can argue management has contributed in creating a 'bridge' between distributed employees, being a broker contributing to a 'work space' where employees can meet and learn in a legitimate way. One reason for organizing for such networks can be the aim of obtaining similar self-organized learning activities that can take place in CoPs and to facilitate innovation (Swan, Scarbrough, & Robertson, 2002). However, if this is possible is a much debated topic (e.g., Hislop, 2009; Thompson, 2005). A core point seems to be how one sees the role of managers, i.e., if one assumes that managers can control such communities or rather be brokers and cultivators trying to facilitate for learning and innovation, without being too directly involved.

Networks of different types are operating both within and across organizations. The interactions between the 'contexts' and activities seems critical, if to become integrated as a more holistic learning practice. Wenger (1998, 2003) points at the importance of both some shared aspects and some difference in order to learn and that practicing is not taking place within sharply separate communities (i.e., the importance of integration). Boundary crossing tends to create tensions which can either open up for learning or close. Wenger (2003) suggests three main bridges that can facilitate learning within and not least across units: people (who act as *brokers*, e.g., which creates arenas and can transfer and translate ideas, objects and views), *boundary objects*, and *varied interactions* between people. Below we focus mainly on boundary objects and knowledge.

Knowledge and Boundary Objects – Towards Process

Knowledge has often been seen as an object that can be made explicit and transferred, however this view has been supplemented with or changed with a more process view addressing the stickiness often hampering transferring and a turn to other concepts when trying to understand how actors know and learn (Orlikowski, 2002). We share the process view on knowledge/knowing where capability is a main side, but where there still can be involved also materialized and more stable elements (Corradi, Gherardi, & Verzelloni, 2010; Gherardi, 2009; Knorr Cetina, 1997, 2001; Orlikowski, 2005; Tsoukas & Chia, 2002). If knowledge no longer is seen mainly as objects, but processes, how then to understand boundary objects? One can argue that similar to changing the view of knowledge from mainly being an object toward mainly being processes, we can change from 'boundary objects' to 'boundary spanning process-tools'. The interesting focus then is how boundary spanning processes can be facilitated through different kinds of 'vehicles' and resources being tangible or intangible.

Traditionally, boundary objects have mainly been seen as external things, such as forms, drawings, models, and diagrams. They are seen as useful for knowledge sharing, since information can be transferred from one context to another context with important contextual features relevant to the receiver intact (Star & Griesmeier, 1989). When boundary objects are enacted, they create "windows" and give access to different types of knowledge. Star and Griesmeier (1989) describe how a questionnaire form to fill inn information was able to transport context knowledge needed to create an exhibition, from the archeologist at the site, to a museum. Boundary objects are however not merely material; boundary objects can be "stuff and things, tools, artefacts and techniques, and ideas, stories and memories" (Bowker & Star, 2000, p, 298). Examples of recent studies of the role of boundary ob-

jects range from integrating stakeholders for successful resource management (Clark et al., 2016), in global politics (Gray, Gruby, & Campbell, 2014) to developing knowledge to solving problems (Franco, 2013). Below we briefly review the nature and role further.

Nature of boundary objects and boundary spanning process resources

The notion of boundary objects was first developed within actor-network theory, but has been used by other approaches. Wenger (1998, p. 105) defines boundary objects as "artifacts, documents, terms, concepts, and other forms of reification around which communities of practice can organize their interconnections". For example, a memo telling a story, call upon the fore-understanding and meaning processes of the person reading the memo, but according to Wenger, the relations are not only between the person and the memo, it is also between the CoP where the person is situated and the CoP which the memo comes from. Sometimes boundary objects facilitate sharing without a shared perspective and sometimes boundary objects helps the mutual construction of a perspective (Swan, Bresnen, Newell, & Robertson, 2007). That there are two contexts involved can contribute to communication problems that calls for negotiations of meaning. One reason for this potential problem can be the difference between what Wenger (1998) calls the practices of design versus practices of use. In our empirical context this might be seen as the difference between experiencing phenomena during practices of working versus trying to express or to understand the phenomena through practices of representation. In a later texts he (Wenger, 2003) groups boundary objects into three main forms, i.e., artifacts, discourses, and processes. This latter seems to include a turn from a focus mainly on physical objects, to language and processes.

According to Nosek (2004), boundary objects can be anything perceptible by the senses, e.g., cognitive maps, non-verbal expressions such as body language, tone, heartbeat, gestures, and brain patterns. Heartbeats and brain patterns can hardly be communicated to others directly; they are probably to be displayed on drawings (on paper or screen), and then interpreted. Others have addressed power point slides, technology, and physical artifacts as examples of boundary objects (Newell et al. 2009). We would add different physical tools, prototypes, examples /stories about or shared experiences such as activities, thoughts and emotions, probably also different ways to call upon memories, attentions, and focus, which start shared processing. Even though boundary objects mainly are described as physical and cognitive artifacts, we assume a broader and versatile understanding and are open to the idea that emotions can serve as boundary spanning and process-resources. For example, emotions can be part of stories and what is communicated, known, and learned, as well as what resonates with the other that experiences the expressed. Pure stripped cognitive 'facts' can describe some aspects of life and practices, but far from all. Further, we propose that actors (individuals and collectives) differ in preferences and practices when it comes to how and what they communicate, learn, and know, which can be reflected in the boundary objects or process-resources applied and how they are used.

The term boundary objects has from practice based perspectives been criticized. Orlikowski (2002) stress that learning happens largely through "doing", but that perspectives often have given privilege to knowledge-as-object or knowledge-as-disposition over knowing-as-doing. She emphasized that we might learn some useful insights about capabilities if we also focus on what people do, and how they do it, rather than focusing on infrastructure, objects, skills, or dispositions. In later work she found that boundary objects appear more in stable environments and not in dynamic contexts (Kellogg, Orlikowski & Yates, 2006). The boundary object concept is criticized for viewing knowledge in a traditional way, knowledge as an object and not interwoven into processes, practices, and relations (Carlile, 2002). Others stress that boundary objects are dependent upon and brought to life through social interaction and use (Barrett & Oborn, 2010).

The roles of boundary objects /spanning process-resources

The literature review shows that boundary objects can contribute to point of reference, visualize knowledge, knowledge transferee, interaction, coordination and alignment, as well as exchange of experiences, thoughts, and emotions in dialogues and perspective taking (Barrett & Oborn, 2010; Boland & Tenkasi, 1995; Chrisman, 1999; Fisher & Reaves, 1995; Koskinen & Mäkinen, 2009; Star & Griesmeier, 1989). Boundary objects can enhance the capacity of an idea, theory, or practice to translate across culturally defined boundaries, for example, between communities of knowledge or practice (Fox, 2011). It has been argued that boundary objects are objects that "have different meanings in different social worlds but their structure is common enough to more than one world to make them recognizable, a means of translation. The creation and management of boundary objects is a key process in developing and maintaining coherence across intersecting social worlds" (Star & Griesemer, 1989). This latter quote addresses the interpretative and translation processes of people 'using' them. Put differently, it addresses flexibility and process, rather than something static and fixed (Newell et al., 2009). The meanings enacted toward the boundary object can, thereby, differ from one person to another. In short, it can be a bridge or interface between contexts. Further, we propose that one main (although not only) role of boundary objects is to help people to disclose and communicate about experiences and practices so that they can reflect on-action and prepare for later 'in-action', i.e., operate as 'boundary spanning process-resources'.

METHOD AND CONTEXT

The aim of the study is to develop new insights about learning as practice, and in particular the natures and roles of boundary objects. Grounded Theory (GT) (Glaser & Strauss, 1967) provided our methodological approach here, primarily due to its ability to facilitate and offer explanations and descriptions of complex organizational practice (Orlikowski, 1993).

THE CASE AND SUB-CASES

The empirical study takes place in two regions of the Norwegian Labor Inspection Authority (NLIA). The organization is chosen since it seeks to facilitate individual and collective learning and shared practices across geography, through formally created networks of practice. The regions are selected due to the long geographic distance between the employees in these regions and consequently lack of face-to-face (f2f) interactions. The employees work either from small regional offices or home office, and they are often on the move undertaking inspections all over their district. The NLIA is a distributed public organization with small district offices scattered all over the country. The inspectors in this organization have mixed backgrounds. Historically speaking, people with some years of experience were recruited from industries in the building and construction sectors, very often they had been union representatives. Others moved up from working as clerks to being an inspector, often after gaining qualifications from working closely with an old-timer (experienced college). More recently, people have entered the organization with a professional college/university degree (bachelors or masters).

The networks were selected based on the following criteria: they all offered a distributed context (networks from the two largest regions) and they represented different knowledge areas adding variation to the study. The study involves data from five networks: two networks set up for preventing accidents, one for occupational hygiene, and two within the area of psychological well-being. All of the networks are staffed with around eight to fourteen people.

The tool used in the network settings is, the GoToMeeting tool, a highly rated web-based tool that allows everyone in a group meeting to share whatever is on each participant's computer. The tool contains features like screen sharing, sharing of keyboard and mouse control, chat, and phone, and the tool is also integrated with email and the Outlook calendar for the efficient booking of meetings (see *http://www.gotomeeting.com*). While you can share everything you have on your computer and have a telephone meeting, the contenders do not see each other. The GoToMeeting tool was introduced in

the organization at the same time as the competence networks were established and has become a tool in the inspectors' daily tasks in project work and the main channel for the networks, which meet once a month online, but only once or twice a year face-to-face.

Data Gathering and Analyzing

The field work is done by the first author. It started with a few interviews, which where helpful in developing an overview and for building relationships with coordinators and members in the competence networks. The relationships gave access to participate in their meetings, first the face to face meetings and then online meetings. A moderate participative role was taken during observations (Spradley, 1980), i.e., asking questions, giving some feedback, and interacting socially. The informants were asked about sharing and learning activities and media use in the network context, and out of these activities we were able to describe practice. The study is based on interviews with 14 ordinary network members, 2 managers (who observe the meetings) and 3 network coordinators (ordinary Inspectors) and observation of face to face and online meetings over a 1.5 year period. Primary data sources supporting interview and observational data include textual data such as minutes of meetings, annual reports and evaluations.

This study employed the theoretical sampling procedures developed by Strauss and Corbin (1994) for conducting qualitative analysis. Our chosen informants have worked in the organization between 1 to 20 years, and in the networks from 1 – 5 years. We sought interview data from multiple members of the networks, figuring they could give us different insights into our topic. In particular we targeted informants working within different tasks and knowledge needs. In this way we hoped to understand the evolving learning practices in different competence network contexts. Interviews were semi-structured, tape-recorded and transcribed. Due to the long travel distances, 9 of the 18 interviews were conducted by telephone. This made it possible for us to collect data from dispersed inspectors. The average face-to- face interview and the average phone interview lasted both 53 minutes. In our experience the phone interviews' proved as elaborative as the ones we conducted face-to-face, maybe due to the informants' familiarity with describing complex phenomenon on the phone.

We read each transcript of each interview to deepen our understanding of work knowledge and boundary objects in use in learning activities. First, we identified those sentences and paragraphs known as "incidents" in our open coding (Table 1). This initial process of labeling simplified our synthesizing of the many interviews and notes and provided us insights.

The second step, axial coding, involved our combining and collapsing categories. Several times incidents were moved from one category to another. Then the three practices emerged out of our data, and we initiated a focused coding (Glaser, 1978) by sorting the initial categories into 3 categories – 3 practices – 'visualizing' which was developed mainly from categories 6, 7, 9, 14, 15, 20, and 22. Moreover 'documenting' developed from categories 2, 3, 5, 8, 9, 13, 16, 19, and 20 and 'testing' developed from categories 12, 14, 17, 18, 19, and 21 (see also Figure 1). Note that some categories gave insight to more than one practice, like category 14, learning during inspections.

The comparison between data (and not data and theory) is put in the foreground in Grounded Theory, but we did not enter the field tabula rasa. Theory has helped us to interpret findings in the analysis as recommended by Turner (Cutcliffe, 2000; Turner 1981) for Grounded Theory. Activities described in the interview data and observational data have been compared and the activities within each practice have been "moved around" between the emerging categories – our typologies (ideal types); they have also been discussed and member checked at several occasions during the study. Interviews have also at several occasions been read as an entity, adding new interpretations of the findings.

Table 1: Category listing

1. Discussing the agenda of the meetings	12. Importance of using different senses in knowledge transfer and learning
2. Learning from Powerpoint presentations	13. Learning from projects
3. The importance of sharing correspondence with clients with colleagues for learning	14. Learning during inspections
4. Making minutes of meetings	15. Learning from discussions
5. The importance of storytelling during network meetings	16. Use of intranet for learning
6. Role of pictures in knowledge transfer and learning	17. Importance of getting to know each other to learn
7. Stressing importance of picture taking during work	18. Importance of taking field notes for learning
8. Use of work applications	19. Importance of reading documents before discussing
9. Description of work activities	20. Discussing work equipment (tools, machines) and its potential hazards.
10. Description of the management of the meetings	21. Discussing moody managers
11. Importance of face to face meetings for trust	22. Discussing accidents

PRACTICES OF REPRESENTING PRACTICE - IN ORDER TO LEARN

Three ideal types of representations as part of the learning practices in networks have been developed, i.e., 'visualizing', 'documenting' and 'testing'. The three practices are illustrated in the Figure 1.

The three representing practices are learning modes that are used and function differently across networks. The networks mostly working with phenomena and knowledge close to natural science typically practice the ideal type 'visualizing' and 'documenting'. The networks working with psychosocial work environment phenomena and largely based on knowledge related to social science typically practice the ideal type of 'testing' and 'documenting'. The main reasons for 'visualizing' versus 'testing' seem related to the work ontology and knowledge paradigm, while 'documenting' seems to be a strongly expected way of practicing rooted in the logic of bureaucracy, seeking more objective, documented, and transparent work practice which the learning practice is strongly embedded within. Further one can argue all three ideal types are embedded in and intertwined with the more overall practices of working that the employees are involved with in their everyday life outside the network. Without interesting activity outside the networks there would have been little to represent and work with in the networks. Without the networks, what then? One of the reasons for establishing the networks was that the expert center present in the earlier organizational model was closed, and one tries to involve the whole organization in the learning and knowledge development through these networks. Another co-existing reason was that one wanted to reduce the more individual and coincidental 'try-and fail' learning practice that often took place when employees worked alone distributed around the country. One hoped to facilitate collective and reflective learning and practice through these networks, and was also creating norms against try-and fail learning and mainly experience/action with little shared reflection. The three ideal types of representations are using partly different types of boundary objects and have different learning results. But they all seem to involve senses, storytelling, conversations, reflections-on action, and sense-making. The main type of senses

and reflection approach are however partly different. Below we describe each of the ideal types in separate sections.

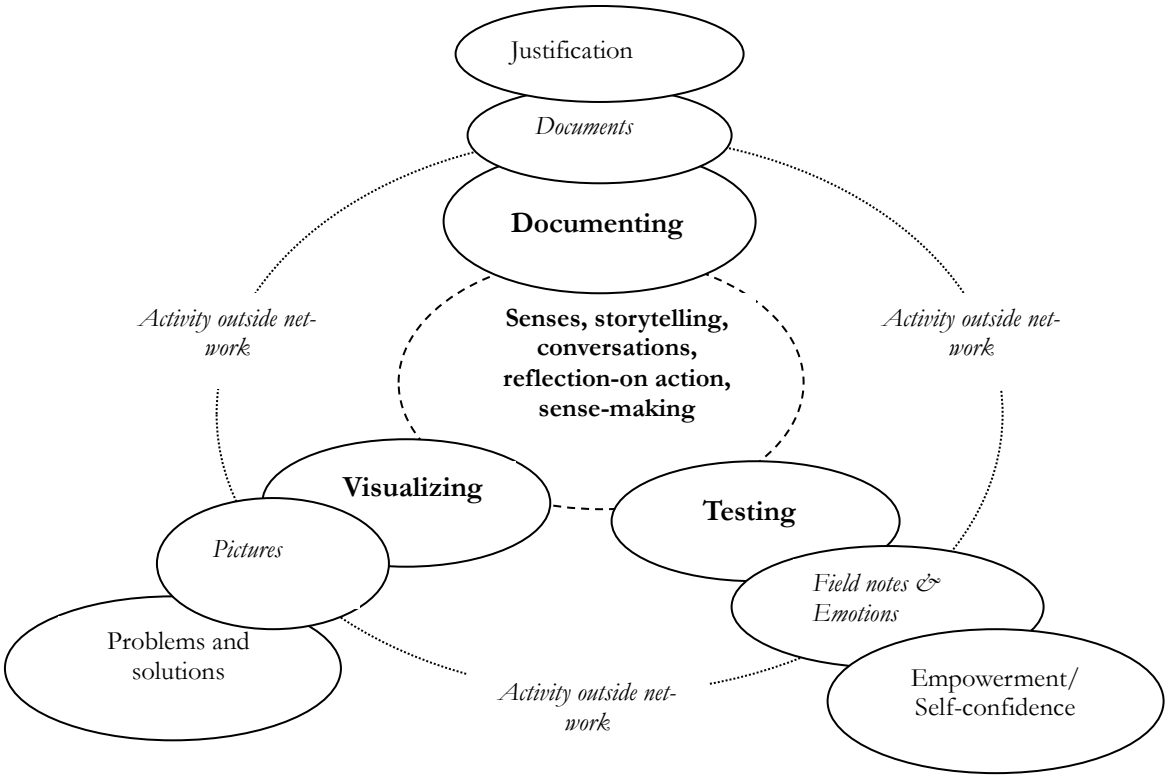

Figure 1: Three ideal types of learning practices within the networks of practice

VISUALIZING

This representation practice is used mostly by the networks set up for knowledge areas in the naturalistic knowledge areas, i.e., the accident networks and the network of occupational hygiene, where the majority has an engineering background. When 'visualizing´ they inform about, and discuss, what they have seen or would like to see at inspected sites and how to cope with it. Pictures are used together with oral stories and conversations from the field, in order to show problems or solutions to problems. One inspector illustrates the use of pictures this way:

> *"….we present to each other pictures of as an example what is sensible placement of ventilation facilities, what is unreasonable placement of ventilation facilities, and why in a welding workshop. You can use a half hour to explain it, but it takes 3 minutes if you have a picture"* (Member of the network for occupational hygiene)

Senses in use are both seeing and hearing. 'Visualized practice' is possible by bringing a camera and taking pictures during inspections, and since the technology at hand facilitates efficient sharing of pictures. Pictures taken at enterprises are presented at f2f meetings as well as online. Historically, various types of engineers are used to illustrate their work through drawings or prototypes. In the labor inspectorate, pictures are used to illustrate practice, e.g. What can go wrong with different equipment and what must we look for when conducting inspections? How should a proper scaffold look like? The inspectors can in principle take pictures in the business of what they believe is relevant for their job. But some images they are more careful to send out, and some images they will not submit to anyone, because they know that there is sensitive technology for the company. Some of our informants stressed the importance of taking and attaching pictures to the case before putting it

into the archive, useful for the task handling and for later sharing online on GoToMeeting in projects or in the network.

An example of picture in use is presented in Picture 1.

Picture 1. Example of a picture taken during an inspection

The picture illustrates what they present to each other. In the conversation and storytelling they focused on the work processes related to this job, the problem of dust in work processes, and experiences regarding risk preventing efforts. This is then reflected on and made sense of. The picture illustrates how polluted air is taken out of the production hall through a point extraction, put on the machine where the dust is produced. The pictures illustrate a solution to a more general problem situation for the inspectors. They often struggle to find effective solutions to fulfill the requirement of the legislation and in a cost-efficient way for the inspected work place, i.e., finding solutions that can work for both parts. When they talk about these pictures, the presenter addresses attention towards certain areas of the picture to illustrate how the problem was solved or shows the problem to get help in solving the problem.

'Visualized practice' addresses the complexity the inspectors and their authority face. Even though their mission is to insure health and safety for employees, it can be problematic to impose that without also considering the costs and practical solutions for the business or public authority they have inspected. The stories they tell are often about the need to find a cost effective way to solve the health and safety risks. Examples in the stories are often smaller businesses that will go bankrupt if authorities force them to install what is needed to get rid of the problem. The inspectors therefore sometimes have to explore and develop problem solutions in innovative ways, rather than to apply ready-made solutions (i.e., more exploitative approaches). They make robust inspection practices by helping to move forward a process involving many actors (i.e., more collective processes). The pictures and stories are also about the enterprises situation, about dangerous chemicals and features of the existing industrial building. In sum, an involvement of heterogeneous entities (documents, peo-

ple, equipment) leading to innovations – that adds up to a situation where the intentions of the law is insured, but with less costs for the inspected entity. The main 'boundary objects' here, their window into the practice of the others, are the pictures and stories illustrating problems and/or the problem solution. Such as, how they got rid of the polluted air in an effective and cost effective way**.** A sharing of one innovation/solution might trigger further innovations or the use of the innovation in other contexts as well. The 'visualized practice' seeks to reduce complexity and to facilitate reflections, dialogue, and constructions at individual and collective levels, and hence distributed learning and innovation. The visualized practice represents a culture of engineers and focuses on practical solutions, which seems easier transferred by the use of technology. While others argue that awareness is hard to develop online, the visualized practice described here creates awareness quickly in this online context, but here this mechanism is also supported culturally by the strong task oriented identity, the importance of doing inspections, and the phenomena these employees work with. Visualized practice is in Star and Griesmeiers (1989) terminology, an ideal type of a solved problem - and when shared - communicating a better road map for doing inspections. It supports the way of thinking of inspections, as to enforce the law by working together with the inspected entity, to find solutions which both the business and the "law" can live with. Many inspectors regard this as the most effective way to insure their mission. Using stories and pictures on GoToMeeting serves this purpose well.

Documenting

Inspectors in all five networks open up the archive to share their way of documenting and reporting in official documents on inspected enterprises. In a bureaucracy documents stored in archives are seen as a mean of ensuring the impersonal use of the law for the individual client (Weber, 1971). All written official documents regarding a case have to be stored for control, by the others or used as evidence if somebody has a complaint. But this archive is also important material for knowledge sharing and learning, not only through content analyses but through the conversations. The 'documenting practice' category represents findings where the inspectors through the GoToMeeting tool are able to represent on screen the whole process of case handling (outside of the network) like inspection on site, picture taking, dialog with other public bodies, and inspected business. Here norms regarding the quality of work come into play, like quality of interviews, note taking, communication, pictures, and written correspondence. The use of documents is a necessary resource for learning activities in a bureaucratically organizational context. To achieve 'equal handling', documents are needed to understand the practice of others, and works as the window (a boundary object) into it:

> *"We are very dependent on presenting each other's documentation, where the information is, what it says, how we use it, then we use GoToMeeting."* (Experienced Inspector)

Through documenting practice they show each other documentation of conducted task handling, legislation used, where it is and what it says. But this sharing must be accurate and traceable:

> *We can't share by referring to what we remember, we need to find the case, our sharing must be traceable.* (Experienced Inspector)

In bureaucracies, such as this authority, action is taken on the basis of and recorded in written rules (Weber, 1971). This is also true regarding sharing and learning as pointed out here. Sharing and learning start with recorded cases and the written rules in use. This implies that the sharing of documents is necessary to inform people and document about what legislation they use and how they use it when sharing experience and their knowledge.

This practice differs from visualized practice since it adds the following essentials:

1. The inspector displays how he or she formulates letters and how he or she makes references to the law, and sends information to the inspected enterprise.

2. The inspector displays the whole process from the first letter to the enterprise, notes taken at the inspected site and how he or she has followed up after orders have been put on an enterprise.

The activities represented in the network are the practice of law enforcement when conducting inspections and writing letters when being outside the network. Senses in use are hearing and seeing, and perhaps touching documents. GoToMeeting is seen as a proper tool, since it facilitates the sharing of whatever is on the individual inspector's computer: letter, notes and more important access to their work systems intranet, Vyr, a register for injuries, and Ephorte an archive and task handling system. Using documents is a way to share the practice of individuals with a group since it reveals both standard procedures of the organization and also local variants and personal interpretations and habits regarding the process and how the task handling is written up. In such it can develop both the practice of the individual and the collective toward increased similarity. They also use pictures in this practice. GoToMeeting is in this respect regarded as very effective:

> *"If the legislation is changing, pictures on screen can easily create a mutual understanding of the new legislation. Like when I present machines and equipment that are in line with the new rules. Using the GoToMeeting tool, using pictures takes three minutes as compared to 30 minutes if you had to explain only with words."* (Experienced employee)

'Documenting practice' is, compared to 'Visualized practice', more inward oriented towards the individual inspectors use of the legislation, checklists, and how he or she write up letters to the inspected business. The practice was developed as a coordination effort to insure unity when task handlers worked together in projects; now inspectors are often distributed geographically so the practice is enacted in the networks as a way of sharing and learning. The result of the activity is justifications, mutual understanding of the practice of the others, and more collective practice. However, documenting as a representation mode in the learning practice depends upon how open they are, and that differs. Some are more reluctant to disclose too much about what they actually do, as they are afraid to lose some of their flexibility when 'in-action', since new routines increasing the standardizing can then be forced upon them. One can argue the concealment of practice then is not mainly due to tacitness, but it is willingly disguised (Heidegger, 1927/1996).

Testing

This ideal type of representation practice, 'testing', we found in the two networks working with psychosocial well-being. 'Testing practice' refers to the question, "did I conduct my case handling correctly?" Also this practice is closely related to the norms for objective case handling, being aware of the personal and subjective perceptions and judgments, they seek toward more "objective" or correct handling, through socially shared, controlled, and negotiated solutions in the network. This practice is supporting individual decision making and distributed authority, through confirming or adjusting individual subjective judgments in collective processes.

In the organization they distinguish between Level 1, 2, and 3 inspections. Level 1 is the easiest, where the inspector conducts unannounced inspections using a simple questionnaire, interviewing some of the people they meet at the work site. Levels 2 and 3 are more advanced inspections, involving announced inspections and separate interviews with management and employees or group interviews. Within the area of psychosocial well-being, inspections are always at Level 2 or 3, producing a lot of material for the inspector which must be analyzed and interpreted in relation to professional knowledge regarding negative effects of stress, and the law.

The 'testing practice' differs from visualized practice and documenting practice regarding the following:

1. The participants have to read documents <u>before</u> the meeting.
2. ICT are, as they see it, not able to mediate this learning practice well.

While the colleagues in the other networks commented that presentations were more or less unprepared, some of the commentators in 'testing practice' have to read through all documents, and minutes of observations and interviews, to try in advance to pick out and argue for the relevant and most essential 'facts' to be discussed in the case. This is time consuming. Due to the complexity of the material and the role of personal likes and dislikes, which the inspector might have, social cues are important for sharing through testing practice. F2Fmeetings are preferred, online discussions are possible but then it is not always possible to have the needed in-depth discussions. This 'testing practice' has some similarity to the traditional learning mode where the apprentice followed the experienced inspector on inspections and learns by observing the experience, sharing, and discussions, but here this happens without doing the inspections together. Instead they share their notes, stories, and emotions from inspections in order to re-create some of the richness and complexity to do the 'test':

> *"We have so much data after level 2 or level 3 inspections. It is hard to sum up the best solution. If somebody is unsure about if he or she have done it correctly, we can do a "test". Go through his or hers case and discuss it. Very often it turns out that he or she did not think very wrong. We discuss like if it is acceptable that a manager are moody; one day he gives everybody a hug, the next day he do not look at you at all –and the employees tells us that they feel unsafe. Then <u>we use our own emotions to conduct our judgments</u>. This is an important role of our network, to discuss with colleagues' the judgments in our work, our use of our personal emotions. Like: What is too much and what is foreseeable of moody behavior of an manager?* (Coordinator of a network for psychosocial well being, our underlining)

'Testing practice' reveals a "hidden" or "tacit" attention/attunement, checklist and judgments among inspectors who work within the area of psychosocial well-being. One can argue it involves intimacy knowledge and know-how, based largely on personal knowledge (Johannessen, 1988) but also distributed across inspectors. The rules and requirements within this area are not so straightforward: it is not so easy to measure stress compared to polluted air. To share their own "checklist" (what they felt at the inspection) they first have to find a way to express their own emotions about the case and emotions during inspections. Senses in use are seeing, hearing, and feeling, one can argue a more bodily involvement. Previous personal and shared experiences have formed their emotions and foreunderstanding, which they use when they have to figure out whether, e.g., the behavior of the manager (in the case above) is foreseeable or not, and the work environment a risk or not.

The individual inspectors use field notes, emotions, and stories as 'boundary objects', making up a "window into the practice of the other":

> *"The psychosocial, is about to feel and to be touched. No, it is not. Or in other words it is too. But it's within regulatory limits. The law says that you should not be exposed to adverse psychological burden. And then you have to know a little about what is a unfortunate mental strain, and you need to know a lot about the psyche and body. And this is where the problem is in a sense, to be able to explain it well enough in writing. For you are going to have to justify it professionally, and you should connect it to the regulations. What is it you must expect in a job, and what is it that is so much or so special that you could not have expected it. Then it's not according to the law. It's also about to be as uniform as possible, that we need this network . There are the professional reasons from what we know about the body and psyche and bodily reactions, and so we have the network that creates the framework, so together this should be fairly objectively.* (Member a network of psychosocial well being)

Note taking when conducting inspections is regarded as very important, for example, notes from observations of where people sat, how they behaved, and how they interacted, when the problems were discussed with the employees and management. All are seen as helpful in the restructuring of what the inspector saw and felt during fieldwork. A reconstruction through rich written and/or oral descriptions helps to create a certain feeling of what took place, so they can agree upon the climate and events in the workplace on the basis of these observations represented in field notes and stories. Emotions are, according to them, important to express, share, and discuss to insure a sense of "objectivity", since emotions are seen as the most personal and 'subjective'. This notion of emotions fits

surprisingly well to the idea about bureaucracies described by Weber (1971, p. 128). On the other hand, they also acknowledge the importance of emotions.

These findings suggest that the sharing and learning processes promote self-confidence and empowerment of the individual through focus upon their individual role in task handling, on how to conduct, follow up inspections and put orders within new areas. One coordinator explains it this way:

> *"We know the rules, we know what the health impact might be, stress is not good, but how to use it in practice – it is fun to get new angles on it, like today when we discussed integrity (personality at work). We do not put orders on it today, but the day someone is a bit tough and puts an order on it, and manages to do it in a way that it does make sense… many will follow I am completely convinced"* (Coordinator of a network for psychosocial well-being)

Such an empowerment processes can promote "responsible" autonomy (Newell et al., 2009), since they promote critical discussion of the use of the rules, professional knowledge, use of personal emotions, and the role of personal judgments. When sharing emotions, social cues are important for sharing. F2F is, coming not as a surprise to us, preferred. Online discussions are seen as possible, but far from good enough since it is difficult to get in-depth expressions and discussions through ICT. Mainly they use the online meetings to plan activity, discuss policies more in general, have someone to lecture about a topic for an hour, and share short stories or reflections. This partly has to do with time spent in the network than the media (GoToMeeting or F2F). A F2F meeting takes one whole day, a GoToMeeting meeting is scheduled for only 1-2 hours, leaving less time for in-depth discussions.

The Network and Learning Practices

The learning practices described here are partly developed in the networks and partly taken from other contexts at work. For some, it is natural to take their camera out on inspections along with the notebook. But some find it difficult to take pictures, as they may contain trade secrets or that taking pictures is not part of their job, but the job of the police. When an accident at a work place has happened, some inspectors, particularly in the districts, bring a camera to ensure that good pictures for legal proceedings are being taken because they know that the police officers in their district have little experience. (It is very often their first job as a police officer.) Documents, letters, and formulations have been informally shared before the networks and have increased in recent years since inspections have been more and more conducted in projects. More project work has made it more clear that they have to carry out inspections and issue orders more equally. In other words, the inspectors have become more dependent on each other to see which rules are used and how they use them - such as how to justify an injunction. The GoToMeeting tool has been very helpful in these processes because the tool helps the sharing of the legislation in use on distance. The testing practice of individual assessments has been developed in the networks and the precursors of today's networks (in one of the regions). Perceived benefit of the networks has varied, because much time has gone into discussing what the purpose of the networks should be, and different tasks have been given to the networks by the managers. Also the benefit has been hampered since it is the number of inspections that are measured (and not learning) and rewarded, therefore many consider learning in the field as the most important work and learning arena (and not the network), leaving less value for the learning taking place in the MNoP's.

Discussion and Concluding Remarks

In this paper we set out to investigate learning processes in the form of representing practices where people often work alone or as pairs when being 'in-action'. We have asked the question, How can representations of practice serve as boundary objects facilitating learning? We have explored and described findings from five network cases in one organization and used the concept of boundary objects (Star & Griesmeier, 1989). Three ideal types of representations being part of learning practices where developed; for an overview of the three see Table 2.

Table 2: Learning as different representation practices

Practice	Visualization	Documenting	Testing
Activities in inspection context	Finding cost effective practical solutions to fulfill the requirement of the legislation	Enforce the law by conducting inspections and writing letters	Conduct judgments on complex matters
Resources used in the learning activity	Pictures, stories, and conversations	Stories and documents from one case handling process (letters written)	Field notes, written letters and emotions. Stories.
Senses	Seeing (pictures) and hearing (stories)	Seeing and hearing written and oral words/texts.	Seeing, hearing, feeling through rich stories. Being touched.
Approach	Analytical reasoning	Analytical reasoning	Intuitive first, then analytical reasoning
Knowledge types	Engineering and practical	Juridical knowledge, context and writing skills	Tacit, intimacy and personal, emotions, gut feeling
Media use preference	GoToMeeting; Powerpoint	GoToMeeting, Powerpoint, access to Vyr, Ephorte.	Prefer face-to-face
Skills	Skills in reducing complexity	Skills in representing process on ICT, ICT skills	Skills in representing and negotiating details/complexity and richness orally
Result of learning in the network	Sharing problems and problem solutions	Shared understanding and use of justification.	Empowerment and self-confidence. More reflective ('objective') and collective practice
Learning across outside and inside network	Explore outside, share inside	Explore and exploit inside	Reflection on action, thoughts and emotions observed and experienced. Develop knowledge, person and practice.
Hampering learning in the network	Too few pictures, lack of photo practice, that can visualize	Not all informants want to disclose practice. Practice is disguised. Afraid the autonomy/flexibility can be reduced through new collective routines	Complexity, trust, time in the network, attunement and real participation difficult through ICT-interactions

The table shows the three practices we have uncovered. The first two practices make use of classical boundary objects described in the literature before (Bechky, 2003; Star & Griesemer, 1989: Wenger, 1998) pictures (and illustrations) and documents (the law, checklists, and correspondence).

Our most surprising finding is the 'testing' practice with its use of emotions as a boundary object - a boundary spanning process-resource. We argue, however, that this not only shows emotions in the representing practice, but also in how they practice when out in the field. One can argue that they need to reproduce in the network, the complexity, emotions, empathy felt in the field when judging and coping with the situations. When doing their work, they use feelings and intimacy knowing. 'Intimacy knowing' (also termed 'intransitive understanding') can take place and be shown as capable attention, seeing, judging, and understanding similar to what has been described when studying experienced, e.g., nurses, glassblowers, service workers, or researchers in action or in conversations (Eide, 2007; Frost, Dutton, Worline, & Wilson, 2000; Johannessen, 1989; Josefson, 1991; Polanyi, 1958, 1969). An experienced nurse or radiographic can recognize patterns, understand and cope with a situation in a way that the novice is unable to do. Feelings can then inform and guide the highly capable actor in use: "What one learns is not technique; one learns to *judge* correctly. There are also rules, but they build no system, and only experienced individuals can apply them properly…The genuineness of the expression cannot be proved; one must *feel* it" (Wittgenstein, 1953/1992, p. 261-262, our translation). It is thus when distinguishing faces or situations, when reading a poem, or when knowing what word to use when talking, express knowing in the doing. Certain rules become a part of us, incorporated into the self-identity and what we know, in a bodily, emotional, and anonymous way. The 'rules' and feelings locate us in a culture. We do not know them as explicit rules and cannot give full accounts of them because such 'rules' are situated, tacit, dynamic, and social, and differ from the logic of formal rules that are general, static, and explicit (Wittgenstein, 1953/1992).

In the networks of practice, the inspectors use emotions through rich stories (orally and through written field notes) to communicate and understand each other's practices. This is more than visualizing or documenting. Individuals in the psychosocial wellbeing networks relate with others where they use their experiences, attention and "gut feelings", i.e., intimacy knowing, when communicating and trying to represent the practice, so that others can use their own experiences/fore-understanding when trying to interpret and understand what the first person is communicating. Emotion can bring resonance, as it tends to bring up memories and more tacit knowing. After reaching a certain common glimpse of the case in matter through more intuitive approaches, they can start 'testing' the retold situation and activity through reflections and sense making. One can argue the perceptions, emotions, knowing, and actions of the person can become more disclosed and ready for reflection on-action both for the involved person and the others in the network. It opens up for a collective elaboration, support, and verification, or critical rethinking, about what is appropriate and preferable coping. Emotions can be an important resource for boundary spanning creating the capability of integrating knowledge: experience, professional knowledge about psychosocial work environment, human psychology and bodily reactions, and knowledge about the legislation.

Often it is a matter of professional and social support, a practice contributing to empowerment, legitimacy, and development of self–confidence for the individual and collective. It can also introduce and put order on phenomenon not yet experienced by some of the inspectors (newcomers).

Like the two other representation practices, also this one contributes to increased transparency of practice, reflection on action, and collective learning possible due to the shared activity in the network of practice, which in turn may reduce the deficit of individual implicit use of discretion (Lipsky, 1980), and at the same time keep interpretation plastic enough for the individuals to adapt other meanings in each unique context for conducting inspections, an important feature of boundary objects (Star & Griesemer, 1989).

Inspectorates are bureaucracies where enforcement of regulations through the comparison between the regulations and more and less clear condition in the field as the main task. Meanwhile, the exer-

cise of discretion is an important part of the work. Any measures must also be justified and follow the values of impartiality, equality before the law to bureaucratic procedures. In addition the inspectors face the challenge of balancing a variety of values (e.g., doing control, and at the same time being helpful), which means that one should not only enforce the law, but interpret it in relation to professional knowledge and also be solution oriented and helpful in relation to the inspected businesses.

Our findings suggest that the inspectors try to create a rich environment for knowledge sharing and learning: First, through the techniques of the 'visualized practice', they share innovations in the inspected enterprise by the analytical and solution oriented use of pictures and stories. Second they document their work by presenting the legislation they have used in a given case and their own letters to the inspected businesses, in other words, how they analyze a case and draw reasonable conclusions. These two practices communicate ideal types of conducting inspections regarding (1) balancing the requirements of the law and what is cost–effective for the inspected entity and (2) adjusting local/individual use of the law with a larger group (network or project). The three practices differ in inward or outward focus. While visualization explores equipment used outside in inspected organizations, documenting is more focused on the internal use of the legislation on a group level and testing is more oriented towards the empowerment of the individual. The networks are seen as useful when they offer solutions, justifications, and/or empowerment/self-confidence; in other words, they produce useful learning despite that they are not conducting tasks together, an important feature of NoP's (Brown & Duguid, 2001). Hampering factors for learning described have been, e.g., lack of picture taking is a problem for visualized practice, and lack of trust and openness in the two other representing practices. To us this underlines learning as a social accomplishment (Hislop, 2009).

We see skills for learning, i.e., skills for communication and representation of work situations and practices, as an important facilitating factor. First, for some (visualizing practice) this involves the skill to reduce the complexity of practice; this is done in some of the networks through using pictures in addition to storytelling and conversations. Second are the skills of representing cases by the use of ICT and documents. This learning skill varies between the participants and is related to their individual ability to represent the documents they are using from different systems through ICT. Third are the skills of communicating and representing the complexity and nuances of human and social work environment issues; this is not easily glimpsed by a picture, therefore they use rich written and oral stories, filled with emotions, in the hope that the readers/listeners are able to glimpse the phenomena, context, and coping. This both demands skills by the narrator, as well as the reader/listener; it is here that the ICT-communication tool and short time can become major obstacles. The narrator's ability to make the experiences more explicit, to articulate it and narrate it in the written, spoken, and body language in ways that becomes meaningful also for the others are critical. So is also their will and confidence to do so.

This paper has shown sides of how employees learn and perform legitimate and capable work performance by focusing on how they represent practice and reflection 'on-action' retrospectively. This take place in networks of practice - as a preparation for later 'in-action', in such one can argue it involves moves across work spaces (contexts). Also one can argue that 'on-action' narrating and reflections is in itself a kind of 'in-action'. The practices taking place in networks of practice should be interrelated or preferably intertwined with the practices taking place outside of the networks, if to function as parts in a broader holistic learning practice.

To sum up, we see at least three implications of this research. First, since learning processes take the form of practices, these can be identified and nurtured by management giving helpful support through developing arenas, technology, and time. Available documents and pictures for sharing are dependent on the ICT tools at hand and existing work practices. But to have pictures at hand, somebody must have taken them for a purpose. This shows that not only work activities are interconnected into a broader field of practices as practice based theorizing suggests (Newell et. al 2009; Schatzk, 2001). Also, learning activities can be heavily dependent on and interconnected to what seem to be

minor and sometimes overlooked practicalities (as picture taking and attaching them to the case in the archive) within work practices. Critical resources, which can serve as boundary objects for learning, can sometimes be minor, les useful, aspects of work practices, but most useful in a learning context. An awareness of theses relations can be useful to help the production of materials that can be helpful in learning.

Secondly, practices and their boundary objects differ regarding whether they can be displayed best online or not. Some practices are shared easier through pictures or other visualized means combined with richer stories. Others rely mostly on stories.

Recent studies (Benn et al., 2013; Iorio &Taylor, 2014) underline the intuitive and interpretative processes in distributed sensemaking. We also acknowledge the role of emotions in sensemaking and, in particular, individual emotions enacted as a 'boundary object and spanning process-resources' in bureaucratic knowledge work revealed in this study. According to Wenger (1998), boundary objects have the ability to reconcile different perspectives. The sharing of emotions seems to orient them and function as boundary objects in the sense that the sharing of them helps individuals to recognize and reflect upon their experiences and actions to become more "objective" and collective. While there is search for "stuff and things" having boundary object effects, to ease knowledge sharing and construction we have also to take into account the role of versatile stories, deeper meanings, and emotions which accompanies the use of them. Emotions have so far been seldom focused on both in learning and in relation to boundary objects in particular, this we suggest need further research.

Three and finally, our study confirms and develops the insight that boundary objects not only are objects and something static, which can be useful in learning processes. Rather we have shown that the boundary object itself can be dynamic and that the main point seems to be that it creates boundary spanning processes opening up for learning from each other and/or together (collective).

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